SAFETY REGULATIONS

Laboratory work

AARHUS
UNIVERSITY
Department of Engineering, BCE

Indhold

Introduction

These safety regulations applies to all employees, guests and students at Department of Engineering, BCE. Everyone working in laboratories at the department must be familiar with the contents of this Safety Regulations.

The Safety Regulations describes general safety rules that everyone must be familiar with. In addition, there are specific rules, such as working with GMO, human material, gases etc., which one must be familiar with the content of if working in these areas. This must be confirmed in written before working in the laboratories.

Laboratories may be dangerous workplaces. Therefore, think the work process through and look for information on chemicals and safety. It is important to keep the laboratories structured and clean.
It is impossible to cover every possible situations and techniques in these Safety Regulations. It is therefore the responsibility of all group leaders to provide instruction in the safe use of special techniques. At the same time, it is everyone's responsibility to seek information that is necessary to work safely.

The project manager always has the overall responsibility for ensuring that the work is carried out in a safe and responsible manner. In the event of an accident, it is the responsibility of the project manager to take the necessary action. This may be done in collaboration with the Working Environment Organization

New employees and students are thoroughly instructed in work procedures and safety rules. By any doubts it is important to ask.

Calling for help

If fire, accidents, or other life threatening situations occur at Aarhus University, first call:

Emergency
Call 112

Emergency room
Call 70 11 31 31

You are not allowed to show up at the emergency room without calling the doctor first.

Weekdays between 8-16: call your own doctor.

On weekdays between 16-08, as well as weekends and holidays: call the doctor on call.

First aid

In each lab there are pages with an overview of first aid procedures. These papers can be removed and taken to the site of the accident, or out of the building in case of evacuation. On the back of each page is an overview of relevant emergency numbers.
All laboratories are equipped with emergency showeres and hand showers, which can be used to extinguish a fire in/on people or to flush people in case of chemical spills.
In several places in the building, safety cabinets are provided with equipment so that emergency aid can continue in the event of an evacuation. On the next pages are the first aid procedures as found in the laboratories.

For more information:
http://www.life2save.dk/forstehjaelp/viden-og-info/film-om-forstehjaelp-og-hjertestartere

The three manl points of first aid:

1

Make it safe

1. **Get an overview**
2. **Secure yourself and the injured person as soon as possible if necessary.**

e.g. by:

- Extinguish fire
- Disconnect power
- Relocate an injured person
- Close the fume hood/door
- Evacuate the building

2

Provide firts aid e.g. by:

- Stop heavy bleeding
- Put the injured person in locked position
- Clear severe blocking of the airways
- Provide heart-lung rescue

3

Alarm by calling 1-1-2

Chemical burns

Chemical burn in the eye

- Start treatment to avoid further damage
- Make sure there is no contack linses preventing flushing
- Flushing of the eye, use: eyewash bottles, tap water or other non corrosive liquids which you have access to
- The eyes must be actively kept open to ensure effective flushing
- Rinse for at least 20 minutes

For more information:
www.sundhed.dk/borger/patienthaandbogen/oejne/sygdomme/oejentraumer/aetsning-af-oejet/

Use of eyew flush bottles

Eye flush bottles are either found on the water tap or as disposable bottles. Make sure you know the location of the eye flush bottles before they are needed.

Working alone

- The bottle are opened by turning the lid
- The eye must be opened completely with thumb- and forefinger
- The eye cup is gently pressed against the eye – still with the eye open
- Flush thoroughly by pressing the bottle repeatedly
- In severe chemical burns, an reflective eye closure follows, which is why the affected person cannot adequately flush his own eye **and the nearest person must help**

Standing or sitting persom

- Helpers open the affected eye with thumb- and forefinger
- The eye cup is kept a hans width away from the eye
- Flush thoroughly by pressing the bottle

Lying person

- Remove the vertical plastic tube in the bottle
- Helpers open the affected eye with thumb- and forefinger
- The eye cup is kept a hans width away from the eye
- Flush thoroughly by pressing the bottle

For more information:
https://www.youtube.com/watch?v=-P9CUT1XS5k

Chemical burns on skin

- Remove the cause of the chemical burn
- Flush the chemical from the skin using 25-34 degress running water
- If the corrosive chemical is a powderlike substance, brush it off before flushing
- Remove clothing and jewelry that has been contaminated with the chemical
- Flush for at least 20 minutes under the tap or emergency shower. Some chemical burns need to be flushed for many hours
- Minor chemical burns (typically a few centimeters) usually heal without further treatment
- For larger chemical burns, contact the emergency roon

For more information:
https://www.sundhed.dk/borger/patienthaandbogen/akutte-sygdomme/foerstehjaelp/varme-og-kulde/brandskade-kemisk-aetsninger/

Internal chemical burns

Internal chemical burns or ingestion of organic solvents:

- Do not induce vomiting
- Drink immediately plenty of water or milk
- Call an ambulance or bring the injured person to the emergency room. Remember to bring information on the chemical (name, chemical formula, container)

Poisoning

Poison information

Call 82 12 12 12

Base and acid chemicals

- Remove any visible matter residue
- Give something to dring (water or milk) quickly, but do NOT induce vomiting
- Call a docor
- While waiting for help you can:
  Place the person in locked side position and monitor
  Flush remains on the skin with a lot of water
  For residues in the eye, se eye damage

Toxic gases

In general, when working with gases, it is important to assess the situation before approaching an unconscious person. There may be a potential risk that there will still be gas leaks and thus toxic gas present in the laboratory.

When the person is awake:

- Get the person out in fresh air
- Placed the person warm and comfortably half-seated
- Call for help
- Pay attention to whether the person is breathing. If the person stops breathing, start heart-lung rescue

When the person is unconscious but breatning:

- Get the person out in fresh air
- Provide free airways
- Place the person in locked side position
- Call for help
- Pay attention to whether the paerson is breathing. If the person stops breathing, start heart-lung rescue

For meoe information:
https://www.sundhed.dk/sundhedsfaglig/laegehaandbogen/akut-og-foerstehjaelp/patientinformation/forgiftninger/

Heat Burns

Minor burn

- Cool the burn as soon as possible by immersing the burned area in cool water or alternatively under running temperate water (12-18 degrees) for at least 30 minutes
- If the above is impractical, cool with cold towels
- Cooling down the burn reduces swelling by transferring heat away form the skin
- Do not put ice on the burn
- If cooled quickly, 30 minutes may be enough
- Cooling for more that three hours has often no effect on the skin, but may relieve pain

For more information:
https://www.youtube.com/watch?v=42oRIGiwDCk

Major heat burns

- Call 112 for an ambulance
    - Do not remove burned clothes
    - Ensure that the injured person is no longer in contact with burned material or exposed to strong smoke or heat
    - Ensure that the injured person is breathing. If the person stops breathing ensure that there is nothing blocking the airways. If necessary, start mouth-to-mouth rescue
    - If possible, immediately cool with water or cover the burned area with a cool, wet, sterile banbage or steril towel
    - Look for signs of shock
    - Place the injured person with the legs raised, if possible
    - Monitor regularly vital functions such as level af awareness, heart rate and breathing until help arrives

For more information:
https://www.sundhed.dk/borger/patienthaandbogen/akutte-sygdomme/foerstehjaelp/varme-og-kulde/forbraendinger-brandskader/

Burns on face and head

- Call 112 for an ambulance
- Explain that you suspect respiratory injury and that the person has respiratory problems
- Improve air supply by e.g. loosen tight clothing around the neck

When the person is unconscious:

- Make sure the injured person breaths
- Place the injured person in locked side position
- Prepare to begin resuscitation if necessary
- Cool down the burned area
- For cooling use a bottle or jug so that you can pour the water
- Put a towel or similar over the shoulders to collect water. Let it run for 10-20 minutes

For more information:
https://www.sundhed.dk/borger/patienthaandbogen/akutte-sygdomme/foerstehjaelp/varme-og-kulde/forbraendinger-brandskader/

Electric shock

- Call 112
- Look first. Do not touch the person who may still be in contact with the electrical source. By touching the person you can also get an electric shock
- Disconnect power if possible. If this is not possible, move the source away from the injured person using a nonconducting object e.g. cardboard, plastic or wood
- As soon as the person is free of the electrical source, check if the person is breathing and has a heart rate
- By no or very weak pulse, initiate heart-lung rescue
- If the person is unconscious or pale and shows other signs of shock, then place the person with the head slightly lower that the body and legs raised
- Unconscious persons who breathe and have a pulse should be placed in locked side position
- Cover major burns to prevent evaporation

For more information:
https://www.sundhed.dk/borger/patienthaandbogen/akutte-sygdomme/foerstehjaelp/varme-og-kulde/elektrisk-shock/

Firefighting

For firefighting, you need to have the knowledge and skills needed to act appropriately in the event of a fire.

If it is necessary to evacuate, take the appropriate evacuation package and provide safety vests to the Evacuation Mangaer and Site Assembly Manager. It is everyons responsibility for the building to be evacuated

Vests for Evacuation Manager and Site Assembly Manager

The four main principles of firefighting

1

Save People

Warning of endangered persons, including any evacuation of the building by activating the fire alarm. Rescue of persons who cannot move themelves. If injured first aid e.g. mouth to mouth should be included in this step

2

ALARM THE FIREFIGHTER

Call 112. Be prepared to provide information regarding the reason for your all (that it is burning), where itis burning (exact address), details of any injured persons and the phone number you are calling from. Remember to inform if the fire is due to chemicals

3

LIMIT THE FIRE

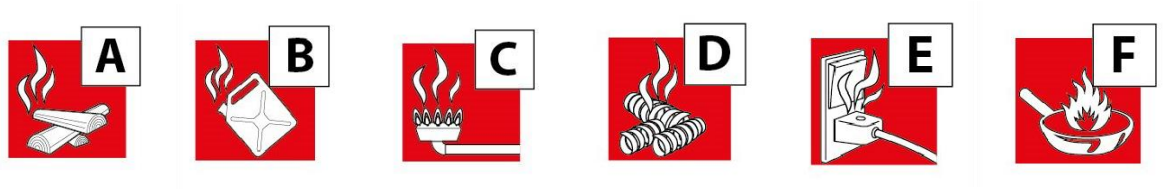
Close doors and windows. Close the gas and remove any pressure bottles and flammable material without endanger yourself or others

4

FIGHT THE FIRE

Use proper extinguisning equipment

Fire classes



Type of fire extinguisher	Fire class A Solid materials like wood, paper, textiles etc.	Fire class B Liquids	Fire class C Gasses	Fire class D Metals like magnesium, aluminium etc.	Fire class E Power plants	Fire class F Vegetable oils, fat etc.
Water	YES	NO	NO	NO	YES/NO*	NO
Powder extinguisher ABC	YES	YES	YES	YES	YES**	YES
CO2 extinguisher	NO	YES	YES	NO	YES	NO
Fire blanket***	NO	YES	NO	YES	NO	YES

*Depends on the approval of the extinguisher according to DS/EN3. Typically up to 1000V in 1.0 m distance
**Electronics and IT equioment may be damaged
*** Used by fire in pots etc. Used by fire in persons

Chemical spill

If hazardous chemicals are spilled outside the fumehood, it may be necessary to evacuate the building. The necessity must be assessed in advance via the risk assessment sheet.

In case of evacuation:

- Activate fire alarm
- Call 112 and inform that there is a chemical spill. Inform wich chemicals are involved. Provide the address

Responsibilities

Researchers, supervisors, students and laboratory technicians

Prior to starting the work in the laboratory a risk assessment of experiments, test set-up and waste management must be prepared and approved. In relation to assessing the waste management, the sorting key must be used. There will be specific sheets for the different fields of work (chemistry, GMO, biotech, work with human material etc.). Please note that the risk assessment must be signed by the responsible supervisor/teacher and the student.

Researcher and supervisors responsibility

- Ensure that safety checks in the laboratories have been completed (with a signature) by everyone working in the laboratory
- **Risk assessment** of the given protocol/method/chemicals. This must be available for all experiments and experimental setups and be signed by the student and researcher/supervisor
- **The risk assessment** must be sent to the laboratory technician for information
- **Choise** of analysis/equipment
- **Advice** of what chemcicals to purchase and use
- **Risk assessment** of chemicals before purchase
- Accomodate the **principles of substitution**. The substances that are least toxic must always be used
- Chemicals need to be replaced on an ongoing basis if less toxic ones can be used
- Cleaning of laboratory and disposal of chemical waste daily and after completion of project
- Information to the laboratory technicians of new students and duration of projects

Laboratory technicians responsibility

- Introduction to safety equipment
- Cleaning of laboratory and disposal of chemical waste daily and after completion of projects for the laboratory technicians own work
- Control of cleaning after completion of projects (bachelor, master PhD)

Students responsibility

- Always prepare before teaching. Your must have read the protocols on beforehand, risk assessed the experiement and experimental design and taken the necessary precautions. This must be available for all experiments and experimental setups and be signed by the student and researcher/supervisor
- Have obtained the necessary guidance on all laboratory equipment before use. This applies to standard laboratory equipment (centrifuges, scales, pipettes, etc.) and to special equipment (GC, cell sorter, etc.)
- Before starting up experiments you must have considered waste management, how to collect and dispose waste
- When attending courses you must never work alone in the laboratories
- By bachelor, master and PhD projects, it must be approved by the researcher or supervisor before working alone in the laboratory. You must always know where the various safety and emergency equipment is located before working in the laboratory
- Students at Danish universities are not covered by the Universitys insurance. As a student you have to have your own insurance
- You should inform your supervisor if you become pregnant or have an illness that may affect your laboratory work
- In the first semester you must atted a mandatory safety course
- Inform the work environmental organisation of any irregularities
- Cleaning of laboratory and disposal of chemical waste daily and after completion of projects. Cleaning must be checked and approved by a laboratory technician before the report can be handed in

Good laboratory Practice (GLP)

Dress

- Always wear safety glasses and a sealed lab coat where required. Take off your lab coat when leaving the laboratory
- Wear long pants
- Transport the lab coat outside the laboratory in a sealed plastic bag
- No high heals or open shoes
- Safety shoes might be required
- Scarves are allowed if there is no loos parts. Long sleeved must be covered with the lab coat. The lab coat must be made of cotton or similar fire inhibiting material. It should be possible to remove the lab coat quickly in the event of an accident. It must be possible to comply with other safety regulations (e.g. safety glasses)
- Contact lenses are not recommended in the laboratory (prevents proper rinsing of chemicals in the eyes). If you wear contact lenses wear a note on your lab coat "I wear contact lenses"
- Long hair must be set up so that it is not caught by rotating machines or ignited by open fire e.g. a bunsen burner
- Do not wear jewelry in the laboratories. It can be damaged by chemicals and it may prevent effective rinsing. Finger rings may prevent sufficiently hand wash
- Follow all instructions properly. Deviations can only be made by agreement with the supervisor or instructor

Behavior

- Hands must be washed as the last thing before leaving the laboratory
- Walk quietly. Never run and do not make sudden movements
- Do not store things on the floor (equipment, boxes, waste, etc.)
- Ensure order and cleanliness
- Experimental setups that should be used for more days must be marked with name, group number, e.mail/phone number (unmarked setups will be removed without warning)
- No backs in the laboratories and in the hall ways
- Cell phones and laptops must only be in the labaratories by agreement with the supervisor or instructor
- No food or drink in the laboratories. Glassware or other equipment is prohibited for use with beverages or food
- Wipe tables before and after work. Use a cloth with the required detergent
- Dispose waste properly. In in doubt contact your supervisor or instructor
- At the end of the day chemicals are either put back in the chemical cabinet or in a temporary storage room if one is used
- Chemicals with toxic hazard labeling must be stored locked. After use these chemicals must be returned to the laboratory technician, supervisor or instructor
- Never pipette by mouth
- Never pour excess chemicals back into the container ot bottle (avoid contamination)

- For acid/water mixtures: acid in water
- Water on the floor should be wiped off immediately to prevent slippery floors
- Chemical spills must be removed immediately in accordance with instructions for the specific chemical

Cleaning

Everybody has a responsibility to keep the laboratories nice and clean. All emergency exicts must be free and not blocked by e.g. boxes

Chemicals

- Chemicals must always be stored in cabinets or on shelves and never on the floor
- When you finish your day-today work in the laboratory all chemicals should be stored in chemical cabinets

Waste including paper, gloves, glass and needles

- Waste must be disposed in waste bins according to type. Everybody helps to empty waste bins as needed. Note: in connection with courses chemical waste collected in the fumehoods is only be emptied by the laboratory technician
- Needles are disposed in the yellow needle waste bins

Cleaning of glassware and automatic pipettes

Glassware and pipettes must always be cleaned after use. Old chemicals on the glassware can affect your experiments

- Use the sorting kay to make sure your waste is disposed in the right way (see below)
- Leave the equipment to evaporate in the fumehood for the next day (if there has been organic solvents in it)
- Cleaning using water: Rinse with demineralized water
- Cleaning using dishwasher: Follow the instruction of the dishwasher in the autoclave room. In some laboratories there is a tray that will be picked up for washing

Safety equiment

Personal saftely equipment, ventilation and emergency equipment

Proctetive equipment

Personel Protection

Glasses

- Safety glasses must be used during laboratory work when required
- Contact lenses should only be used if safety glasses are used at the same time. If you use contact lenses wear a note clearly on your lab coat "I wear contact lenses"
- Safety glasses must have a side shield and a cover at the top so splashes are less likely to hit the eye

Lab coat

- Lab coats are not only used to protect the clothes but also to protect against harmful substances and against fire
- The lab coat shold be washed or discarded after contact with hazardous substanses and materials
- The lab coat must have buttons in the front so it allows for quick removal in case of emergency
- The lab coat must be made of cotton or other fire retardant material

Gloves

- Aims to protect against absorption of skin penetrating substances. Gloves must be used when working with corrosive, harmful of infectious substances. Be aware that excessive use of gloves may cause skin irritation
- Chemicals can migrate through the gloves, which is called breakthrough time. On several suppliers website you can find information about the breakthrough time for different chemicals and different types of gloves
- Change a contaminated glove immediately. Never recycle disposable gloves
- 4H gloves are also available
- The gloves are removed after work to avoid contaminating handles, objects, etc.
- Always remove the gloves when leaving the laboratory

Laminar Air Flow benches (LAF)

LAF benches are used for sterile work. This ensures your reagents and cultures against contamination
LAF benches must not be used when working with chemicals

Use af FAF bench

- Always work with the least possible opening to ensure proper ventilation and flow in the LAF bench
- Keep your face above the edge of the lid
- To ensure optimal conditions do not create turbulence in the bench. Therefore, unnecessary bottles and equipment should not be in the bench

Alarm

- Pull down the lid until the alarm stops
- Check the flow with a small piece of paper taped to the edge of the lid
- In case of any defect, place a sign on the bench "Out of order, must not be used"
- If the alarm proceeds contact a laboratory technician or supervisor

Fume hood

Fume hoods are used when working with hazardous chemicals, smelly gasses or dust. A fume hood protects the environment from contamination as the air in a fume hood is replaced and ventilated when it is turned on

Use of fume hood

- Always work with the least possible opening to ensure proper ventilation and flow in the fume hood
- Keep your face above the edge of the lid
- To ensure optimal conditions do not create turbulence in the bench. Therefore, unnecessary bottles and equipment should not be in the bench

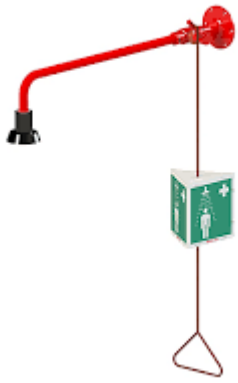
Alarm

- Pull down the lid until the alarm stops
- Check the flow with a small piece of paper taped to the edge of the lid
- In case of any defect, place a sign on the bench "Out of order, must not be used"
- If the alarm proceeds contact a laboratory technician or supervisor

Point suction

- Partially protects the environment from being exposed to contamination from the sample
- Can only be used for reduction of non-hazardous gasses
- Works only properly if the suction is maximal 15 cm from the sample

Emergency Equipment



- Emergency showers is optimal for extinguishing fire in persons or for flushing chemicals on clothes or persons
- CO2 fire extinuishers are found at different places in the buildings. These extinguishers are suitable for fires in liquids, gases and electrical equipment. They can not be used for extinguishing fires in solids, or fire in perons as the risk of freezing is very high due to the low temperature of the CO2
- Fire blankets are used for extinguishing small fires in pots, trash etc. It is very sutable for extinguishing fire in lying persons. Standing persons must be layed down in order to prevent the flames from spreading to the face
- Eye flush bottles are located in several locations in each laboratory. After use, discard the rest of the bottle

Safety cabinets

A safety cabinet is an emergency cabinet containing safety equipment to use in the event of an emergency or an accident

- Only use the safety cabinet if you are in the building outside business hours. One of the staff is contacted during business hours
- Eye flush bottles are found at every safety cabinet

Content

- A sign "Cleaning after chemical waste – access prohibited for unauthorized persons" and tape for use on the door where the accident has occured
- Disposable lab coats for use if a persons clothes cannot be used – e.g. in cases where the clothes are wet with chemicals
- Diaposabel plastic shoe covers for preventing own shoes from contact with chemicals
- Rubber boots for use instead of own shoes
- Blanket to keep a person warm or for use as a pillow
- 5 liters plastic bottles containing demineralized water, a sponge and a bucket. If a person is burned or has chemical burns, and you cannot access an emergency shower. Water is poured into the bucket and the sponge is used for putting or flushing water onto the affected area. Keep providing first aid until professional help arrives
- Nitrile gloves and H gloves
- Bucket with sand used for collecting oily liquids
- Bucket with vermiculite which are soft granules used to absorb liquids
- Sacks for colleting used granules and sand. Put the sack out in the open air after collection
- Bucket for collecting powder. Write the name of the chemical on the bucket and put the bucket out in the open air
- Dustpan and broom for collecting waste
- Gas mask
- Always contact one from the working environment organisation if something has been used from the safety cabinet

Daily safety in the laboratory

Safe work in the laboratory implies that you:

- Consider whether the chemicals you work with are dangerous and what safety equipment to use
- Have performed a risk assessment of ypur experiment and experimental setup
- Are sure about waste handeling
- Have received an instruction in using the equipment. This is especially important regarding equipment that can get very hot, has rotating parts or otherwise can be of any risk
- Know the locations of emergency equipment and exits and know the procedure for using them

Before starting work in the laboratory the following must be ensured:

- Make sure you know the location of safety equipment such as fire extinguishers, fire blankets, eye flush bottles, emergency shower, emergency exits, safety cabinets etc.
- For all of your experiments evaluate if there are:
  - Risk of burns (e.g. heating large quantities of water or oil, dilution of acids and bases, exothermic reactions)
  - Risk of burns using open fire (e.g. tightness of hoses, loose clothing/hair, development of flameable gases)
  - Risk of accidental contact with hazardous gases, stings from boiling liquids, penetration of gloves
- If any of the above mentioned issues are relevant action must be taken to avoid the risk factor. Ask you supervisor or the laboratory technician if in doubt

Labeling of chemicals and containers

We use Kiros for registration of chemicals. For each group there is a specific username and password which can be obtained from the responsible laboratory technician or your supervisor.
A prerequisite for being able to work safely in the laboratory is to label your containers with chemicals properly. Everyone should be able to see what the container contains and what safety precautions to take when working with the substances.
This means that all containers to be stored must be labeled according to the CLP rules (see below).

Labeling includes:

- Content
- Who made it
- Hazard pictograms
- P and H statements
- Signalword
- Preparation date
- Durability

It must only be put in the chemical cabinets if there is a printed label on it. Make sure the chemical has been registred in Kiros. It is possible to print labels from Kiros.

Containers that contains a chemical for only a short period of time must at least be marked with:

- Content
- Who made it
- Hazard pictograms
- Preparation date

Safety Data Sheet (SDS or MSDS)

All stockchemicals are labeled according to the CLP regulation (see below) when they are recieved from the supplier. Information according to the CLP Regulation is available for all chemicals on the Safety Data sheet. The safety data sheet can also be found in Kiros or downloaded from the suppliers website.
Safety Data Sheets are called SDS or MSDS which is an abbreviation for **Safety Data Sheet og Material Safety Data Sheet** respectivily. Ensure that the solutions and mixtures you make are labbeled accordingly.

CLP

CLP is an abbreviation for the English words for classification, labeling and packaging of substances and mixtures. The CLP Regulation is based on the United Nations Global Guidelines for Classification and Labeling, GHS (Globally Harmonised System). It ensures that workers and consumers in the EU are clearly informed about the dangers of chemiclas by means of classification and labelling of chemicals. All chemical substances and materials must be classified and labeled according to the rules of the CLP Regulation.

H and P statements

- Hazard sentencs H (Hazard) indicate the hazards associated with handling the harzardous substance or product
- Precautionary statements P (Precaution) indicate what precautions to take, how to handle, store, and dispose the chemical or substance or what to do if an accident appears

Hazard Pictograms

Physical Hazards

GHS01 – **Explosive substance**

This pitogram means explosives, self-reactive substances and organic peroxides which may cause an explosion when heated

GHS02 - **Flammable**

This pictogram warns against flammable gases, aerosols, liquids and solids:

- **Self-reacting substances and mixtures**
- Pyrophoric liquids and solids that can ignite on contact with air
- Substances and mixtures which, in cintact with water, develop flammable gases
- Self-reactive substanced or orgnic peroxides which can cause a fire when heated

GHS03 – **Combustible**

This pictogram indicate a fire nutrient gas, solid or liquid which may cause or exacerbate fire and explosion

GHS04 – **Gases under pressure**

- **Gasses under pressure may explode upon heating**
- **Cooled gas may cause cold damage**
- **Dissolved gasses**

Also gasses that are usually safe can be dangerous when under pressure

HEALTH HAZARDS

GHS05 - **Corrosive**

When using a chemical with this pictogram, be aware that it is corrosive and can cause severe skin burns and eye damage. It can also etch metals

GHS06 – **Acute toxicity**

Chemicals that is acute toxic through skin contact, inhalation or ingestion and which can even be fatal

GHS07 – **Health Hazard**

This pictogram means one or more of the following:

- **Acute toxic (harmful)**
- **Causes skin sensitization as well as skin and eye irritation**
- **Respiratory Irritation**
- **Narcotic, causes lethargy or dizziness**
- **Harmful to the ozone layer**

GHS08 – **Serious health hazard**

A substance or mixture with ths pictogram has one or more of the following effects:

- **Carcinogenic**
- **Affects fertilify and fetus**
- **Causes mutations**
- Respiratory sensitizing and may cause allergy, asthma or respiratory distress through inhalation
- **Toxic to certain organs**
- Harmful by inhalation. May be fatal or harmful if ingested or in contact with the respiratory tract

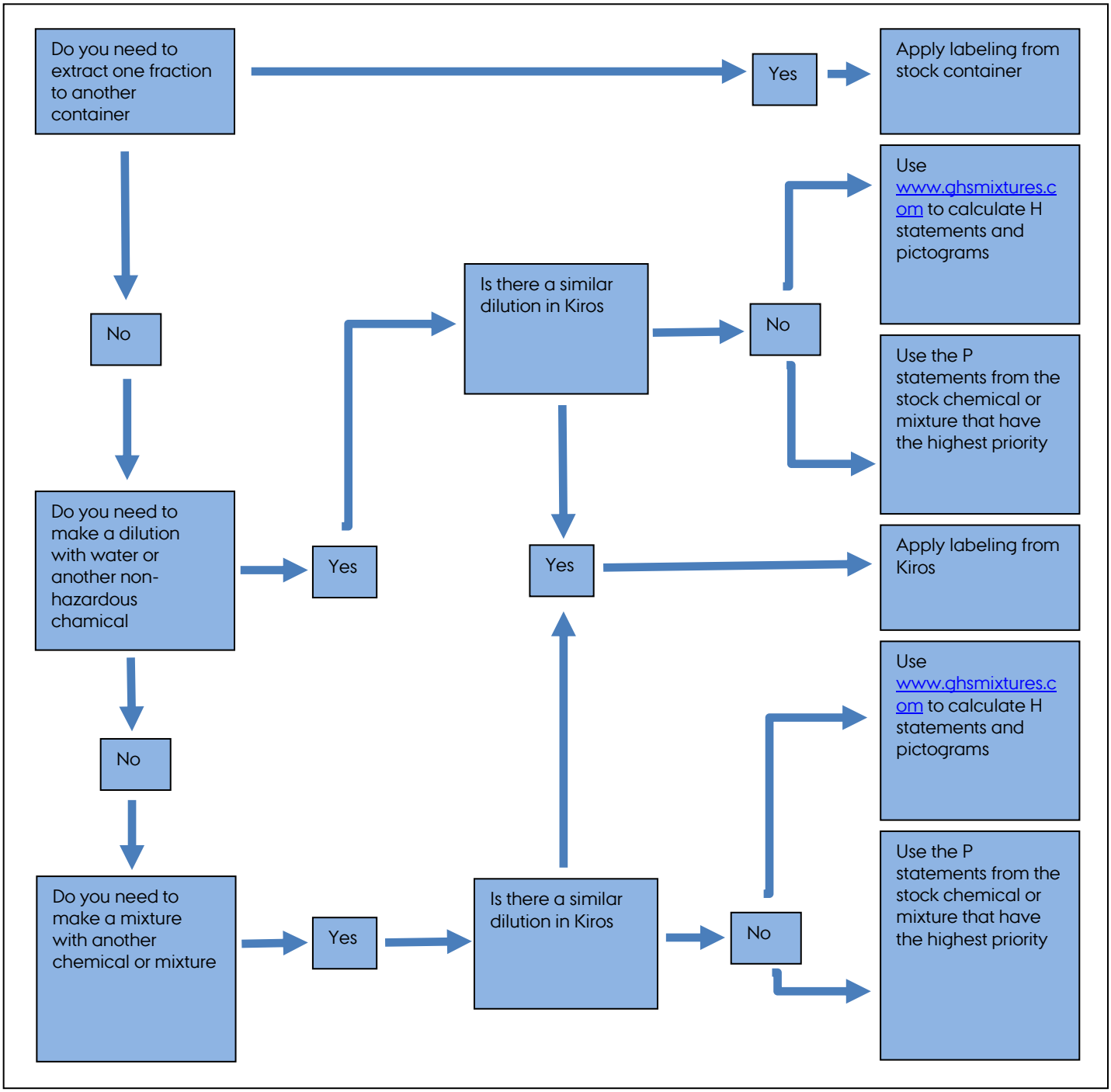
ENVIRONMENTAL HAZARDS

GHS09 – **Dangerous to the environment**

This pictogram warns that a substance is hazardous to the environment and toxic to the aquatic environment

Method of labeling

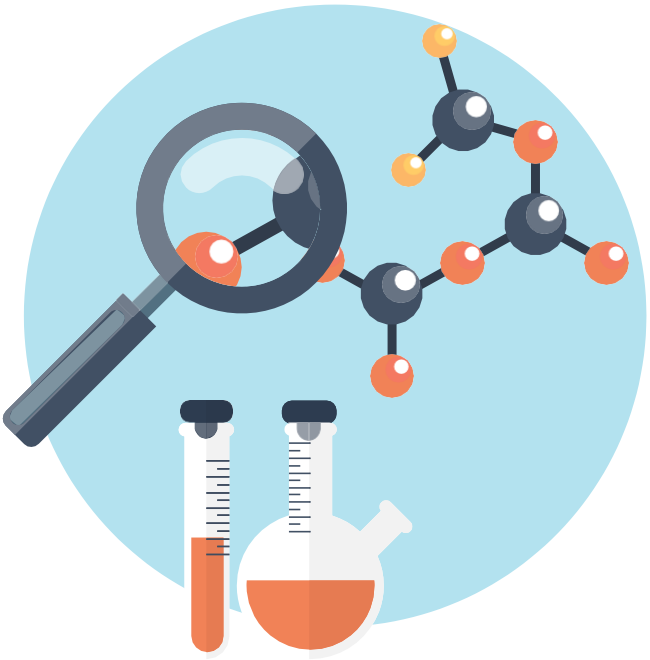
Labeling of chemicals is complicated and requires experience. To facilitate the overview you can use the flow chart below.



Calculation of H statements, hazard pictograms and signal words

The calculation is done by entering the information you have for the pure chemical (eg. Acetonitrile 99.9% or formic acid 96%). Next, a mixture of the pure chemical is made by specifying what weight percentage of the chemical constitutes the final mixture. The calculator assumes that the percentages stated are a non-hazardous chemical (e.g. water). This, a 10% acetonitrile solution in water, is calculated by making a "mixture" with 10% acetonitrile as the only "compound".

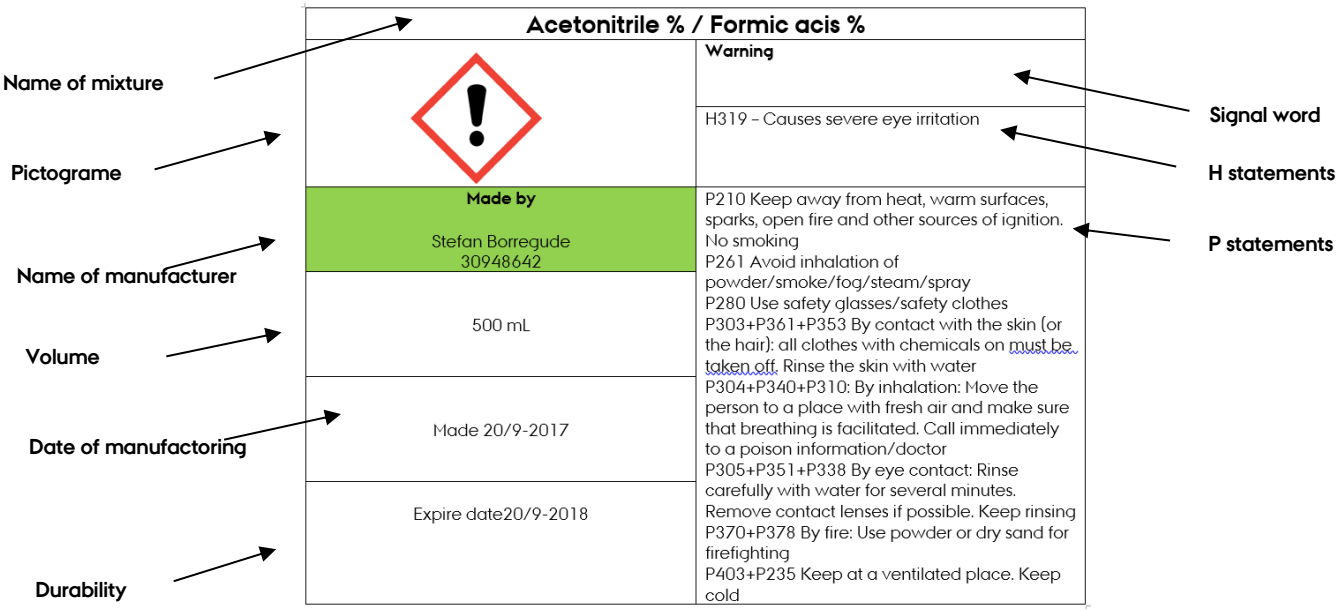
- Find the safety data sheet for the chemical. There are several options:
- Search KIROS: www.kiros.dk
- Download from the suppliers homepage (e.g. www.sigmaaldrich.com)
- Open a browser and go to https://ghsmixtures.com/
- Create a ne user by pressing "Get started"
- Log in
- Click "Add a compound/mixture" and select "Add A Compund"
- Enter relevant information on the chemical. Below is the information on the hazard statements (H-statements) that can be read from the safety data sheet section 2 and 3. In case of no knowledge, the section is left blank. Note that P statements and certain H statements cannot be entered, as the effect of these mixtures or dilutions cannot be put on formula and therefore not calculated. In these cases, thay are transferred unchanged to the new label. This will in most cases lead to an overestimation of the P statemetns, but this is the best solution for the present.
- Repeat for each chemical you need to work with. Note: The free versin has a limited number of compounds or mixtures that can be entered per user. Create new user if you need to create more.



Example of a label with correct information:

There are many ways to build a correct label, but common to all is that they should at least be labeled with:

- Content
- Who made it
- Hazard pictograms
- P and H statements
- Signal words
- Preparation date
- Expiration date



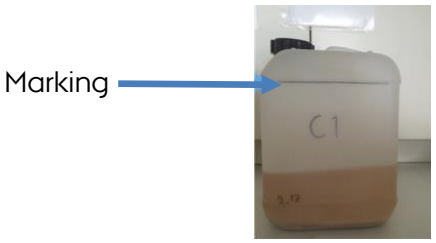
Wasre handling

Waste handling is an important part of the safety in the laboratory. A large part of the accidents recorded are due to improper handling of chemicals. Failure to properly disposal of waste may cause two incompatible substances to be mixed into the waste bin and unintended chemical reactions may result in the risk of very serious accidents.
Companies and public institutions that generate hazardous waste are obliged to dispose it complying legacy including ensuring that hazardous waste is not mixed with other categories of hazardous waste. Hazardous waste is sorted into different waste groups (see sorting key below).
For a mixture of chemicals the sorting key is used. Each statement from the top is taken into account in relation to the given waste. The waste must be disposed in the waste bin that corresponds to the first category of waste with which the waste can be defined.

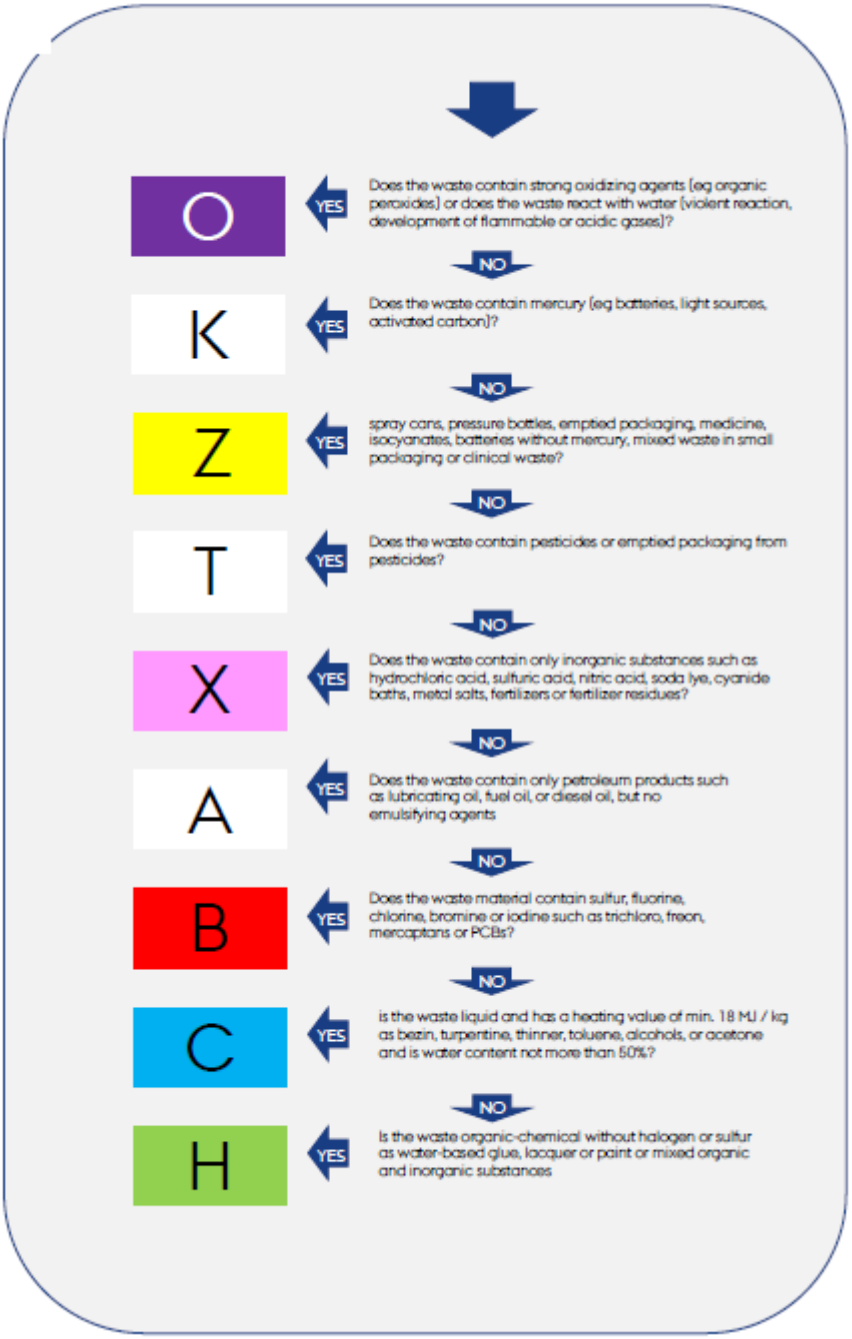
Sorting key

The sorting key gives an overview of the individual waste groups and is used to identify how waste is prioritized and sorted correctly.

- In Kiros or on the SDS/MSDS of the chemical the waste group will be indicated. This is stated under "Transport classification of hazardous waste". If the waste group is ntot specified the sorting key is used
- There might be subcategories under each waste group depending on how the substances react with eachother, solid/liquid, halogens, acid/base etc. For proper waste handling contact group leader/course manager/laboratory technician
- For liquid waste always work in a hood when the chemical waste are poured into marked plastic containers
- Leave used glassware in the hood for evaporation overnight. After evaporation it can be cleaned
- When the waste container is filled to the mark it must be disposed



- When the waste container is in the hood do not put on the lid. This is to prevent pressure build-up in the container. The lid must only be put on just before disposal.
- If there is no waste bin a new must be put in the hood marked with the appropriate category
- Solid waste must be handled according to current procedures at the individual locations



Sorting Key

Examples of waste handling

- An aqueous solution of 4 M sulfuric acid must be poured into the container as X labelled acid since none of the above waste categories matches the solution
- A titration with Iodine in a starch solution is poured into B waste, since Iodine is a halogen and none of the above waste categories matches the solution
- Solutions containing peroxides, e.g. hydrogen peroxide or postassium peroxide sulfate must be discarded as O waste. O waste has the highest priority in the sorting key, so no further consideration is needed
- Discarding alcohols, ethers and most HPLCs (grade e.g. as methanol and acetonitrile) occour in C waste, as they are organic compounds without halogens and with a calorific value of at least 18 MJ/kg. However, at a dilution of more that 50% water, it must be discarded as H waste
- Besides weak solutions of organic compounds such as alcohols and ethers etc. organic acids (e.g. acetic acid) are also disposed as H waste (not to be mixed with X acid that may only contain inorganic acids)

Work Environmental Organization

Structure

The Work Environment Organization deals with the work environment including safety. At AU the Work Environmental Organization has four levels:

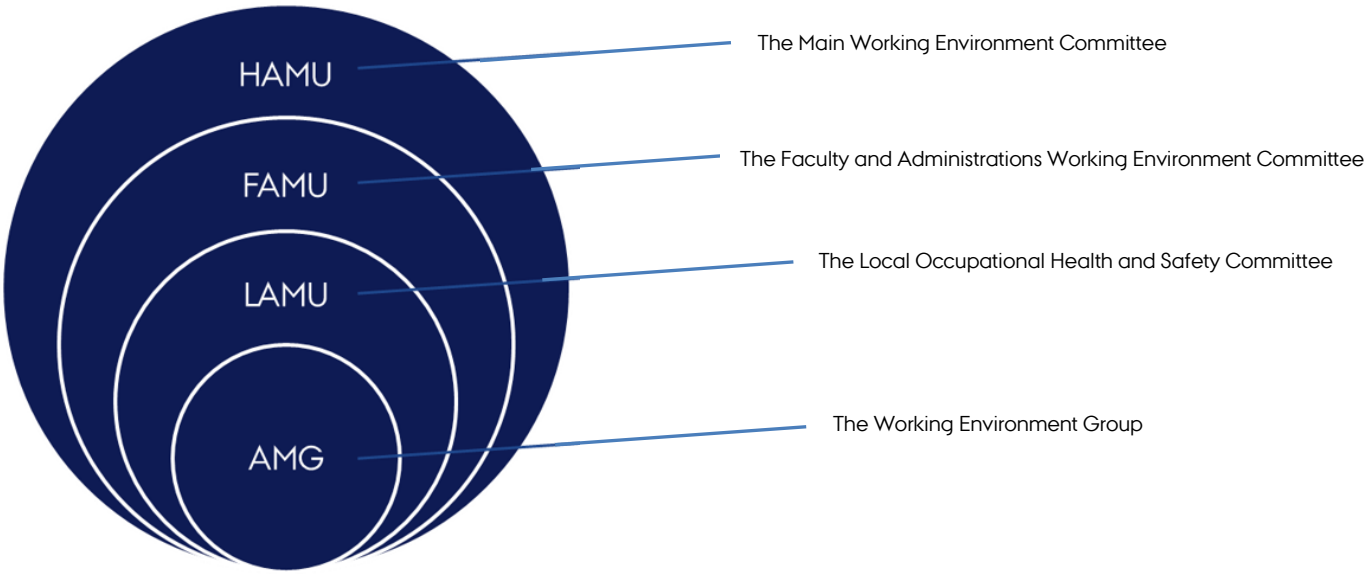
The Main Working Environment Committee (HAMU)
The Main Working Environment Commitee advises the management of the working environment at AU. The Main Working Environment Organization plays an important role as it establishes and defines the overall goals and rules across areas.

The Faculty and Administration's Working Environment Commitee (FAMU)
The Falcuty and Administration's Working Environment Committe plans and coordinates the faculties and administations working environment. FAMU defines goals for effort and ensures that decisions are implemented throughout the falcuty and administration.

Local Occupational Health and Safety Commitee (LAMU)
The Local Occupational Health and Safety Committee plans, advises and solves specific occupational health and safety problems. The working environment committees can get help and support for their work through LAMU. The Committee analyses the work environment actions, gives advise regarding specific work environmental problems and do follow ups on whether the work environments is effective and preventive.

The Working Environment Group (AMG)
The Working Environment Group helps colleagues and students in everyday life. All institutes and deputy director areas at AU have one or more Working Environment Groups. The group is responsible for the daily and environmental work at the institute/unit. A successful Workin Environmental Group requires the support of colleauges and students and the group must make sure that their results are visible and continuously handle the working environmental problems that are raised.

Room Responsible
At each location there is a list of room responsibles.



Work Environmental Group, ENG
Contact information

Work Environment Manager / Supervisor Representative

Morten Dam Rasmussen
Phone 25152755
E-mail: mdr@eng.au.dk

Working Environment representative
At each location there is a list on the door where you can see who is occupational healts and safety representative.