

## Chemistry laboratory rules and regulations

These regulations and rules are for your safety and that of your colleagues. The room supervisor and armico will go over these rules and regulations with you at the beginning of your work and it is up to you to make sure that you fully understand all that follows during this introduction.

Reading this document, as well as others that can be found [here](#), is the first step towards being allowed to work in the chemistry laboratory. The discussion with the lab supervisor and the armico is the next. To this discussion you should bring a completed experimental form and a detailed experimental description. The former can be found on the SSME website and the latter is a document in your own words that describes in detail the proposed experimental protocol with its associated risks. The function of these documents is twofold. First, it aids you in thinking about the risks associated with the experiment and to plan the experiment out in detail. Second, it will make it easier for the armico and lab supervisor to assess whether all risks have been accounted for. Both these documents have to be signed and approved by your supervisor and the armico before you are allowed to work in the laboratory. The experimental descriptions will be stored on the group's Y drive, so that future researchers may benefit from your description of the experiment.

### How to “your and others’ personal protection”?

#### How to work safely with chemicals?

Chemicals are often dangerous and can harm you and others. For many chemicals, the risks are well documented in Safety Data Sheets (SDS). For any chemical you purchase, this document is available (often online). With the SDS you (and the armico) can assess the risks of an individual chemical. For example, the SDS of any purchased chemical will list the required personal protective equipment, as well as the required measures in case of a spill or accident. The challenge arises when new compounds are synthesized, which is what typically happens in a research environment. For these new chemicals it is not always straightforward to predict what the safety hazards are. If unknown, you should always assume that new materials and mixtures are at least as dangerous as the individual precursor chemicals and treat them and the waste as such. However, because the exact risks of synthesized compounds and by-products/impurities are not always known, the minimum requirements for personal protective equipment when working with chemicals in the chemistry laboratory are goggles, lab coat, and gloves. This is not optional, but mandatory.

In principle, all work with chemicals is performed in a fume hood. However, due to the working height of the fume hoods, for some (taller) people it is not ergonomic and safe to perform certain actions (e.g. mortar and pestle use) in the fume hood. For such activities an exception can be made in that they may be performed on a workbench, but only under two conditions. Respiratory protection is required when working with non-water soluble and toxic powders and the action must be performed under one of the mobile suction units. These rules also apply when using sand paper on pellets or other solid objects. If you encounter such a situation, always discuss with the armico and/or lab supervisor.

Chemicals should be stored in suitable containers in cupboards, the glovebox, or a chemicals cabinet. Fume hoods are work spaces (safe work spaces are clean and tidy), not for sample storage.

When you transport chemicals or chemical waste, do so in the dedicated cart that is in the chemistry laboratory. In general, keep chemicals in their designated laboratories. Exceptions are samples that you want to analyse in other laboratories.

### How to safely work with disposable gloves

The disposable glove is a personal safety measure against chemicals which can penetrate, irritate, or burn the skin. This type of glove offers no protection from prolonged contact with chemicals; it is meant to protect the skin in case of a spill, or other accidental contact with a chemical. When gloves get contaminated, it is good practice to dispose of them within half a minute. This means that you don't need to drop what you're doing to replace the gloves, but can do so at the end of your current action.

Never touch objects or surfaces outside of the fume hood with an obviously contaminated glove. When such obvious contamination has not occurred, it is allowed to touch other objects and surfaces. For this laboratory it has been decided that it is not required for the gloves to be taken off whenever the experimentalist needs to quickly take a note, adjust the fume hood, or perform similar actions. Because this introduces a risk of contamination, it is mandatory to clean all objects and surfaces as soon as you are done with the experiment, or before you leave the laboratory for any reason. If you leave behind a contaminated area for even a few minutes, this poses a safety hazard for other users of the lab, who expect all surfaces to be clean and safe to touch. In general, it is recommended to keep a clean working space at all times.

There is a specific way to take off gloves without exposing yourself to the contamination on the outside of the gloves. The room supervisor or armico will demonstrate and check if you know how to do this.

The final point concerning laboratory hygiene is to wash your hands when leaving the laboratory. This further reduces the risk of exposure of yourself and others to harmful substances.

### How to protect your eyes

Whenever you are in the chemistry laboratory for any other reason than passing through, goggles are mandatory.

Before you begin work, make sure you know the locations of the eyewash stations. In case you or someone else gets a chemical in their eyes, it is vital to act quickly. There are eyewash stations outside of all laboratories in the main hallway. Note that the eyes must be forced open to be washed well. In order to facilitate this, follow the instructions on and around the eye wash stations.

### How to protect your body

Whenever you are in the chemistry laboratory for any other reason than passing through, a lab coat is mandatory. In addition, wearing open shoes and/or high heels in the laboratory is not allowed. In terms of legwear, these must fully cover your legs (no shorts, skirts,  $\frac{3}{4}$  pants).

It is not allowed to take your lab coat out of the chemistry laboratory, the only exception being to the furnace laboratory.

The main coat racks for lab coats are at the entrances to the laboratory from the main hallway, with additional coat racks in the furnace room and the weighing room, for movements between the laboratories. Here you could hang an additional coat, if desired.

## Other rules for a safe and professional working environment

You will be assigned a fume hood by the room supervisor during your introduction to the laboratory. It will be your responsibility to keep this space tidy and clean.

For safety reasons, but also space conservation, a clean desk policy on the workbenches will be enforced. This means that when you have completed your actions, or are leaving the laboratory for a period of more than ~30 minutes, make sure you leave a clean and empty workbench behind, or with clear information stating when you will return to clean. Dispose of razorblades, needles, sandpaper or other waste you have created. Store back all components (including your logbook) and chemicals you have used. Clean the surfaces and leave everything as you found it. If you did not find it clean, inform the room supervisor.

The above also applies to common use areas, such as the cleaning fume hood and the sink. Do not leave objects there and clean these areas after you're done using them. The drying rack is the only allowed place to leave glassware, but only for a reasonable time so it can dry. The final action in cleaning glassware is putting it back into its storage space.

Stray samples and objects will be thrown out.

Reaction vessels and storage containers with chemicals and samples need proper labelling: name of experimentalist, compound name, and date.

In order to be fully aware of your surroundings it is forbidden to wear headphones while in the chemistry laboratory.

When you use the last of any chemicals, consumable, or solvent, it is your responsibility to make sure the next user still has access to these items. Refill or replace the consumable and if applicable, dispose of the empty container in the correct fashion.

## How to dispose chemicals and waste

Never pour chemicals down a sink.

Dispose used chemicals, by-products and obsolete samples and polluted disposables in the correct manner. Mixing waste of different categories can result in very dangerous situations, e.g. acids and bases, or nitric acid and organics. In order to prevent such incidents, you need to be aware which kind of waste you have and what the safest way of disposal is. Incompatibilities involving purchased chemicals can be found in the SDS of the material, but for synthesized chemicals and mixtures this can be unknown. In that case, consult with the armico or laboratory supervisor. Do not just guess, this can lead to dangerous situations.

Contaminated objects (no needles, blades, glass), such as gloves, paper, and aluminium foil, need to go in the black bins. Small amounts of solid chemicals (<0.5 g) can also go in the black bin. However, for small quantities of solids it is good practice to dispose of solids by destroying or

dissolving them and then disposing of the solution. For most metal compounds, nitric acid ( $\text{HNO}_3$ ) can best be used, as this is the only waste stream that is allowed to have significant (heavy) metal content. Nitric acid is a strong oxidizer, so always check the compatibility of your waste with it before mixing these. For disposal of  $>5$  g solid, consult the armico or laboratory supervisor. They will help in determining the appropriate method of disposal of the material.

Used needles and razor blades need to be disposed of in small yellow bins, which can be found on the workbench above the black bins.

Glass waste can be disposed of in the white bucket under the workbench, across from the cleaning fume hood. It is good practice to roughly clean contaminated glass waste before disposing of it in the bucket. If there are volatile compounds on the glass, either let it fume out in the back of your fume hood, or clean it with ethanol/acetone before disposing of the glass waste.

For liquid waste, there are four categories that are commonly used in this laboratory; containers for these categories of waste are always present:

- Nitric acid ( $\text{HNO}_3$ ) + Nitrates + (heavy) metal containing solutions/suspensions
  - o Never dispose of concentrated HCl in this jerrycan. HCl is only allowed in dilute ( $< \sim 5\%/1.5\text{M}$ ) form, or in a spent aqua regia solution
  - o RU002 (NB4 system)
- Inorganic acids (except nitric acid) + light/non-toxic elements in solution
  - o RU003 (NB4 system)
- Inorganic bases
  - o RU012 (NB4 system)
- Organic solvents (halogen-free)
  - o RU009 (NB4 system)

When you produce waste that does not fit in any of these categories (e.g. halogenated solvents,  $>10$  g of solid chemicals), do NOT throw it away in any of the other containers or leave it. Contact the room supervisor and armico to discuss how to deal with your waste.

**Never fill a jerrycan above the maximum allowed level.** This is indicated on the jerrycan with markings and often additionally by permanent marker. If any waste container is full, do the following:

- Close the container
- Remove the container from its position and inspect if it is clean on the outside; if not, clean with paper + water/ethanol
- Apply appropriate stickers for the type of waste in question (safety labels, RU sticker, description sticker). These stickers can be found **TO BE DETERMINED.**
- Use the dedicated chemical transport carts to move the container to the appropriate location in the logistics corner.
- **TO BE DETERMINED**

## How to manage time

You are not allowed to work in the lab outside times regularly scheduled for your lab as there is no safety crew. Working in the lab outside of working hours, i.e. before 08:00 and after 18:00 and

at any time during the weekend, is forbidden unless with the specific approval of your PI or the armico. Even then, work outside regular hours is only allowed when a second, qualified person is present within sight range when performing an experiment.

## How to respond to an accident

Familiarize yourself with the location and proper use of the fire extinguishers.

Even with the best of preparations, accidents can occur. It is important to act calmly and always prioritize safety. Evaluation is also important, but not during the incident.

When an accident happens to you, or in your surroundings, your first course of action should be to leave the room and find support in the nearby offices and laboratories.

When you see an accident happening, it is vital to **prioritize your own safety**. Leave the room with the person to whom the accident happened, but if they can't do this, don't rush to help them. Leave first, get support, assess the situation from outside the laboratory and only then act.

In case of any serious incident, or in case the people that have gathered are unsure about what the correct course of action is, always call (050-363)8050 for help. Do not undertake any action unless you are 100% sure it is safe to do so. Examples of serious incidents are:

- Spill of volatile chemicals
- Any gas leak
- Fire
  - o In case of fire, you may decide that you can safely stop the fire from spreading by using a fire extinguisher. This decision must always be made only after leaving the room and getting help first. If in this time the fire has done more material damage, that is unfortunate, but is always preferable over personal injury.
- Personal injury
  - o One of the situations where you can aid another is when a person's clothing catches fire. Again, **first consider your own safety** (you can't help someone if your clothing is also on fire). If the situation allows, get a fireproof blanket (from the red container near the main entrances of the laboratory) and use it to guide that person out of the laboratory and onto the hallway floor (forcibly if need be) where the flames can be extinguished by rolling them over the floor. Getting someone who is on fire on the floor is vital to protect the head and lungs from the fire and smoke, which will rise to envelop the head when standing upright. Never turn a fire extinguisher of any type on a person whose clothing is on fire, as this could cause eye injuries.

## How to respond to the fire alarm

Should a fire alarm sound while you are working in the laboratory, turn off any heat source and calmly leave the building via the nearest (emergency) exit. When outside, it is good practice to stay with the other group members and get in touch with those who have left through another exit. This way, it can be assessed if everyone has safely exited the building. Even if someone seems to be missing, never enter the building again before the all-clear has been given. Report any concerns to the staff that are responsible for managing the situation.



Version	Date	Changes
2.0	7-6-2024	Update to reflect new lab and incorporate updated rules
2.1	19-6-2024	Implementation of feedback J. Baas