

Laboratory Regulations of the Department of Chemistry

04/2023

Emergency Telephone Numbers

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|--------------------------------|---|
| Fire Brigade | 122 |
| Police | 133 |
| Ambulance | 144 |
| Europ. Emergency Number | 112 |
| University Porter | 37335 (MG) 37370 (UFT) |



University of Natural Resources
and Applied Life Sciences, Vienna
Department of Chemistry

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1.1 Introduction:

These regulations for laboratory safety are valid within the entire Department of Chemistry and are to be followed by all employees, students, apprentices, guests, service technicians, etc.

All new department members must sign, at the time of either signing their contract, receiving keys or commence their employment, that they have read and understood these guidelines as well as the fire safety guidelines; these guidelines are available also via the departmental homepage and the departmental secretariat.

All new department members will receive safety instruction from the group or project leader and are obliged to obey the laboratory safety regulations.

New laboratory members must be equipped with the appropriate protection materials (safety glasses, lab coat, etc.).

The Head of the Department, teaching assistants, and Group Leaders must enforce the laboratory regulations.

In case of repeated violation of the laboratory regulations by an individual or a group, the Head of the Department, Assistant or Group Leader will decide on further action.

1.2 Regulations for Laboratories and the Building:

In the event of an emergency (e.g., fire alarm), work must be stopped and the laboratory must be evacuated using the marked emergency exits.

All emergency exits should remain free from all objects; also fire extinguishers and first aid boxes may not be moved or hidden, even temporarily.

Transport of chemicals and liquid gases: for chemicals proper baskets must be used for transport; in the case of liquid gases, adequate Dewar flasks must be used.

Chemicals may never be transported in the passenger elevators – use only the freight elevator for transporting chemicals.

1.3 Regulations for the Work Place:

Prevention of accidents is your personal responsibility: do not leave this to others!

You must be aware of all emergency exits, the fire safety regulations, emergency numbers and other relevant official information.

It is compulsory to wear **personal protection equipment** when working with chemicals. First priority: safety glasses. Those who wear prescription glasses must wear suitable protective goggles that cover their glasses. Also compulsory is protective clothing: lab coat, gloves, protective ointment, dust or chemical mask, etc.

Food, cosmetics, and pharmaceuticals must never be consumed, used, or stored in the laboratory or next to chemicals and biological substances.

Refrigerators in the laboratory are restricted for chemicals only

Smoking is strictly prohibited in all laboratories.

Desks in laboratories: Chemicals and items contaminated with chemicals may not be brought into the laboratory writing areas.

Always avoid production of **aerosols** in the lab atmosphere, use fume hoods.

Do **not overload workbenches** with chemicals. Work surfaces must be kept clean, and good work hygiene should be observed.

Pictograms, **H/P sentences** on chemical labels and the respective material safety data sheets (MSDS) **must be consulted**; these are generally available from the supplier's website or catalogue. Note the following principle: experiments should be designed with the smallest amounts of educts/products possible - the smaller the scale of the experiment, the smaller the impact of possible accidents.

The group leader is to be informed prior to higher-risk experiments with chemical or biological substances. Undergraduates, trainees, apprentices, guests, service technicians, etc. can only work with higher-risk materials when a competent supervisor is present.

External staff (e.g. service technicians) has to register to the group leader and must receive safety instructions as well. He has to be provided with protective gear.

The use of temporary crutches (or similar mobility aids) in the laboratory is forbidden due to safety reasons. (Solutions for individuals at a later time point will be offered in such circumstances).
Any person who is pregnant may not work in the laboratory due to safety reasons. If you suspect or know that you are pregnant, please contact the occupational doctor (Arbeitsmedizinerin) and the laboratory head. **Please consider your safety with this issue seriously!** (Of course, solutions for individuals at a later time point will also be offered in these circumstances)

Before starting an experiment, **take all necessary measures to prevent accidents** – this also means double-checking when you have doubts about the clarity of the instructions – misunderstandings are a frequent cause of accidents. Preventative measures to be taken also include ensuring no release of noxious-smelling substances!

Spilt chemicals should be immediately cleaned up using the accepted methods.

Open flames and ignition sources may be used only in rooms, where no flammable substances are in the vicinity. The use of flammable substances is prohibited in all high-risk rooms as well as where flammable materials are stored (**EX-Protection**). Note that cold rooms and refrigerators are not suitable for the storage of flammable chemicals (no EX-Protection).

Flammable liquids must not be used or stored in the vicinity of open flames – except when necessary for good microbiological practice.

Care must be taken when using a hair dryer or a heat gun near flammable substances.

Do **not interfere unnecessarily in others' work** – this can endanger you and others.

Do not enter closed zones or rooms to which entry is prohibited.

Solvent containers must never be closed when completely full (vessels may be filled to a maximum 95% capacity).

Gas cylinders and pressurised gas outlets must be fitted with pressure-reduction valves. Gas cylinders must be secured to the wall or laboratory bench and may only be transported with the safety cap in place.

Pipetting of liquids by mouth is forbidden. Pipette bulbs or other appropriate suction devices must be used.

For optimal functioning of the ventilation system, the density of gases or vapours must be considered. Vapours of flammable liquids are always denser than air, as are most gases: exceptions include ethyne, hydrogen cyanide, ethene, methane, and hydrogen, etc. When handling gases and vapours with densities higher than that of air, the inlet of the ventilation system should be close to the floor; for gases that are less dense than air, it should be near the ceiling.

Only laboratory approved and purpose-appropriate authorised laboratory equipment may be used for experiments.

The application of a vacuum or excess pressure (i.e. > 1 bar) to, or the use of stirring mechanisms in, unsuitable glass vessels may lead to breakage, implosion, or explosion of the vessel. Always check the condition of the glassware and the suitability of the type of glass from which it is made.

Never use damaged or broken glassware (danger of injury).

When using or storing **liquid nitrogen**, be aware of the presence of condensed oxygen, which can start a fire or cause an explosion upon contact with any combustible material, especially in cooling traps of high-vacuum apparatus. Liquid nitrogen b.p.: -195.8°C , oxygen b.p.: -183°C .

Do **not close ampoules** or glass containers neither after freezing compounds in liquid nitrogen when storing under argon – closing such vessels under cold conditions can lead to explosion when these are thawed. Argon is liquid at -185.7°C and freezes at -189.2°C as compared to the boiling point of liquid nitrogen being -195.8°C .

Glassware contaminated with toxic, foul-smelling chemicals should be cleaned immediately with an appropriate decontamination agent and/or disinfectants and must never be given over to the cleaning service, put into the dishwasher, or simply rinsed in the wash basin.

Glassware or other items contaminated with microorganisms must be either decontaminated or autoclaved; no genetically-modified organisms may be released into the environment and hands should be washed before leaving the laboratory. Furthermore, genetically-modified organisms may only be used within the laboratories appropriately registered with the federal authorities (currently only in the Division of Biochemistry for biosafety level 1). The relevant Gene Technology Law must be applied, and the Committee for Biological Safety consulted, when considering the biosafety level.

Safety gloves should be disposed of immediately after use! Never carry around used safety gloves or other contaminated equipment with you!

Never stick items in the mouth – frequently this may be unconscious (e.g., with pens or licking of labels), but should be prevented.

After finishing work and before leaving the lab washing your hands is obligatory.

1.4 Use of Laboratory Installations and Equipment:

Always read the **instruction manual** carefully before using any equipment! Instruction manuals must remain near the corresponding equipment.

As a matter of principle, pieces of equipment may only be used in the manner foreseen in the instruction manual and may only be used after personal instruction.

As with any manual activities, use of equipment requires adequate practice; the required time must be set aside for this and for the safe use of all laboratory items.

Inexperienced persons should only be trained in critical procedures when using non-dangerous chemicals. This is also valid for working with gloves or the use of new items of technical apparatus.

1.4.1 Fume hoods (air vent)

All experiments involving toxic, flammable and/or foul-smelling gases, aerosols, or vapours must be carried out in the fume hoods. Further, large amounts of hazardous gases, vapours, and aerosols must be directed through absorbent traps (teaching assistants and Safety Coordinators can give advice on this point).

Be aware of the different types of fume cupboard, e.g., those with acid or solvent washing systems.

Fume hoods, for optimal functioning, should not be overloaded with objects, shelves, etc.

If sufficient airflow is not restored, potentially dangerous experiments must be stopped immediately.

The fume hoods are also used to renew and circulate the air in the lab.

1.4.2 Laboratory vacuum supply:

After being switched on at the mains, the central membrane vacuum pumps switch on and off automatically as required.

The condensation collectors of the membrane vacuum pumps must be checked and emptied at least twice per day, and the pumps themselves should be monitored regularly for defects.

Use the vacuum supply appropriately. Only rotary evaporators may be permanently connected to a central membrane vacuum pump. Suction filtration or similar use of the vacuum supply is allowed for only brief periods. For other purposes, check beforehand that neighbouring instruments connected to the vacuum will not be affected.

It is strictly forbidden to allow liquids (even small amounts) to be siphoned directly into the central membrane vacuum pump lines! A safety trap to collect liquids must be inserted between vacuum consumer and vacuum module.

Waste gases generated during operation of the membrane vacuum pump must always be conducted into a fume hood.

Only glassware may be evacuated which is designed for this purpose.

Rotovaps, desiccators, etc., must be equipped with an adequate splinter protection.

1.4.3 Laboratory service columns:

The cooling water module may be used only to circulate through instruments with return of the cooling water to the same module. Connection of the cooling water module to the water supply in only one direction is forbidden.

All tubing for liquids must be secured with hose clamps to the inlets and outlets on the column as well as on the apparatus.

Regulator valves for gases and liquids should always be opened slowly to avoid pressure shocks! Avoid rapid pressure changes in closed vessels.

All tubing must be removed from any module not in use (except the vacuum module).

1.4.4 General indications regarding laboratory installations and equipment:

Before performing any experiment, check the apparatus for leaks (water, gas, vacuum lines, etc.). Take care not to construct a closed system, since exothermic or gas-evolving reactions may lead to overpressure, overheating or chemical reactions in a reaction vessel! Freezers and refrigerators must be regularly checked, cleaned, and defrosted.

Cables, tubing, and seals of every piece of apparatus must be checked for brittleness, material fatigue, damage, etc. Defective materials must be replaced.

The oil in the heating baths must be periodically renewed

For hybrid and oil vacuum pumps:

- Take care when changing the oil, which may be contaminated with solvents and/or toxic compounds.
- When solvents are distilled with a high vacuum pump, liquid nitrogen cooling traps must always be used to prevent transfer of solvents or other contaminants into the pump oil.
- During operation, the pump's exhaust gases should always be conducted into the fume-hood.
- Before sending a pump out for repair or service, a declaration indicating whether the

pump oil is or could be contaminated with hazardous substances must be completed.

In general, it is the responsibility of the employees to ensure that all laboratory equipment and apparatus are well maintained and regularly inspected.

1.4.5 Centrifuges:

Centrifuges are capable of very high speeds – therefore, there is a very high danger, particularly when using heavy rotors in modern ultracentrifuges. In case of a defect – e.g., due to imbalanced tubes or non-secured rotors – high mechanical forces can result in heavy (and expensive!) damage to the centrifuge (this has happened in this department!) as well as be a source of danger of laboratory staff. When centrifuging dangerous substances or pathogens, there is the extra danger of aerosols developing in the centrifuge.

Centrifuge tubes and bottles must be carefully balanced prior to centrifugation. Never put your hand into a running centrifuge. Also note that tubes have different maximum speeds (g-force) which they can withstand.

When opening a centrifuge, check for damage tubes or splinters; plastic tubes can also break. Never blindly put your hand into a centrifuge. Never overfill centrifuge tubes – in this case, note that centrifuges have fixed angle or swing bucket rotors.

With dangerous substances, aerosol-tight tubes should be used; upon opening the centrifuge, check for signs of leakage or contamination. You are obliged to consider the safety instructions given by the centrifuge manufacturer.

1.4.6 Mixers, vortexes, shakers:

Due to the induced movements, aerosols may be induced; with dangerous substances, aerosol-tight tubes should be used and checked for their sealing capability prior to use.

1.5 Central Waste Disposal:

Chlorine-containing and non-chlorine-containing solvent wastes are disposed of separately. **Silica-gel** wastes are collected in appropriate labelled containers.

Solvents are temporarily stored in separate, mobile waste-disposal units. These waste-disposal units must be taken as soon as they are full to the central waste-disposal site, emptied with the suction apparatus, and then cleaned. Chlorine-containing and non-chlorine-containing solvent wastes may also be stored temporarily in the 10 or 20 l waste solvent canisters and labelled as 'chlorine-containing solvent wastes' or 'non-chlorine-containing solvent wastes'. The full solvent waste canisters must be closed securely and brought to the central waste-disposal site in appropriate cabinets. The use of protective clothing, safety glasses, and gloves during waste-disposal activity is mandatory.

Other chemical waste, e.g. mercury, heavy metal solutions, broken thermometers, acids, phenol, photographic developer, infectious material, used oil, etc., should be collected separated in appropriately labelled containers.

Eliminate the risk of contamination or injury of the cleaning staff by always wrapping up waste materials and paper towels used for cleaning before putting them into the bin. Never dispose of toxic chemicals in the normal waste!

All biological wastes must be collected in labelled autoclave receivers and autoclaved before being disposed of in the normal waste.

Glass, syringe needles and other sharp material must never be disposed of in the normal waste, owing to the danger posed to the cleaning staff. Syringe needles must be placed in special containers and then brought to the waste disposal site.

Special bins are provided for glass disposal (not separated by colour) in every laboratory. The disposal of glass containing dangerous chemical residues is forbidden. Glass containers must always be rinsed with water before disposal (CAUTION! see hazard warning on the label first)! Laboratory glass is not suitable for recycling.

Further information regarding disposal can be downloaded from the departmental website.

1.6 Storage of Toxic and Foul-Smelling Chemicals:

Special provisions must be made for the storage of toxic and foul-smelling chemicals, e.g., in a room where the ventilation system is equipped with a scrubber. These store rooms must be clearly marked with the specific hazards associated with the chemicals stored within.

Only the amount of chemical or solvent required for daily use may be stored at the bench; the remainder should be stored in the appropriate place (store room or chemicals cupboard with separate storage for acids and bases or in a solvent cupboard for flammable liquids).

1.6. Poisons

In the case of these regulations, poisons are considered to be either:

highly toxic or toxic compounds *or*
hazardous compounds

These are solely to be stored in designated rooms or cupboards; they may not be left standing and unobserved in the open laboratory. Furthermore, the storage and recording the usage of toxic compounds is regulated by law. Records must be kept regarding the type, amount, origin, use and location of poisons produced, purchased, donated or otherwise obtained. These records must be retained for seven years after the date of the last entry in the relevant recording system.

Larger containers of liquids must be stored in chemical-resistant spill-trays; these trays should be large enough to contain all of the contents of the vessel in the case of rupture.

1.6.1. Toxicants

Highly toxic, toxic or hazardous compounds are classified according to the CLP- edict as well as § 35 ChemG 1996;

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|--------------------------------|--|--|--|
| Gefahrensymbol |  |  |  siehe Anmerkung |
| Klassifizierung | akut toxisch Kategorie 1 oder 2 | akut toxisch Kategorie 3 | spezifische Zielorgan- toxizität (einmalige Exposition) Kategorie 1 |
| Gefahrenhinweise (Kürzel) | H300, H310, H330 | H301, H311, H331 | H370 |
| Gefahrenhinweise (Volltext) | Lebensgefahr bei Verschlucken. Lebensgefahr bei Hautkontakt. Lebensgefahr bei Einatmen. | Giftig bei Verschlucken Giftig bei Hautkontakt Giftig bei Einatmen. | Schädigt die Organe. (ev. konkrete Angabe der Organe und des kritischen Expositions- wegs) |

Hinweis: Das Symbol „Gesundheitsgefahr“ (GHS08) ist nach der CLP-Verordnung nicht nur für spezifische Zielorgantoxizität Kat. 1 zu verwenden, sondern auch für andere gefährliche Eigenschaften. Die speziellen Vorschriften für Gifte sind nur anzuwenden, wenn die Kennzeichnung das Symbol GHS08 zusammen mit dem Gefahrenhinweis H370 enthält!

Please note; you are obliged to record the type, amount, origin and disposition of each toxicant and keep this records for a minimum of seven years.

1.7 Labelling of Chemicals, Synthesis Products, and Other Samples:

Chemicals may be stored only in standard chemical containers or other glass vessels that cannot be mistaken for food containers. Any existing labels must be completely covered by the new one. Any new label on solvent labels must be protected with a transparent self-adhesive tape. Chemicals in squeeze-bottles, round-bottom flasks, Erlenmeyer flasks, etc., must be labelled with at least a permanent solvent-resistant marker pen. Instructions for the labelling of chemicals are as follows:

Compound name and/or formula must be given.

User's name must be clearly written.

Date the container was filled must be included.

Any hazards and the correct storage conditions must be clearly indicated.

Solvent canisters must be labelled with engraved tags.

It is prohibited to use empty food, cosmetic or medication containers for the storage of chemicals or other samples.

The chemical inventory system must be updated accordingly when new chemicals are delivered.

You will find an overview of the H and P statements at:

<https://www.chemie.boku.ac.at/en/laborordnung-und-sicherheit-im-chemielabor/hazard-and-precautions-statements/>

1.8 Working at Night, on Weekends, or during Public Holidays:

Trainees, undergraduates and apprentices must not work in the laboratory without supervision. Working before 8 am or after 7 pm requires special authorisation by the group leader.

Graduate students may work before 8 am or after 7 pm but supervisors are responsible for their safety.

Any other employees who work with chemicals or glassware between the hours of 10 pm and 6 am or on public holidays may do so only in the presence of an additional person who is within calling distance. When planning to work with chemicals or glassware at night or on weekends or public holidays, adequate notice must be given to the Group Leader or teaching assistant.

1.9 After Working Hours:

A night authorisation sheet must be displayed for any overnight reaction; overnight reactions may be heated only with a contact thermometer and regulated by a thermostat and, if possible, should be equipped with a spill-tray. The night authorisation sheet must be attached and clearly visible on the fume-hood window, as close as possible to the experiment or the apparatus in use. Each separate experiment requires a new night authorisation sheet. Equipment in continuous operation must be clearly indicated with the phone number of the responsible person and with detailed instructions for how to deal with an accident. Equipment left operating without a night authorisation sheet will be switched off over weekends, on public holidays, and overnight between working days from 10 pm and 6 am.

After work, all employees must make a **final safety inspection** to ensure that all equipment not labelled with night authorisation sheets have been switched off, that chemicals are safely stored, that the water and gas taps and gas cylinders are closed, and that all experiments bearing night authorisation sheets are in progress. Make absolutely sure that all gas outlets are closed and heating of any solvent still containing alkali metals has been switched off at the mains.

2.0 Accidents and Irregularities:

All incidents must be reported. All accidents, medical treatment and irregularities must be reported to the First Aid and Safety Coordinators as well as the Head of Department.

Every Division must retain an Incidents Book, in which all accidents, etc., are entered (date, victim, responsible assistant or group leader, cause and course of the accident, medical treatments as well as a copy of the relevant hospital record and a report from the victim

and assisting employee.

Environmental Protection

The University is setting up an Environmental Management System for ecological auditing (according to EMAS 761/2001).

The Department of Chemistry has a Safety- and Health-Management-System certified at ISO45001:2018

Fire Regulations

1. These departmental regulations complement the general fire regulations and are specially adapted for the requirements of chemical laboratories. It is everyone's responsibility to act appropriately to prevent fire or to ensure safety in the event of a fire. Any irregularities which may lead to fire-related dangers should be reported to the fire control officer.
2. Every member of the department should be able to:
 - activate the fire alarm
 - call the porter (extension 37335 Muthgasse, 37370 UFT)
 - locate and use the nearest fire extinguisher
 - locate the nearest emergency exit
 - locate the nearest first aid box
3. The safe installation and use of equipment, other apparatus, chemicals, tools as well as the unsupervised operation of long-term experiments is the responsibility of the user/operator. In case of doubt about risks, the operator should consult the fire control officer, with whom any relevant measures should be agreed. Fire control regulations should be considered when installing new equipment or when building alterations are made.
4. The use of Bunsen burners or other open flames should be only performed under supervision. Smoking is not permitted in the department.
5. Containers used to store chemicals must be made of an adequate material and be appropriately labelled. Substances which can spontaneously combust in an air or moisture dependent manner at a normal temperature should be stored separately from other explosible, flammable or combustible compounds in rupture-safe containers. Furthermore, substances which can dangerously react with each other must be stored separately. Flammable substances, i.e., those with a flash point below 100°C, may only be stored in laboratories in amounts up to 2.5 litres. The number of such containers should be limited to that absolutely necessary and the total amount of flammable liquids and flammable waste materials stored outside the fire-safe cabinets must never exceed 20 litres per laboratory. Especially dangerous are flammable liquids with a flash point below 18°C or which self-ignite or which produce ignitable/combustible gases in the presence of water or organic peroxides – such substances should *only* be stored in fire-safe cabinets. For liquids with a limited ignition potential, no thin-walled glass vessels may be used; no flammable liquids may be stored in non-EX-protected fridges or freezers.
6. Waste with a tendency to spontaneously combust must be collected in closed containers made of an inflammable material. Such containers should be appropriately labelled and emptied at the end of each working day. Such waste should be kept moist; however, waste which may react with water or which produces self-combustible gases or vapours should be destroyed in such a way as to eliminate any danger. Highly-combustible, easily-combustible and combustible liquids as well as substances which may produce combustible gases or vapours upon contact with water, acids or bases may not be

disposed of in the waste water. When collecting waste, the mixtures which result may not result in a fire hazard.

7. The wedging, binding or obstruction of fire doors (which are labelled) is prohibited. Damage to such doors must be reported to the fire control officer.
8. In the case of a fire alarm, all apparatus and flammable liquids which may cause a fire hazard should be appropriately stowed. The emergency "Gas-Not-Aus" switch is to be used. All should leave the building and all should be made aware of the fire alarm. The fire doors should be closed upon leaving the rooms.
9. If a fire breaks out, the fire alarm should be activated and the porter (extension 1209) should be notified of the type of incident and the room number. Such a notification may be made by more than one person. Until the fire brigade arrives, attempts should be made to extinguish the fire using the materials to hand, as far as this is possible without danger. Those who are not involved in fire extinguishing measures should leave the danger zone.
10. The choice of fire extinguishing agent is dependent on the chemicals involved. Fires involving alkali metals, metal alkyls, lithium alanate, silanes or similar substances which react with water *may under no circumstance* be fought with water or wet extinguishers – in this case, cement powder or metal fire powder should be used. For flammable materials is carbon dioxide or powder to be used; for electrical items, a carbon dioxide extinguisher is preferable. Fires involving liquid or compressed gases, which escape from bottles whose valves cannot no longer be closed, should be combatted with a powder extinguisher at an angle to the point of exit of the gas. Fires involving clothing should be fought with a fire extinguisher, a fire blanket or a laboratory shower.

Documentation

| Änderungsdatum | Änderung | Ersteller |
|-----------------------|-----------------------|--|
| 10.2017 | Erstversion, Freigabe | Andreas Hofinger- Horvath, Tim Causon |
| 04.2023 | Minor corrections | Andreas Hofinger- Horvath |