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Safety instructions for working in the laboratory

1. Safety equipment in the building

The Institute of Technology of the University of Tartu is equipped with a water system, sewerage, electricity, central heating, hot and cold water, ventilation and the following safety equipment:

- primary fire extinguishing equipment – located based on the evacuation schemes of the building (**Action plan in case of fire. Nooruse 1, Tartu**);
- emergency showers – located in the left and right wings of the 3rd, 5th and 6th floors and in the hallway of the left wing of the 4th floor;
- first aid equipment – located in easily accessible places in the hallways of the building; their locations are labelled with adequate symbols:
 - 1st floor: cloakroom;
 - 3rd floor: at the ends of the hallways in the left and right wings;
 - 4th floor: at the end of the hallway in the right wing;
 - 5th floor: at the ends of the hallways in the left and right wings.

In addition, the work groups of the institute have first aid kits in the laboratory work areas.

2. General safety requirements for working in the laboratory

- Every person doing practical work in the laboratory needs to know the location of the closest safety equipment (fire extinguishing equipment, emergency showers and first aid kits).
- Keep escape routes, access to fire extinguishers and emergency showers open.
- Each laboratory has safety guidelines and the employees and students working in the lab are obliged to follow them.
- Employees can first begin working in the lab once they have completed the initial training (including reading this safety manual) and instructions on the work area and signed the occupational safety and health guidance registration book/form validating that the training took place.

- Students can start working in the lab only after undergoing occupational safety guidance, which includes familiarising themselves with this manual, and signing the occupational safety and health guidance registration book/form validating that the training took place.
- Working in the lab must always be safe for you and others in the lab. When preparing laboratory work, it is necessary to identify potential hazards during the experiment, minimise the risks and prepare precautionary measures.
- Always label your own substances and vials containing chemicals by writing your name on them, the name of the substance in the container and the date of the corresponding work.
- When working in the lab, you must wear a lab coat that protects you and your clothes from drops and splashes of chemicals. In accordance with the work assignment and the risk involved, it might be necessary to wear a protective mask, protective gloves made of proper material and protective glasses. Gloves that are contaminated with chemicals must be replaced with new ones and utilised as required, so that chemicals are not spread around in the lab. Shoes (indoors shoes) must be firmly in place and cover the toes. Long hair must be tied back.
- Move around in the laboratory as little as possible when fulfilling your work assignments. When moving around, do not rush and be careful not to slip or fall, or break or tip over any lab containers.
- If you want to reach something from a higher shelf, use an additional step that securely rests on the floor (e.g. a rolling step stool).
- It is forbidden to keep foods and drinks in the lab, and eating and drinking are not allowed in the lab.
- Avoid touching your face with your hands in the lab and do not place personal items in working areas. It is forbidden to put anything in your mouth in the lab.
- Headphones are forbidden to be used in the lab except for those designed to be used as personal protective equipment.
- Only employees and students who have completed special training can independently work with electrical, gas or other devices that are higher sources of danger.
- When working with UV light, you must protect your eyes with safety glasses or a safety screen. Do not stare directly at the UV light source. Protect your hands and skin with clothes and protective gloves. Use the lamp for as short a time as possible.
- It is not allowed to perform dangerous jobs alone in the lab.
- After performing laboratory work, thoroughly clean your work station and any other areas in which you have worked with chemicals. If chemicals spill on the work area or floor, clean the contaminated area immediately. Clean the items you have used while working with the chemicals and put them back in the right places.
- The work area in the laminar flow cabinet and the working equipment and devices must be sterilised for around 15 minutes with UV light immediately after the work is finished.
- When leaving the lab, leave the safety equipment in the lab. Shortly before leaving the lab, wash your hands so as not to spread the chemicals or biological materials used in the laboratory.

- The last person leaving the lab must close the windows and doors and turn off the lights.
- If you notice a colleague or fellow student doing something wrong in the lab, notify them and, if needed, notify the manager of the work or supervisor.

3. Handling chemicals

- When handling chemicals, study the chemical safety data sheets first. All chemicals must have safety data sheets and these need to be accessible in the work station (laboratory) where the chemicals are being used.
- Employees and students must follow the safety labels on the chemical containers (see ANNEX 1) and follow the corresponding safety requirements.
- Avoid using *Substances of Very High Concern (SVHC)*, including
 - category 1A and 1B¹ carcinogenic, mutagenic or reproductive toxic substances;
 - persistent, bioaccumulative and toxic or very persistent and very bioaccumulative substances²;
 - substances for which there is scientific evidence and single cases that they may have serious effects on human health or the environment and that they could be as dangerous as the substances mentioned above, e.g. have endocrine disrupting properties.
- When working with corrosive and toxic chemicals, you should always wear a lab coat, safety glasses and gloves and, if necessary, a chemical-resistant apron and half or full mask.
- Inflammable or explosive (and also dangerous and toxic) substances may only be handled under a fume hood.
- Working with concentrated acids or strong alkalis may only take place under a fume hood.
- When diluting concentrated acids, pour the acid into the water in a fine jet, not vice versa, to avoid the local fierce heating of the acid and erupting from the container.
- Do not keep or use inflammable substances near the flame nor around devices that could produce sparks.
- The fumes of inflammable substances can create an explosive mixture when combined with air, so you should stay at least 2 metres away from an open flame when pouring these substances.
- If a larger quantity of chemical has spilled and collecting it could damage your or other people's health, notify the building manager. If necessary, call the Rescue Board (no 112) and evacuate the building.

¹ [Regulation \(EC\) No 1272/2008 of the European Parliament and of the Council](#) (26 March 2018)

² [Regulation \(EC\) No 1907/2006 of the European Parliament and of the Council](#) (26 March 2018)

4. Managing chemical and hazardous wastes

4.1. Chemical waste

- The wastes of hazardous (including toxic and carcinogenic) chemicals is gathered into special containers in the lab. These are not thrown in the rubbish bin or poured down the drain.
- The remnants of chemicals must not be poured together randomly! This could create an unforeseen chemical reaction and an even more dangerous substance (substances) or situation!
- Only low-rank water solutions of organic or anorganic chemicals that are not flammable or explosive, toxic or dangerous to people, the environment or water organisms and that are biologically easily decomposable may be poured down the drain.³
- Do not pour concentrated acids or strong alkalis into the sink. The residue of acids and alkalis needs to be carefully diluted and then neutralised until their pH level is from 6-9.
- Spilt acids or alkalis need to be neutralised and the contaminated area cleaned.

4.2. Glass and sharp objects

- Pieces of glass and disposable laboratory glass are gathered into separate plastic containers.
- There is a special sealable container for sharp objects (razor or scalpel blades, syringe needles, etc.).

4.3. Biological waste

- Liquid biological waste is disinfected with a scour that neutralises bioorganisms, such as Virkon™, before pouring them down the drain. In addition, items which have been contaminated with biological material need to be disinfected before washing.
- Pipette tips, gloves and other similar items which have been contaminated with biological materials are considered hazardous waste.
- Solid biological waste, including culture mediums contaminated with biological material, are gathered into a special hazardous biological waste bag made of strong material that is marked in yellow.

4.4. Labelling hazardous waste⁴

- The label on the packaging of hazardous waste must be in Estonian, clearly legible and wearproof.
- Information on label: waste code (HP1-HP15)⁵, specified name of waste and name of waste generator. If the composition and qualities of chemical waste are not significantly different from the substance that make up the main part of the waste, then there must be corresponding hazard pictograms, hazard statements and precautionary statements on the package about any substances (chemicals) that pose a hazard.⁴

³ [Regulations of City of Tartu communal water system and sewerage use](#) (26 March 2018)

⁴ [Procedure for labelling and packaging hazardous waste](#), (22 March 2018)

⁵ [Commission Regulation \(EU\) No 1357/2014](#) (23 March 2018)

- In order to collect the waste of solid substances, it is advisable to use the original packaging of the substance.
- If the waste collecting container is full, notify the building manager, who will make sure the hazardous waste is removed. Handing over hazardous waste takes place in room Nooruse 1-034 (where there is a corresponding sign on the door).
- Waste management on University of Tartu premises is regulated by **the waste management regulations**.

5. Using a fume hood

- Before starting to work under a fume hood, check the ventilation first.
- When working, adjust the sash of the fume hood to make it as low as possible so that the exhaust is maximised.
- When working under a fume hood, use safety equipment (glasses, gloves, apron, respirator, etc.) and be especially careful when handling hazardous, corrosive and/or toxic substances.
- Devices and chemicals which are not needed are not allowed to be kept under the fume hood.
- The fume hood is not meant for storing lab containers or hazardous chemical waste long-term.

6. Working with glass containers

- Glass, quartz and other ceramic materials are (usually) brittle. The edges of broken glass or quartz are sharp! To avoid breaking glass or quartz, do not use excessive force when working with these materials.
- If a glass container breaks, clear up the pieces immediately and carefully. Gather spilt substances using specified means, if necessary asking others to help you. When clearing up small pieces, use damp paper.
- When placing a rubber hose onto a pipe or a glass vessel, or when removing it, you may have to wet the hose or lubricate the inside of the hose with a suitable lubricant. To protect your hands, use safety gloves that are cut- and jab-resistant.

7. Working with electrical appliances

- Before working with appliances (including non-electrical ones) thoroughly familiarise yourself with the manual and safety instructions. Do not start working with appliances that are new to you and for which you have not been given proper training.
- Before plugging the electrical appliance into the power network, make sure the appliance is switched off and in its initial work position.

- Before using an electrical appliance, make sure the socket, the appliance's cord and the connector are undamaged and that the appliance is suitable for working with line voltage and has a proper ground circuit.
- When switching electrical appliances on or off, avoid touching grounded metal objects with your other hand.
- Electrical appliances that are plugged in should not be touched with wet hands.
- If there is a burning smell when using an electrical appliance, or you can see sparks or some parts of the appliance are overheating or there are strange sounds, stop working immediately and safely, switch the appliance off and remove the power cord from the socket. If necessary, notify the manager of the work or supervisor.
- Disconnect the burning electrical appliance from the socket. If possible, do so without touching the device, from the switchboard, or by pressing the emergency power off button.
- Under no circumstances should a burning electrical device be extinguished with water. Use an extinguishing blanket or CO₂ extinguisher.
- If the device is working differently than usual, there may be a technical error. In such cases, switch the device off if possible or remove the cord from the socket and notify the manager or supervisor of the work immediately.
- Be careful with hot electrical devices (hot plates, drying cabinets, presses, etc.). When putting glass containers into a switched-on drying cabinet, avoid touching the containers and the metal shelves and walls on the inside of the cabinet. If you burn your hands, rinse them immediately under cold water and use a soothing gel if necessary.

8. Using a gas burner or spirit lamp

- Using a gas burner or spirit lamp is not allowed until safety and device handling training has been completed.
- A gas burner or spirit lamp cannot be used if long hair is untied.
- When you notice that the flame of the gas burner has gone out, release the burner's trigger immediately.
- Do not bend over a lit gas burner or spirit lamp.
- Make sure that there are no flammable gases, liquids or solid substances near you when working with a gas burner or spirit lamp.
- Do not leave an open flame without supervision!
- When leaving the lab, make sure that the gas burner's trigger is in the released position and that no gas is leaking.

9. Using bottled gas

- Gas bottles should be securely fixed and far from heat sources. Especially toxic and corrosive gases like Cl₂ and HCl should be kept in cabinets with an exhaust fan.

- It is not allowed to work with bottled gas until special training has been completed.
- Check gas hoses and connections before working and monitor them while working.
- If you discover a leak, notify the supervisor so as to eliminate it.
- Before starting work, make sure that the pressure indicator of the bottled gas has not decreased below the allowed limit, which indicates the need to order a new bottle. If the pressure indicator has decreased below the allowed limit, notify the manager or supervisor of the work.
- Keep in mind that one bottle may supply gas to one or several devices via a gas line. If the bottled gas supplies gas to one device, then the gas flow will be regulated through the reductor on the bottle, and when the work is finished the gas cock on the bottle should be closed. If the bottle supplies several devices via a gas line, the regulation of gas flow happens via the reducers on the gas panels at the points of use, and when the work is finished the gas flow should be closed from the gas panel at the point of use at the work station.

10. What to do if there is an accident risk or fire

- Notify your colleagues and work manager or head of unit immediately if there is any danger of an accident and/or fire.
- In the event of a serious and threatening accident, employees must take measures based on their knowledge and available technical means to avoid potential consequences if this does not endanger the employee's life or health.
- In the event of serious and threatening danger, the people in danger must leave their work stations or dangerous area quickly and safely, using the evacuation routes.
- Employees and students must know how to use fire extinguishers in the event of a fire. This means that before working they must have completed **fire safety training**.
- If liquids catch fire, the airflow into the lab must be blocked and open flame should be put out with fire extinguishers. Water can be used as an extinguisher only if there are liquids that are miscible with water (ethanol). In other cases, use a fire extinguishing blanket or CO₂ extinguisher.
- The employee/student who discovers the fire notifies the people in the danger zone, calls the emergency number 112 and the university's security centre number (737)5111 and acts according to the knowledge and skills they acquired during their fire safety training.

11. What to do in the event of an accident

- First aid should be given without putting yourself in danger. If necessary, call for help, in the case of serious accidents calling 112 and following the instructions of the rescue operator.
- The victim or witness notifies the manager of the work, the health and safety representative or the head of unit or the head specialist of work environment of the (work-related) accident. If necessary, call for help. The student notifies the supervisor

of the accident immediately and necessary measures are implemented depending on the accident.

- In the event of a serious or fatal work-related accident the work station and devices are left untouched until the representative of the Labour Inspectorate or police arrive and give permission to continue working.

If it is impossible to keep the devices or the work station untouched, their state at the moment the accident occurred must be recorded.

11.1. First aid in the event of (corrosive) substances getting onto the skin

- If acids or alkalis gets onto the skin, it is necessary to wash the skin immediately with a copious amount of water.
- If chemicals get into the eyes, it is necessary to wash the eyes immediately with a copious amount of water. If available, use an eye shower.
- If corrosive substances get into the eyes, the eyes must immediately be rinsed with running water before seeking the assistance of a doctor.
- If strong acids and concentrated weak acids or alkalis get into the mouth, the mouth must be rinsed with water.
- If necessary, use an emergency shower to rinse yourself.

11.2. First aid in the case of burns

- In the case of skin burns, hold the damaged area under cold running water (if there is no open wound) for 15-20 minutes to ease the pain and avoid damaging the tissue.
- After the initial cooling of the skin you can use existing means to soothe burns (if there is no open wound).
- In the case of more serious burns, seek help from a doctor after cooling the skin or call an ambulance (112).

11.3. First aid in the case of poisoning

- If you experience dizziness (or other signs of poisoning) when working with toxic gases, immediately get some fresh air and notify the manager/supervisor of the work of what has happened.
- In the case of gas poisoning, move the victim into the fresh air at once, clear their airways and remove any clothes obstructing their breathing. Further first aid depends on the properties and amount of gas inhaled, and according to the situation you should turn to the manager of the work, supervisor or a doctor, if necessary calling an ambulance (112).
- First aid in the case of other chemical poisonings also depends on the substance. Therefore, it is necessary to familiarise yourself with the properties, toxicological information and first aid of each substance before working with a substance.

11.4. First aid in the case of cuts

- Clean the wound under running water.
- If the wound is bleeding heavily, it should be bound with a sterile compression bandage or a wound dressing pressed on the injured area until the bleeding stops.

- The cleaned wound must be covered with a band aid with a wound dressing or bandage of the right size.
- If you cannot stop the bleeding or the wound needs stitching, call an ambulance or go to the emergency room.

12. Works cited

This guide was compiled by Anna-Liisa Peikolainen, Regina Maruste and Petri-Jaan Lahtvee following the safety instructions of UT Institute of Chemistry, UT Institute of Molecular and Cell Biology and Department of Chemical and Biological Engineering of Chalmers University of Technology and the valid regulations of the Republic of Estonia.

ANNEX 1 – Hazard labels for substances

Hazard labels for substances (GHS hazard pictograms) and hazard statements since 1 December 2010 (1 June 2015 for preparations) ^{1,6,7} (Regulation (EC) No 1272/2008) and possible precautionary statements to prevent danger

	<p>Unstable explosives. Explosive; mass explosion hazard. Explosive; severe projection hazard. Explosive; fire, blast or projection hazard. Fire or projection hazard. Heating may cause an explosion. May mass explode in fire.</p> <p>Precautions Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Keep wetted with... Ground/bond container and receiving equipment. Do not subject to grinding/shock/.../friction. Wear protective gloves/protective clothing/eye protection/face protection.</p>
	<p>Extremely flammable gas; flammable gas. Extremely flammable aerosol; flammable aerosol. Contains gas under pressure; may explode if heated. Extremely flammable liquid and vapour; highly flammable liquid and vapour; flammable liquid and vapour. Flammable solid. Heating may cause a fire. Catches fire spontaneously if exposed to air. In contact with water releases flammable gases which may ignite spontaneously; in contact with water releases flammable gases. Self-heating; may catch fire.</p> <p>Precautions Keep away from heat/sparks/open flames/hot surfaces. No smoking. Do not spray on an open flame or other ignition source. Pressurised container: Do not pierce or burn, even after use. Keep container tightly closed. Use explosion-proof electrical/ventilating/lighting/.../equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep/Store away from clothing/.../combustible materials. Keep only in original container. Do not allow contact with air. Keep cool. Protect from sunlight.</p>

⁶ GHS pictograms <http://www.unece.org/trans/danger/publi/ghs/pictograms.html> (22 October 2013)

⁷ Precautionary statements <http://www.terviseamet.ee/kemikaaliohutus/klassifitseerimine-margistamine-ja-pakendamine/lisainfo/hoiatuslaused.html> (22 October 2013)

	<p>Wear protective gloves/protective clothing/eye protection/face protection. Ground/bond container and receiving equipment. Keep away from any possible contact with water, because of violent reaction and possible flash fire. Handle under inert gas. Protect from moisture.</p>
	<p>May cause or intensify fire, oxidizer. May cause fire or explosion, strong oxidizer. May intensify fire, oxidizer. Precautions Keep away from heat/sparks/open flames/hot surfaces. No smoking. Keep/Store away from clothing/.../combustible materials. Wear protective gloves/protective clothing/eye protection/face protection. Wear fire/flame resistant/retardant clothing. Take any precaution to avoid mixing with combustibles... Keep reduction valves free from grease and oil.</p>
	<p>Gas under pressure. Contains gas under pressure; may explode when heated. Contains refrigerated gas; may cause cryogenic burns or injury. Precautions Wear cold insulating gloves/face shield/eye protection.</p>
	<p>May be corrosive to metals. Causes severe skin burns and eye damage. Causes serious eye damage. Precautions Do not breathe dust/fume/gas/mist/vapours/spray. Keep only in original container. Wear protective gloves/protective clothing/eye protection/face protection. Wash... thoroughly after handling.</p>
	<p>Toxic if swallowed, in contact with skin or inhaled. Fatal if swallowed, in contact with skin or inhaled. Precautions Do not get in eyes, on skin, or on clothing. Wear protective gloves/protective clothing/eye protection/face protection. Wash... thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe dust/fume/gas/mist/vapours/spray. Use only outdoors or in a well-ventilated area. Wear respiratory protection.</p>
	<p>Harmful if swallowed. Harmful in contact with skin. Toxic if inhaled. Causes skin irritation. May cause an allergic skin reaction. May cause respiratory irritation. May cause drowsiness or dizziness. Precautions Wash... thoroughly after handling. Avoid breathing dust/fume/gas/mist/vapours/spray. Wear protective gloves/protective clothing/eye protection/face protection.</p>

	<p>Contaminated work clothing should not be allowed out of the workplace. Use only outdoors or in a well-ventilated area.</p>
	<p>May cause an allergy, asthma symptoms or breathing difficulties if inhaled. May cause damage to organs; causes damage to organs. May cause genetic defects; suspected of causing genetic defects. May cause cancer; suspected of causing cancer. May damage fertility or the unborn child; suspected of damaging fertility or the unborn child. May be fatal if swallowed and enters airways.</p> <p>Precautions Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Avoid breathing dust/fume/gas/mist/vapours/spray. Do not breathe dust/fume/gas/mist/vapours/spray. In case of inadequate ventilation, wear respiratory protection. Wash... thoroughly after handling. Do not eat, drink or smoke when using this product.</p>
	<p>Very toxic to aquatic life; very toxic to aquatic life with long lasting effects; toxic to aquatic life with long lasting effects.</p> <p>Precautions Avoid release to the environment.</p>