Safety instructions for the laboratory

2025-2026

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Bar-Ilan University
אוניברסיטת בר-אילן

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Introduction

Research students, laboratory workers and heads of laboratories,

As every year, there is a symposium on safety work in laboratories. It is important for us to bring you several important topics, some of which you will receive in the lectures on the day of the study and some of which appear in the booklet in front of you.

There is a lot of information and the procedures written in it must be followed to prevent accidents and occupational diseases.

Research work in laboratories requires attention, vigilance and supervision of processes that are carried out in a challenging work environment and there is potential for damage in an emergency. The work should be carried out with the utmost care while paying attention to the smallest details to avoid a disaster. In the past years, there have been a significant number of safety incidents in which researchers and students were injured during their work in the laboratory. Some of the injured were treated on the spot and some were sent to hospitals for further treatment. From the investigation of the incidents, it turns out that one common denominator is the failure to follow basic safety procedures while involving the human factor. In one of the incidents, a laboratory burned down, which without quick extinguishing operations would have caused damage to a floor and even to an entire building. The economic damage that will be caused to the laboratory and its employees as a result of stopping the research will be huge. There is no doubt that following the safety instructions helps to reduce and minimize damage to the body and property.

The safety department investigates and conducts an inspection of each incident with the aim that the next incident can be minimized and even prevented, as a results of an organizational culture of researching the truth and extracting lessons while adhering to learning from the lessons of others.

The safety department at the university invests heavily in trainings, equipment, procedures and budgets to enable researchers to carry out their work in an adequate and safe environment. In our visits to the laboratories, we add and improve the personal and departmental safety measures. All year long we improve the training control methods and the implementation of safety on campus. We have been investing a lot in fire detection and extinguishing in recent years.

Accident prevention is everyone's duty. A laboratory manager must test the ability of the laboratory worker to carry out the research under safe conditions. The responsibility also applies to the employee, researcher and student in the laboratory to ensure a safe working environment and the use of protective measures to carry out the research in a safe manner. The safety department will assist with procedure training and equipment testing.

Observance of procedures and regulations is an integral part of planning the work processes in the laboratory. At every stage, the safety processes must be treated as an inseparable and uncompromising part of the research and work in the laboratory.

Make sure that every laboratory has the necessary tools for prevention (signage, protective measures, training) and treatment after an incident (extinguishing systems, fire extinguishers, showers) to provide a complementary response in real time.

This seminar is part of the safety at work training system whose purpose is to deepen the knowledge among those involved in the craft and reduce the safety risks to a minimum.

I wish everyone a safe working year.

Sincerely,
Kobe Biton
Head of the security, safety and environmental department

EMERGENCY PHONE NUMBER

Ramat Gan: 03-531-7777

Control center (for non-emergencies) 03-531 -7171

Safety contacts

Telephone numbers of the safety inspectors:

Name	Job title	Phone	Cellphone
Dr. Hagit Kun	Head of safety department	7919	054-6603305
Dr. Amiel Yanai	Biological safety officer	7717	054-2040759
Dr. Oded Friedman	Chemical safety officer responsible for poisons and waste treatment of hazardous substances	7206	052-3667128
Dr. Hadar Sclar	Hazardous materials safety officer	7488	054-3096967
Dr. Itay Lazar	Radioactive radiation safety officer	8202	050-4260978
Dr. Naomi Sinai	Laser radiation safety officer		054-7861577
Itay Aharon	Fire safety officer	7207	052-8336057
Yehoshua Alon	General safety officer	4331	052-5600757

Guidelines for treating Emergency events

Report immediately on any accident/safety incident, to the lab. Manager and to the

Emergency number 03-531-7777

One must also report incidents, which were treated and finished, to laboratory manager & safety officer.

Burns	a. Minor burns caused by heat – rinse with cold water or bathe the injured site in ice water. b. Chemical burns – remove contaminated clothing/shoes. Rinse the site for 15 minutes in running water. c. Use the Hexafluorine solution and the calcium gluconate gel (for skin only) to treat exposure to HF acid. d. For relief and treatment of other chemical burns, use diphoterine, which is effective in treating burns caused by over 700 different types of substances.
Fire	a. A small fire (in a cup/bottle) – put out the fire by covering the opening with an inflammable substance. b. Large fire – use the laboratory fire extinguisher. c. Fires involving reactive metals (sodium, magnesium, etc) –extinguish only with sand or a designated extinguisher. d. In the event of a large fire – shut off the main electricity and gas valves! e. Water should not be used to extinguish most fires, and burning substances should not be thrown into the sink. use the fire extinguisher in the lab
Spill	**Before treating spillage, wear an appropriate personal protective equipment**. If spilled **over the body** – remove contaminated clothing and wash with water for 15min. a. **Chemical** spill - Absorb using an absorbent material, which should later be collected into a bag/container and discarded as contaminated material. If necessary, the site should be disinfected. b. **Radioactive** spill – Notify the Radioactivity Safety Officer immediately. c. **Biological** spill: 1. Spill on bench: disinfect with 70% ethanol or 0.5% fresh bleach. 2. Spillage on a floor: evacuate the laboratory, close doors, wait 20 minutes for aerosols to settle. Cover the spillage with absorbent material. Splash bleach on the spillage, from the outside in. Collect the material with a dustpan and brush. disinfect again the floor / spill area with bleach. The absorbent material should be disposed of as a chemical waste. 3. Spill in a centrifuge or shaker: close the centrifuge/shaker, wait for aerosols to settle, disinfect with 70% ethanol or 0.5% fresh bleach.
Eye	Flush well, with running water for 15 minutes, using an eye-wash station
Cuts	a. Rinse cuts thoroughly with water. If there is serious bleeding, apply pressure on the site, using a sterile bandage, and proceed according to the medic on site, recommendation. b. Broken glass sould be picked up with broom and dustpan. c. cuts, abrasions or other injuries with contaminated sharps: rinse thoroughly with water and soap and disinfect with a disinfectant (iodine solution). Promote bleeding from the wounds.
odor	Handling strong/unidentifiable odors 1. Immediately open the windows to air out the room. 2. Attempt to identify the source of the odor (gas valves, sewage drains, open bottles, etc.). 3. Evacuate the lab; ensure that no one remains in the lab. 4. Notify the Security Department: 7777, or 03-5317777, from any phone.

****Other emergency authorities (such as fire fighters) will be notified, if needed by the emergency stuff****
In parallel, security personal would be sent to the main gate to meet and direct them to the site.

Emergency situations

An emergency situation, is characterized by the sudden formation of a new situation that poses a threat to human life, property, equipment, etc.
Whenever you encounter an emergency situation, you are in charge of the event until the situation is resolved or until it is transferred to another qualified party in an orderly manner while providing all the details and information required for further treatment. Fast and correct response has critical effect on the result.
The order of operations: detection → inhibition → a call to arms → transfer of command

Safety and emergency equipment

1. Every laboratory worker must be familiar with the practical use of safety measures in the laboratory, on the floor and in the building, their location and how to use them. These measures include: a safety cabinet including first aid equipment, fire extinguishers, buckets of vermiculite, emergency shower, eyewash, blanket to put out a person on fire, emergency cabinet, main gas taps. You should also know the escape routes from the building in case of emergency.

Safety measures in the laboratory

Safety at work in the laboratory

Each laboratory in the university is an independent unit under the responsibility of the head of the laboratory.

The head of the laboratory or a laboratory manager has passed the certification of a safety trustee as defined in the law, which enables the understanding of the requirements of the safety regulation.

Every laboratory worker needs to carry out a hazard assessment and preliminary assessments for the processes he or she perform, according to extreme situations and various malfunctions as part of the work planning.

Below are examples of questions that should be raised as part of the work planning and hazard assessment process:

- Is the tool suitable for the job? Is the equipment intact? Is the pipe well connected?
- Is there a risk of an uncontrolled eruption? (fire, heat, explosion, spill, etc.) and what can be done to prevent or minimize the incident?
- During an outbreak, do I have the means to deal with it? What are the measures and where are they located?
- What are the risks of exposure to hazardous materials?
- Is the storage in accordance with the rules and properties of the material?

This review must be performed for every new process, and any process in which changes have been made.

Laboratory safety instructions

General

1. The entrance to the laboratory, and the work in it, will be with the approval of a qualified person only and under his supervision.
2. Do not eat or drink in the laboratory.
3. Smoking in the area of the laboratory buildings is prohibited.
4. Do not use contact lenses in the laboratory areas.
5. It is forbidden to work in the laboratories with hazardous agents alone!
6. The doors and windows of the laboratory will be closed routinely.
7. Wash your hands thoroughly with soap and water before leaving the laboratory.
8. In any case where a lab worker is in the laboratory before 7:00 a.m. or after 10:00 p.m., he will report this to security ahead of time by calling 7171.
9. High risk areas (radioactive areas, areas of use of pathogenic material, etc.) will be operated in accordance with special safety instructions and will be marked accordingly.
10. Removal of laboratory waste will be done according to the safety guidelines related to this and which appear below.
11. Do not throw glassware, needles or any object that could cause injury into the trash can. They must be disposed of in the hard plastic containers designated for this purpose.
12. **Pregnant women** - there is an obligation to inform the laboratory manager about pregnancy at work in the laboratory within 10 days. It should be noted that there are substances that are prohibited for work

during pregnancy and breastfeeding. [See below the women's work regulations (prohibited work, restricted work and dangerous work) 2000].

13. It is the duty of the laboratory workers to ensure that other people who enter the laboratory for their work, such as cleaning staff, plumbers, technicians, etc., will not be exposed to harmful factors. These people must be warned of expected risks, accompany them as long as you are in the laboratory and help them perform their task safely.
14. In biological lab – access is for approved personal only. Approval by head of the lab.
15. In biological lab – processes releasing aerosols will be done under biological hood or other restriction equipment.
16. In any case of an accident in the laboratory, at the same time as handling it, you must call the **security hotline** (emergency tel. 7777) and provide the exact location of the incident, the details of the incident, the number of victims and their condition, and the necessary help.

Guests

1. The host and the Principal Investigator are responsible for the safety of the guests in the laboratory.
2. Guests must comply with all safety instructions relating to the facility - including the use of personal protective equipment.
3. No guest will be left alone: he will be accompanied at all times by an employee appointed for that purpose.
4. Youth under the age of 16 should not be allowed to visit the laboratories.

Women's work in the laboratory

The law refers to women's work in several aspects, women of childbearing age and pregnant women (Women's Work Regulations (Prohibited Work, Restricted Work, and Dangerous Work), 2001). The regulation lists substances that are prohibited at work of childbearing age or restrictions on exposure to certain substances. The legislator's intention is to prevent exposure of a pregnant worker to substances that may cause harm to the fetus and therefore it is the responsibility of the workers and their superiors to prevent exposure to such substances.

The list of substances appearing in the regulation includes cytotoxic preparations. Cytotoxic preparations are defined as "a preparation known or suspected to be carcinogenic and/or teratogenic or mutagenic, which is used for human or veterinary treatment, detailed in the NIOSH list that is updated from time to time" (Ministry of Health Circular "Treatment with Cytotoxic Preparations" No. 5/2022). Based on this guideline, there are health restrictions for working with cytotoxic preparations as well as instructions and guidelines for the use/storage/disposal of these materials. However, there may be pure substances in laboratories that, if packaged as a medicine, would be defined as a cytotoxic preparation. These substances do not fall under the definition of a preparation, but, of course, their use for a pregnant woman, if at all, should be done with extreme caution.

Every pregnant laboratory worker must check the safety data sheets of the materials in which she works and/or the members of her laboratory work. If the substance is defined as a mutagen, carcinogen, cytotoxic, etc., the worker, in cooperation with the head of the laboratory, must carry out a risk management procedure: what are the possible ways of exposure, the amount used, the frequency of use, etc., including the worker's exposure during the performance of the experiment by another worker Depending on the conclusions of the risk assessment, it will be decided how to act. There are several possible courses of action:

1. Finding a substitute material that is not a mutagen.

2. Avoidance of working with the material during pregnancy/restriction of staying in the laboratory while working with the material by other workers.
3. Increasing personal protection (double gloves or switching to working in a chemical hood as an example).

Personal protective equipment

1. A buttoned 100% cotton coat with cuffs must be worn at all times in the laboratory area. Do not fold the sleeves of the robe.
2. Do not go out wearing gowns or gloves to areas outside the laboratory.
3. It is mandatory to use protective gloves and put the gloves on over the edge of the coat sleeve. Gloves suitable for the process to be performed must be used.
4. It is mandatory to wear protective glasses while working and staying in the laboratory, even for people with eyeglasses.
5. Closed shoes must be worn.
6. Long hair will be collected while working in the laboratory.
7. Respirators used for protection against dust, particles, microorganisms and aerosols shall have a European standard (EN149:2001) FFP2 or American standard N95, at a minimum. some respirators have an exhaust valve that allows air to escape from the respirator, thus making it easier to breathe and humidify the respirator. reusable respirator are marked 'R' for single use are marked 'NR'. if not indicated then the respirator is intended for one-time use.
8. Hearing protection are labeled a number indicating the strength of the attenuation in decibels (SNR according to the European standard or NRR according to the American standard). Protective equipment must be ordered according to the strength of the required attenuation.

Equipment/instruments

1. The use of devices only after receiving instruction from a person authorized for this, and with the approval of the person in charge in the laboratory. Main instructions including safety instructions must appear on the device.
2. In devices such as: autoclaves, steam collectors, steam boilers, air collectors (compressors), lifting devices and lifting accessories, make sure before using the device/ appliance that there is a valid certified tester inspection label on the device/ appliance as required by law.
3. **Do not use improper equipment.** The device/ appliance will be marked with a "do not use" label.

Glassware

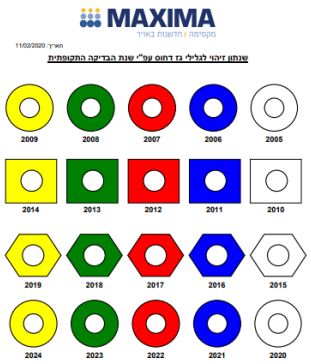
1. Check the integrity of the glassware in use before any procedure.
2. Don't use sharp edged/broken/damaged glassware.
3. While inserting glassware into a plug (cork or glass), it is advisable to lubricate the tube with a little glycerine and hold the glassware and the cork with a towel/coat - to prevent injury to the hand.
4. Glassware must not be thrown into the general trash.

Laboratory Materials

1. All materials are under the responsibility of the head of the laboratory and the employee who are responsible for all safety aspects related to the work/storage and removal of the material.
2. Before using the material, the user is obliged to familiarize himself with the properties of the material, the dangers that may arise from it, instructions regarding its storage and the steps to be taken in the event of a malfunction while working with it.
3. Before using the material, the user must read the safety data sheet (SDS) of the material.
4. A reasonable distance must be maintained between chemicals and risk factors (such as: heat sources, exposed electrical sources, vibration sources, dangerous work systems, open fire, the formation of sparks).
5. All materials and solutions must be marked clearly and in detail: content, name of the manufacturer. No material will be found without a means of identification.
6. Do not taste, or directly smell, a substance found in the laboratory.
7. Pipetting will be done using appropriate manual/mechanical means.
8. It is necessary to work in a chemical fume hood only, in everything that involves working with volatile substances, concentrated acids/bases or any other substance that requires it.
9. When diluting acids or bases, the substance must be added to water and not the other way around.
10. Material residues must be dealt with immediately after an experiment.
11. Do not pour any material into the sink or the trash can. The waste should only be disposed of in the designated containers (see chapter on chemical/biological waste).
12. Transferring a container containing a dangerous substance outside the laboratory will be done only in an unbreakable carrying container used as a spill pallet.
13. Large containers as well as bottles containing corrosive substances (acids, bases) should be kept as low as possible (but not on the floor!).
14. It is mandatory to indicate the opening date on the ethereal solvent container and to carry out regular monitoring to check the presence of peroxides (see working procedure with ethereal solvents) and to treat them, if these are detected.
15. The various chemicals must be kept separate from each other according to **hazard groups and according to compatibility** in such a way as to avoid contact between substances that may react dangerously. Basic separations are:
    i. Strong acids from strong bases.
    ii. Oxidising substances from flammable substances
    iii. Oxidizing agents from strong acids
    iv. Organic substances and strong acids
    v. Substances that may react together in a violent reaction
16. Use of open fire and heat: only after the necessary precautions have been taken (removing flammable materials or their vapors from the environment, fire extinguisher at hand).
17. Mark with a designated sticker every container that contains an active metal used for drying solvents.
18. In biological lab – do not work with factors from human source unless the lab was approved for that.
19. In biological lab – disinfect work station once a day at least and after every spill of contaminating hazard.

Gases

1. All gas cylinders shall be securely anchored to a wall or to a stable support strong enough to prevent falling. The anchoring will be done at 2/3 of the height of the cylinder.
2. Gas cylinders must always be kept upright.



3. The cylinder cover will be securely screwed onto the cylinder whenever it is not connected to the regulator.
4. Flammable/explosive gas cylinders will not be kept in the laboratory unless approved by a safety supervisor.
5. The main gas tap in each laboratory must be closed when the work is finished!
6. Make sure that a flammable/explosive gas cylinder is connected to grounding and that tools made of non-sparking materials are used.
7. Gas cylinders must be kept away from a heat source.
8. Changing the portable gas canister will be done in a chemical hood.
9. Make sure that the flexible piping is secure, to prevent whiplash when releasing uncontrolled pressure from the cylinder.
10. The integrity of flexible piping must be verified and replaced when signs of wear appear. These piping has to be changed every 5 years or when damaged.
11. Gas cylinders must be hydrostatically tested according to Israeli standard 712. The next year for executing the test is visible on the cylinder shoulder or by the plastic tag on the head of the cylinder as in the picture here. Do not use an expired cylinder.

Cryogenic materials

Cryogenic materials are defined as gases that have been compressed into a liquid state and kept at a temperature lower than -150^{0}C. These are kept in an insulated container called a "dewar". For example, liquid nitrogen and liquid helium.

Risks:

- Their spread in a closed room may cause a decrease in the percentage of oxygen in the room.
- Cryogenic liquid in contact with body tissues may cause frostbite.
- Contact of a body part with a very cold item may cause infection.
- Cooling of certain equipment components may cause them to weaken and break.

The cryogenic materials are kept in a container in a boiling state and release gas. In order to prevent an explosion due to the internal pressure, there must be a fixed and free path for the release of the gas from the tank or a mechanism for releasing excess pressure (safety valve) and rupture disks (which are released in case the pressure valve is blocked).

1. Use of personal protective equipment including: cryogenic gloves, safety glasses, face shield, long-sleeved zip-up coat, closed shoes.
2. Connecting and disconnecting the supply hose shall be performed only by a certified technician.
3. Ensure that the faucet handle is positioned upward to prevent it from sticking to the container body during liquid flow (which would result in inability to close the valve at the end of use).
4. Filling and transporting cryogenic liquid will be done only in a dedicated container suitable for cryogenic liquids.
5. Filling will be done by a supply pipe that reaches the bottom of the container to be filled.
6. Hold the tube tightly with both hands the entire time of use.
7. Do not leave a container full of cryogenic liquid unattended.
8. Carrying a container with a handle - the full container must be transported up the stairs and not in the elevator. Transporting a container on wheels - must be checked with the safety department. Do not carry a dewar in an elevator where there are people.

9. Transporting liquid nitrogen in a vehicle - will be carried out after a hazard assessment and appropriate safety guidelines. Do not transport liquid nitrogen in a vehicle with its windows completely closed.

Soldering

Soldering must be done in a place where an efficient suction system and an effective filter for filtering the soldering fumes are installed.

The manual soldering process of the tin-lead type may expose the lab worker to metal fumes, lead being the toxic metal. Metal fumes may enter the body through the respiratory system or a contaminated work environment at the soldering station and contact with contaminated hands that spread the material to the skin, mucosa (mouth and nose) as well as food and drink.

In recent years there has been a shift to the use of tin wires that do not contain lead (90% tin + silver / copper / antimony / bismuth / zinc). It is advisable to switch to using wires that do not contain lead.

Another risk comes from exposure to flex heating products which are in most tin wires. The flex is in the core of the wire and its purpose is to protect the process from oxidation. The heating products of the flex irritate the skin and respiratory tract and may cause chronic damage. It is advisable to choose threads without flex or with a small percentage of flex (0.5-1.5%)

• It is mandatory to install a suction system at the soldering station (suction in the soldering iron or addition of a suction system and charcoal filter).
• Arrange the work station, keep flammable materials away, do not work in a damp or wet environment.
• Do not perform soldering work with contact lenses!!
• Do not eat or drink in the area of the soldering station.
• Remove gloves and wash your hands with soap and water at the end of the work day.
• Learn about the dangers of soldering.
• Clean the work surface at the end of the work day.

Tetramethylammonium hydroxide (TMAH)

For the attention of those working with **tetramethylammonium hydroxide (TMAH)** $(CH_3)_4N(OH)$, the Director of Occupational Safety and Health recently distributed two articles reviewing three deaths due to dermal exposure to the substance.

The director issued a directive to treat the substance as high risk, and the use of skin and respiratory protection measures are compulsory.

The safety data sheets state that the danger of this material is at a high level of toxicity in dermal exposure even at concentrations of 2.38%.

Safety protocol for working with hydrofluoric acid (HF)

Hydrofluoric acid (HF), is a colorless, corrosive liquid.

Hydrofluoric acid (HF) differs from other acids due to the fluoride ion, which penetrates the skin easily and causes destruction of deep tissue layers, including bones.

Pain associated with exposure to HF solutions (1-50%) may be delayed for a period of 1-24 hours.

If HF is not neutralized, the fluoride ion may continue to cause tissue destruction for days which may result in organ loss or death.

Even moderate exposure can quickly induce damage, if not promptly and properly treated. Therefore, an immediate medical intervention, even in the absence of symptoms, is necessary.

Tissue damage is caused both by corrosion of hydrogen ions and by chemical burns from the penetration of fluoride ion into the tissues.

Fluoride ions are able to penetrate and form soluble salts with calcium and magnesium. They can form salts with other cations, as well. These salts, will dissolve quickly, resulting in free form fluoride ions, which will induce further tissue destruction.

HF can attack glass, enamel, ceramics, concrete, rubber, many metals and organic compounds. When reacting with certain metals, explosive hydrogen gas may be formed.

General

1. You must never work alone in the lab while working with HF, make sure that another person will be next to you, this person should be aware to HF risks and to the appropriate emergency actions.
2. A printed SDS must be at the HF work place
3. You must not work with HF, unless you have a special HF antidote by the reach of your hand (Hexafluorine solution + calcium gluconate ointment)

Personal protective equipment (PPE)

You must wear a special personal protective equipment:

1. An acid apron
2. Special Acid gloves
3. A Face shield
4. Long pants
5. Closed shoes

HF storage

1. you should store the HF in a well ventilated, low shelf
2. Keep away from other materials.
3. Label the cabinet clearly for its HF content
4. Place the HF bottle in a secondary containment made from an appropriate material (polypropylene or Teflon)

Work

1. Before working with HF always check visually, the integrity of the gloves and the apron.
2. Work will be performed in HF appropriate vessels.
3. Work with HF will be made only inside a chemical fume hood, with the window shield lowered as possible.
4. It is recommended to use a tray in order to prevent spillage and contamination of the hood's bench.
5. While working with HF, label the fume hood with an appropriate sign.
6. While working with HF, the fume hood should be clear from other chemicals, especially metals and organic compounds.

Disposal

HF disposal will be coordinated with the Dr. Oded Friedman (7206 / 052-3667128) which is in charge of the laboratory waste.

Emergency actions

In any case of emergency, one should report immediately to the university control center (7777 / 03-5317777)

1. **Eye spill** – wash with Hexafluorine solution, use the entire wash bottle.
2. **Spillage over body** – sometimes, it takes time for the burn to appear after exposer to HF, therefore, actions should be made immediately even if there is no burn:
   i) Take off contaminated clothes
   ii) Wash yourself for 10 min
   iii) Mark the place of the exposer
   iv) Apply calcium gluconate ointment, use nitrile gloves while you apply the ointment, in order, to avoid a secondary contamination.
3. **Breathing**– breath clean air, seek medical treatment immediately
4. **Oral exposer** - wash your mouth with water, drink water/milk, seek medical treatment immediately
5. **Spillage** :
   i) In case of spillage outside the fume hood – evacuate the lab immediately, close the door and do not let anybody in.
   ii) Absorb the spillage with an absorbance sleeve or with absorbance sheets.
   iii) If the spillage is less than 1L, you can neutralize it by calcium hydroxide or calcium carbonate
   iv) Never use Vermiculite or sand, as they react with HF to give a toxic gas (silicone tetrafluoride)

Safety protocol for working with Piranha

Piranha solution, also known as piranha etch, is a mixture of sulfuric acid (H2SO4), water, and hydrogen peroxide (H2O2).
The solution preparation is an extremely exothermic reaction. If the solution is made rapidly, it will instantly boil, releasing large amounts of corrosive fumes. Even when made with care, the resultant heat can bring solution temperatures above 100 °C.
Sometimes a mixture called "base piranha", is used. It consists of a 3:1 mixture of ammonium hydroxide (NH4OH) with hydrogen peroxide.

Piranha solution Hazards

- Strongly acidic.
- Extremely powerful oxidizer.
- Highly corrosive.
- Formation is extremely exothermic.
- Releasing large amounts of corrosive fumes.
- The solution generates gas, inducing a pressure increase in a closed container.
- Explosion.

General

1. Prior to working with Piranha, employee, should be trained by the lab manager.
2. Before working with Piranha always check visually, the integrity of the gloves and the apron.
3. You must never work alone in the lab, while working with Piranha, make sure that another person will be next to you, this person should be aware to Piranha risks and to the appropriate emergency actions

Personal protective equipment (PPE)

While preparing and working with piranha solution, one must use:

1. Face shield
2. Acid gloves above the disposable nitrile gloves\ Equivalent to thick soles for example neoprene or PVC.
3. Acid apron (on top of the lab coat) - the apron interior side will be clearly marked ("inside") to prevent exposure to acid residues. Make sure that there is no exposed skin without protection.
4. Long pants
5. Closed shoes

Hood and vessels

1. Preparation / Work with Piranha will be made only inside a proper chemical fume hood, with the window shield lowered as possible.
2. While working with Piranha, label the fume hood with an appropriate sign.
3. While working with Piranha, the fume hood should be clear from other chemicals, especially metals and organic compounds. The hood must be marked with an appropriate sign "Work is done in Piranha in this hood".

4. It is recommended to use a tray in order to prevent spillage and contamination of the hood's bench.
5. Work will be performed in glass or Teflon vessels. Piranha solutions are not compatible with plastic.
6. Clearly mark all vessels for their Piranha content.

Preparation

1. Piranha solution should be used freshly prepared. Prepare small amounts of solutions for use of each application. The solution should not be stored, as it generates gas and therefore cannot be kept in a closed container.
2. Do not use hydrogen peroxide at concentrations above 30% in water. Never to exceed 50%.
3. Piranha solution should always be prepared by slowly and carefully adding hydrogen peroxide to sulfuric acid, never in reverse.
4. Piranha solution is extremely exothermic. It must be allowed to cool reasonably before it is used. Use heat protection gloves when necessary to move vessels.

Work

1. Do not mix Piranha solution with incompatible materials such as organic acids, bases and organic compounds. Which will lead to violent reaction and an explosion.
2. Any introduction, into the Piranha solution, should be done carefully and slowly.
3. The hydrogen peroxide must be added to the acid (and not the other way around) in a controlled and slow manner and wait for the solution to stabilize.
4. Signs such as smoke or steam during or after mixing can indicate contamination of organic material, work should be stopped until the solution stabilizes
5. Use only glass or Teflon Tools with Piranha solution (such as tweezers, slide holder, tips, etc.)

Disposal

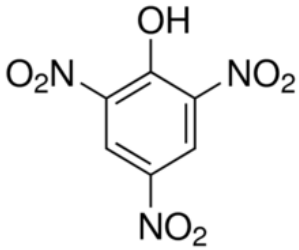
1. Solution that is no longer being used should never be left unattended if hot. It should not be stored in a closed container.
2. The solution should be allowed to cool in an open container, and gas released should be allowed to dissipate overnight prior to disposal. This process should be done in a closed window hood, clearly signed: hazard! Piranha solution in hood, do no enter organics and metals.
3. Piranha solution should not be disposed of with organic solvents waste, as this will cause a violent reaction and a substantial explosion.
4. Piranha solution should be disposed in an opened cap container marked as acidic waste, and must include VERY VISIBLE warning signs not to add any other types of chemicals.
5. Piranha disposal will be coordinated with the Dr. Oded Friedman (7206 / 052-3667128) which is in charge of the laboratory waste.

Emergency actions

1. In any case of emergency, one should report immediately to the university control center (7777 / 03-5317777) and must be reported to your Supervisor.

2. Piranha solution is a strong oxidizer. Both liquid and vapour forms are extremely corrosive to skin and respiratory tract. Direct contact will create skin burns and will be extremely destructive to mucous membranes, upper respiratory tract and eyes.
3. Eye spill – wash for at least 30 min with the emergency eyewash. Place ice on the eyes until you reach to the emergency room.
4. Spillage over body – Take off contaminated clothes and wash yourself for at least 30 min in the emergency shower.
5. Inhalation – breath clean air, seek medical treatment immediately. Piranha solution creates respiratory irritation. Symptoms may be delayed.
6. Oral exposer - wash your mouth with water, drink water, and seek medical treatment immediately.
7. Spillage - In case of spillage outside the fume hood
    a. Wear appropriate PPE to clean spill.
    b. Absorb the spillage with an absorbance sleeve or with absorbance sheets or with vermiculite.
    c. Evacuate the lab immediately, close the door and do not let anybody in.
    d. Inform immediately the safety unit.

Safety protocol for working with picric acid



Picric Acid (2,4,6 Trinitrophenol) may be explosive in an anhydrous state.

In addition, as a strong acid, picric acid attacks all common metals creating explosive salts, which are shock-sensitive

Picric Acid (Trinitrophenol) with more than 30% is unlikely to be explosive. In the wetted state, it is classifies as "flammable solid".

Commercially Picric Acid is sold wetted. Over time the material is dehydrated, and may present an explosive hazard. Therefore, one should follow the safety protocol:

- Write clearly over the bottle the date the container was opened.
- Check the hydration of your picric acid at least every six months and add distilled water as necessary
- Do not use metal spatulas or vessels with Picric Acid.
- Clean the bottleneck, cap and threads with a wet towel before resealing.
- If there is an old bottle of Picric Acid, do not try to open it. Inform the safety department immediately.
- If there is a bottle of Picric Acid with metal cap / lid, do not try to open it. Inform the safety department immediately.
- Discard the picric acid after two years.

- Please contact the safety department for disposal of the chemical.
- DO NOT pour picric acid (and any other chemical!) down the drain; it could react with metal piping to form the explosive salts.
- Chemical waste containing picric acid, should be disposed into aqueous waste. The picric acid should not exceed 1%(w/w) of the waste container.

As a last consideration, Picric Acid is toxic. It causes severe poisoning. The dust is irritating to the skin and eye. It damages vision. Systemic poisoning causes headache, vertigo, nausea, vomiting and diarrhea.

If possible, consider purchasing a 1% Picric Acid solution which will reduce the hazards level greatly

Safety protocol for working with ethereal solvents

These instructions are relevant for materials such as: ethyl ether, tetrahydrofuran (THF); 1,4 dioxane, isopropyl ether (!!), butyl - or other alkyl - ethers; glycol - and polyglycol - mono- and di-ethers; Allyl ethers and benzyl ethers.

1. Do not order ethereal solvents in containers whose contents exceed 1.25 liters.
2. Solvents should not be stored in the laboratory - the amount will be limited to the minimum necessary for routine work.
3. With the first opening of a commercial bottle (or any other packaging) of an ethereal solvent, the date must be written on the bottle in a prominent and resilient manner.
4. Every 3 months a test for the presence of peroxides in ethereal solvents must be performed (by a suitable indicator or as specified in section A below).
5. If the test result is negative, the date of the test and its result will be recorded on the container.
6. If the result is positive, the solvent must be transferred for treatment for the oxidation of the peroxides, as detailed below, in section B, as soon as possible and no later than a week from the date of the test. At the end of the treatment, a repeat test must be performed for the presence of peroxides and only if the result is negative, the solvent will be stored in dark bottles whose volume does not exceed 1.25 liters. The treatment date will be written on the bottle.
7. If you are planning on using an ethereal solvent in an amount exceeding 1.25 liters instantaneously, a test for the presence of peroxides will be performed even if the next periodic test date has not yet arrived. The test will be performed before using the solvent, according to the steps listed in sections 3-5.
8. When working with essential solvents, the following instructions must also be observed:
   A. Distillates that are kept for further work must be stored in dark bottles whose volume does not exceed 1.25 liters and make sure to record the date of distillation on the bottle and perform the periodic tests for the presence of peroxides. A stabilizing agent can be added to the peroxide-free solvent, in order to reduce the rate of oxidation (section C, below).
   B. In refining systems where new amounts of solvent are added from time to time on residues from previous refining, the test procedure for the presence of peroxides in the receiving (lower) flask must be performed.

Qualitative test for the presence of peroxides (hydroperoxides)

A simple and quick test can be performed using test sticks for peroxides, available for purchase or by preparing solutions for testing.

Solution A: dissolve 1.4 g Ammonium iron (II) sulfate hexahydrate $\{Fe(NH_4)_2(SO_4)_2 \bullet 6H_2O\}$, in 100 ml of water. The solution must be prepared on the day of the test!!

Solution B: Prepare 10 ml of 0.5 M H_2SO_4 (0.25 ml of concentrated sulfuric acid in 10 ml of water).

Solution C: dissolve 75 mg Ammonium thiocyanate, NH_4CNS in 10 ml of water.

Performing the test: mix solutions A, B and C. A colorless or pale yellowish solution is obtained.

Shake vigorously a mixture of 5 ml of the tested solvent with 5 ml of the test solution. The appearance of a yellow/brown/red color in the aqueous phase is evidence of the presence of peroxides in the tested solvent - the solvent must be treated to remove the peroxides.

Treatment for removing peroxides from ethereal solvents

For every 1 liter of ether (containing peroxides):

1. Dissolve 12 g of $FeSO_4$ in about 30 ml of water, by heating to 50-60 degrees. Allow the solution to cool to room temperature.
2. Add the prepared solution - to the ether and leave to stir for two hours.
   - Preparing the ether for reuse - after the treatment: will be conducted according to the drying and purification methods used for that solvent.

Use of stabilizing additives (optional)

1. The rate of development of peroxides in ether can be inhibited and slowed down by adding a stabilizing agent.
2. There are a large number of substances that can be used as stabilizers, for example: hydroquinone, diphenylamine, aminophenols, pyrogallol, BHT (2,6-di-t-butyl-4-methylphenol).
3. Below, are acceptable values for BHT concentration in three common solvents:
   • Ethyl ether - 7 ppm.
   • 1,4-dioxane - 25 ppm.
   • THF - 250 ppm.

4. It is important to remember: the addition of a stabilizer is not exempt from periodic testing for the presence of peroxides and their outcomes; The stabilizer is consumed over time and its concentration decreases; The stabilizer is not volatile, therefore in distillation processes a distillate will be obtained that does not contain a stabilizer.

Lab drying oven safety guidelines

The use of drying over is to dehydrate lab equipment.

1. Make sure the exhaust vent on top of the oven, is fully open at all times.
2. Do not place any explosive, combustible or flammable materials in the oven chamber.
3. Make sure to rinse equipment to remove any residual chemicals before placing them into the chamber. When these chemicals are volatilized, they can be inhaled by the user or those around them and posing a health hazard.
4. Do not place sealed containers in the chamber. Sealed containers filled with material, do not provide room for expansion or evaporation and may develop hazardous vapor pressure as the temperature increase.
5. When loading items, make sure the container is safe to use at high temperatures to avoid melting or a fire hazard. If you are not sure, contact the manufacturer for information.
6. When loading containers in the oven, care must be taken to avoid touching hot surfaces in order to prevent hot burns.
7. Make sure that the door is correctly closed.
8. Lab coat, adequate eye protection and heat resistant gloves are required.
9. When the oven is not in use, the on-off switch must be turned OFF.
10. Do not substitute the oven shelves in any part but an original.
11. Make sure the equipment is properly maintained. Report any faults to your supervisor immediately.
12. All Incidents should be reported to your supervisor immediately and must be reported to: emergency number: 03-5317777 if help needed or to safety officer after incident handled.

Safety protocol for working with a mercury lamp

General

Mercury lamps are used as a source of UV radiation for an epifluorescence microscope. These lamps contain a mixture of liquid mercury and an inert gas (argon or xenon) together with a pair of electrodes, located inside a glass shell. When a current is applied to the electrodes, an electric arc occurs, which produces enough heat to vaporize the mercury and create high pressure mercury vapor. The temperature in the arc between the electrodes is around 10,000 ^{0}C and on the inner wall of the bulb around 800 ^{0}C.

Mercury lamps require a warm-up period, during which the liquid mercury evaporates, and the light output increases to thermal equilibrium which may take 1-10 minutes after turning on the lamp. After the heating period, the lamp emits visible light and UV radiation.

The mercury vapor exerts a pressure of about 30 - 70 bar on the bulb.

Risks

Contact with electricity or potential electric shock.

Fire - Covering ventilation slots on a mercury lamp can lead to fires.

Exposure to non-ionizing radiation (UV light) - improper use of the system may lead to inflammation, burns and cancer. The skin and eyes are the most vulnerable.

Breaking a mercury lamp and leaking vapors or liquids -

Mercury lamps operate at high pressure and temperature and there is a risk of the bulb exploding and releasing toxic mercury vapors. Inhalation of high concentrations of mercury vapor can cause acute pneumonia, chest pain, shortness of breath, coughing, gingivitis, damage to the mucous membranes of the digestive system, and may cause irritation of the skin and eyes along with damage to the nervous system.

Breaking a cold mercury lamp can cause the release of liquid mercury.

Work

The microscope systems have built-in engineering controls designed to protect against exposure to UV light. Check the microscope manufacturer's instructions for the location of the protections. Do not remove or damage these protections.

Do not place the sample on a white or reflective background, in order to prevent UV radiation from being reflected back to the user.

Do not operate a hot bulb. A hot mercury lamp must be allowed to cool completely for at least 30 minutes before restarting.

The bulb should be left on if it is to be used again the same day. Repeated activation clouds the glass, shortens the life of the bulb, and increases the risk of explosion.

The danger of the bulb exploding increases as the mercury bulb ages. Therefore, you must be careful and follow the hours of use of the bulb, and replace it at the end of the life span set by the manufacturer.

The hours of use of the bulb are usually counted in the meter installed on the lamp. In devices without a meter, working hours must be tracked in a designated diary.

After replacing the bulb, the designated hour counter must be reset.

The bulb must be replaced even if the bulb changes color or there is a decrease in brightness.

The bulb must be replaced according to the manufacturer's instructions, placing the bulb incorrectly may cause overheating and explosion.

Do not open the cover of the bulb while it is still working because of the danger of UV radiation and burns. Turn off the device and disconnect the socket from the electricity. Wait for the bulb to cool completely before replacing it.

Protect yourself with safety glasses, a coat and gloves when changing the bulb. Gloves are important because hand grease weakens the glass of the bulb and shortens the life time, and also reduces the quality of the light.

Broken or used lamps will be disposed of as chemical waste. Safety department should be consulted.

Emergency
If a cold light bulb breaks and liquid mercury disperses:
Stay away from the place and keep people away.
The control center must be informed.
Protect yourself with a coat, safety glasses and gloves.
Do not collect the glass fragments by hand, use tweezers or tongs.

You should try to collect and unite the drops of mercury, you can use a small brush found in the yellow vermiculite container in the corridor. You can also use a piece of cardboard or a plastic pipette. The mercury must be collected in a closed container, marked, and disposed of as chemical waste.

If it is difficult to collect the mercury, you must protect yourself with a standard respirator (N95) and sprinkle sulfur powder on the surface to bind the mercury particles and prevent them from sliding. The powder and mercury must be collected in a container, labeled, and disposed of as chemical waste. After that, the place should be thoroughly washed from sulfur residues.

If you hear a clicking sound or an explosion from the bulb, and the light of the bulb suddenly goes out:

Immediately move away from the place and keep bystanders away from the building.

The control center must be informed immediately.

Treatment of an event of mercury vapor dispersion will be done by a team protected by a suit and a PPE.

Approval and control for the introduction of a new risk factor

General

Various processes in which there are new risk elements are carried out by researchers in the laboratories and by other parties throughout the university. This procedure regulates the manner of its introduction while responding to safety controls.

Purpose

The purpose of the procedure is to deal with the approval and control of the introduction of new risk factors that have an impact on the level of safety at work Bar Ilan University.

Detail of risk factors

Details of new risk factors are:

1. Introducing new equipment.
2. Preparation of a new chemical/biological/radiation/noise/physical/mechanical factor and more.
3. Establishment of new laboratories (chemical, biological, laser, etc.).
4. Changes in work processes and/or existing equipment in laboratories, workshops, etc.

Below are guidelines for carrying out "change management" processes

1. Notification of the intention to introduce a new risk factor and before its introduction, shall be made to the safety supervisor by the responsible person who is supposed to introduce the new risk factor or change.
2. A documented risk assessment procedure will be carried out, which includes identifying the risk factors arising from the expected or proposed change, determining safety and emergency procedures as necessary. The process will be carried out by the safety officer together with the orderer and another relevant party (if any) in aspects of maintenance and operation of other departments in the university.
3. After completing the required steps according to the established risk assessment, the responsible person who should introduce the new risk factor or change will inform about the required implementation. After control and approval by the safety supervisor, the new risk factor and/or change will be introduced.
4. In the case of the introduction of a new factor and/or a change that required a regulatory approval such as: poisons permit, ionizing radiation permit, dangerous drug approval, pathogen committee approval, transgenic plant approval, high-energy materials permit, certified laboratory approval - an application will be made in accordance with obtaining suitable approval before introducing the risk factor to the university. In accordance with the approval and its conditions, the introduction of the risk factor will be approved.
5. In the case of the introduction of equipment that requires the approval of a qualified tester and/or an appropriate engineer and/or a qualified laboratory, a documented risk assessment procedure will be carried out, which includes identifying the risk factors resulting from the expected or proposed change, determining safety and emergency procedures as necessary. After completion of the required performance according to the risk assessment, the equipment will be installed but will not be used until approval is obtained from a qualified inspector and/or an appropriate engineer.
6. In the event of the introduction of a new factor that requires environmental monitoring, a documented risk assessment procedure will be carried out, which includes identifying the risk factors arising from the expected or proposed change, determining safety and emergency procedures as necessary. After completion of the required performance according to the risk assessment, the factor will be ordered but will not be used until the monitoring and/or preliminary survey is performed.

Purchasing & receiving materials to the university laboratories

Definitions:

"**Laboratory manager**" - head of a research laboratory at the university. As defined in the occupational safety regulations (occupational safety and hygiene at work with hazardous agents in medical, chemical and biological laboratories), 2001.

"**Representative of the laboratory**" - a laboratory worker, whether a student, an administrative worker, an academic worker, another paid worker, a volunteer.

"**Supplier**" - anyone who supplies material to the laboratory.

Purpose:

Materials are frequently brought into the laboratories, whether it is from a purchaser or from another laboratory/company.

The purpose of this protocol is to determine the rules for ensuring an adequate level of safety in the reception of, and incoming materials to the laboratory.

Method:

1. In order to make sure that the material is approved and included in the university poisons permit, supply of material will be only according to the order in the Bar-net material system, or after entering the material as a requirement at no cost.
2. The supplier will transport the material throughout the university in a safe manner:
   - 2.1 Packed and closed well, and its packaging is intact and suitable for the type of material.
   - 2.2 Under appropriate temperature/pressure/dry conditions, which prevent instability of the material.
3. The supplier will provide the material to the representative of the ordering laboratory only. In this way, the responsibility for the material is transferred to the ordering laboratory.
4. The supplier is not allowed to leave the material on the premises of the laboratory or on the premises of the campus without transferring the material to the care of the ordering laboratory.
5. From the moment the material is received at his disposal, the laboratory director is responsible for:
   - 5.1 Proper storage of the material according to university protocol.
   - 5.2 Knowing the hazards of the material according to the safety sheet.
   - 5.3 Disposal of the material according to the university's protocol.

Emergency:

1. The supplier must know how to handle the material in an emergency according to the instructions of the supplier's safety supervisor/traffic safety officer.
2. In any case of a spill, fire, or reaction of the material, all reasonable precautions must be taken:
   - 2.1 Keep a distance, warn passers-by, maintain eye contact, etc.
   - 2.2 Report to the control center - emergency phone number - internal 7777, external 03-5317777.
   - 2.3 Use of appropriate safety measures as needed.

Actions when preparing to move laboratory and occupying a new laboratory

The transfer/evacuation of a laboratory must be reported in advance to the security and safety department

1. **Laboratory preparation for transfer:**
   A. Appointment of a manager for the transfer operation
   B. Compilation of lists for evacuation and transfer: devices and equipment, hazardous materials, biological materials, radioactive materials
   C. Disposal and neutralization of hazardous materials (according to the safety instructions)
   D. Disinfection, purification and cleaning: equipment and instruments, common work areas on the floor/building (equipment will be moved to another site after disinfection)
   E. Removal of existing signage in the laboratory: biosafety level, radioactive hazard, etc.

2. **The laboratory inspection prior to evacuation:**
   Inspection of the laboratory prior to evacuation by a safety supervisor

3. **Packing:**
   - Pack the equipment and materials according to the safety procedures.
   - During the packing days, the hazardous materials will be kept inside the laboratories and under the supervision of the laboratory manager. Do not place equipment and packed hazardous materials in the corridors.

4. **Transferring:**
   - Transporting the equipment and materials from the laboratory according to the safety instructions: receive pointers.
   - Transportation - proper lifting, appropriate tying, appropriate vehicle, transportation instructions.
   - Biological hoods - will only be delivered by the hood company.
   - Autoclave - after transfer, it must be tested by a qualified tester before operation.
   - Gas cylinders - will be delivered by logistics personnel.
   - Equipment used to work with radioactive materials - will be transferred only after inspection by a radioactive radiation safety supervisor and found to be free of radiation.

5. **Occupancy of a new laboratory:**
   1. Designation of a safety trustee
   2. Checking the safety equipment: safety corner, hoods, fire extinguishers, emergency equipment, etc.
   3. Carrying out a hazard survey
   4. Work plan/laboratory safety plan
   5. Biological and chemical monitoring as needed
   6. Receiving safety training by a safety supervisor

Safety Data Sheet (SDS)

The safety data sheet - is an international term for a sheet that contains information concerning the characteristics of a certain substance. Its purpose is to make the relevant safety information for the substance available to the person handling the dangerous substance and to the emergency forces.

In Israel, there are safety regulations at work (safety sheet, classification, packaging, labeling and marking of packaging - 1998). These regulations require:

- The managers and employees, to be aware of the dangers involved in working with the dangerous substance, and the safety measures required for this.
- It is mandatory to follow the instructions shown in the safety sheet.
- Every manufacturer / importer / marketer is obliged to attach the relevant safety data sheet to every material he delivers.
- The availability of information for each employee in Hebrew/English.

There are 16 sections in the safety sheet -

1. Identification of the dangerous substance - the name of the substance and the identity of the manufacturer / importer
2. Risks of exposure to the substance - health, chemical, environmental, etc.
3. Identification of the ingredients and the composition of the material - the names of the ingredients, the percentage of each ingredient in the material and the CAS number
4. First aid in case of injury involving the substance
5. Extinguishing a fire involving the substance is - what is the desired extinguishing method, is there any method that should not be used for extinguishing, detailing hazardous decomposition products
6. Treatment of a spill involving the substance
7. Treatment and storage of the material - storage instructions - cooling, sensitivity to light, etc.
8. Exposure regulation and protective measures
9. Physical and chemical properties
10. Stability and reactivity - information on substances that should not be stored near the substance, dangerous reactions and polymerization
11. Toxicology - information on the toxicity of the substance and known tests/statistics .
12. Environmental information - information about the material's hazards to the environment
13. Methods for waste disposal and treatment
14. Transportation - in this section you can see what the UN number of the substance is, to which hazard group the substance is associated to conclude about its nature. You can find a marked label.
15. Legislation and regulation
16. Additional information

There may be changes in the order of the sections.
Safety data sheets for various materials can be found on the Internet, in professional literature and information centers.
Below are several sites to download safety data sheets:

- http://hazard.com/msds/
- http://www.msds.com/
- http://wwwmsdssearch.com/msdssearch.htm
- http://www.msdsonline.com

Chemical hoods

A fume hood is a tool that provides a protected work environment for the lab worker when working with hazardous materials.

The chemical fume hood consists of an enclosed work area, a blower, ducts and a storage cabinet under the work table. The air from the work area is drawn through suction openings on the back of the hood, through the ducts, and is discharged outside the roof of the building.

1. Each hood will undergo proper inspection - twice a year - and a certificate attesting to its viability will be affixed to it. Do not work in a hood without a certificate of viability or in an improper hood (orange sticker!).
2. Hoods are designed to work 24 hours a day.
3. Verify with thin paper that there is indeed suction.
4. Know the location of the switches that control the supplies to the hood space: the blower switch, power supply switches, gas taps, compressed air, water, pressurized water, vacuum, etc.
5. Remove from the work surface and the hood space any object or tool that is not necessary for the current work.
6. Prepare in advance all the tools and equipment necessary for the work process in the hood.
7. Make sure you leave a space of at least 10 cm around the edge of the hood's work surface.
8. Work inside the hood as much as possible, especially when working with heating equipment that may create hot air currents.
9. Be sure to close the hood window as much as possible. It will be opened up to the height of the marking on the side of the window.
10. Mark with clear signage where hazardous work is performed such as work with corrosive, radioactive, biological, etc. materials.
11. Do not store materials in the hood. Order and work space must be observed.
12. Be sure to turn on water once a week in the faucet in the hood in order to prevent heavy vapors from passing through the sewage system.
13. The hood does not constitute an "insurance certificate" against damage. Even while working in the hood, be sure to use personal protective equipment: coat, closed shoes, safety glasses, gloves.
14. "Efficient flow" means smooth ("laminar") air flow at a constant speed. avoid fast movements (including body/hand movements) in front of or inside the hood. "Quick movements" include quick opening and closing of the front screen, active movement of people around the hood, etc. These activities increase the formation of air currents inside the hood and reduce its efficiency.
15. In the event of a hood malfunction, clear the hood of chemicals, close the hood window and call 8000.

Biological safety

Safety levels of biological laboratories

At the university, the biological laboratories are at a safety level: BSL-1, BSL-2 or BSL-2+.

BSL-1 safety level laboratory - work with biological agents that present minimal or zero risk of contracting an infectious biological agent.

This laboratory is not separate from other parts of the building and there are no entry restrictions to it.

The work is usually carried out in a free/open manner on the laboratory table. Protective equipment is required: coat, gloves, safety glasses, closed shoes.

BSL-2 safety level laboratory - work with infectious biological agents with a significant risk of contracting diseases that are not serious for humans (mostly vaccine-preventable diseases).

The staff will practice treatment of pathogenic agents, under the supervision of the head of the laboratory.

Access to the laboratory is limited to certain employees while work is being performed.

Protective equipment required: coat, gloves, safety glasses, closed shoes.

Processes in which aerosols are released will be carried out in biological fume hoods or under the use of other physical protection equipment.

There is a set of basic and unique procedures, equipment and designated safety devices.

BSL-2+ safety level laboratory - determination of this safety level is done with the help of the biological safety supervisor.

The safety devices in the laboratory are as per BSL-2 level, while the procedures - according to BSL-3 level.

Intended for work with higher risk factors (viruses and parasites) or biological material for which we do not have all the information about the inherent risk (material of human origin).

Protective equipment required: coat, protective sleeves, double gloves, safety glasses, closed shoes.

Safety protocol for working with viruses, blood and tissues of human origin

In the fallowing section all pathogens and human samples would be referred to as pathogens. Safety level is BSL2+.

- ! Saliva and human secretion are not included and can be used at BSL2.
- ! Use of genetic altered pathogen, creating oncogene or toxin requires approval of the Pathogen Committee.
- ! All following instruction are to be added to the instructions in laboratory and BSL2 instructions.
- ! Unexperienced students and short time workers are not allowed to work with pathogens.

Personal protection

• Work with regular personal protection, ie, lab coat, gloves, protective glasses and closed shoes.

• Required the use of double gloves and coverage of the space between the sleeve and the glove (sleeves or long gloves).

• Separate lab coats should be assigned to work with the pathogens, and care should be taken to remove the lab coats upon completion of the work.

• Do not work with exposed wounds.
• Any work involving exposure to blood, blood products, body fluids or tissues of human origin, requires vaccination against Hepatitis B, before starting work.

Equipment

• Work with the pathogen will only be performed in a biological hood. Work outside the hood is only permitted when the pathogen is neutralized or fixated.
• It is recommended to specify a separate hood for work with the pathogen, but it is also possible to work in a common hood for work that is not related to the pathogen. In this situation, the hood should be thoroughly disinfected at the end of the work with the pathogen.
• It is advisable to dedicate specific pipettors for work with the pathogen. Pipettors can be shared with other procedures provided that they are thoroughly cleaned after working with the pathogen (rinsing with 70% ethanol), and provided that these pipettors are used exclusively for work in the biological hood.
• Do not use a suction device - do not suction by public air pipes or a local pump. All pipetting will be performed by a mechanical pipettor. Use of a suction device will only be possible if a HEPA filter is installed on the suction device.
• As much as possible, disposable laboratory equipment (pipettes, test tubes, etc.) should be used to reduce risks.
• Do not grow the pathogen in plates but only in flasks, and preferably in flasks with a filter. Growing pathogen in plates will only be permitted after a risk assessment has been performed by an authorized person.
• Do not use sharp tools (needles, scalpel, etc.) when working with a pathogen. Use of sharp equipment is permitted only after a risk assessment by an authorized person and provided that the required experiment cannot be performed without the use of the sharp device.
• Use of an incubator - preferably a separate incubator. Using a common incubator is possible under these conditions:
Plates with pathogens on a separate shelf (preferably bottom)
Clear marking of the incubator as a "biological hazard"
Anyone working with the incubator will be notified of the existence and location of the pathogens.

Work Methods

• Do not transfer fluid containing pathogen by pouring from vessel to vessel. The liquid should be transferred by pipetting only.
• While shifting from working with a pathogen to working / using equipment that is also used for work without pathogens, remove the top gloves (inside the hood) and throw them in the container inside the hood.
Tubes / boxes / freezers / refrigerators / incubators and any other equipment containing the pathogen must be clearly marked.
• Avoid growing unnecessary large volumes of pathogen and in any case do not load a large volume of liquid in a single vessel.
• Before removing the flask from the incubator, be sure to close the cap.

• In a protocol that involves the formation of viruses by plasmid transfection, the flask can be placed in the BSL2+ incubator immediately, without the limitations of safety level 2+, and henceforth the flask will be considered to contain a pathogen.
• A decision on the number of cell passages required after infection with the virus, in order to move to work at biosafety level 2, will be made after a risk assessment by a qualified person. The risk assessment will address the survival of the virus in culture, the likelihood of recurrence, the presence of episodes, etc. (e.g., after infection with the lentivirus, three passages must occur before returning to being considered a safety-level cell line 2). Experiment performance on public device with those, require permission from the device responsible person cells brought for testing are cells after infection, and obtaining his consent to perform the experiment.
• At the end of the work with the pathogen, the hood must be disinfected with 70% ethanol or bleach (fresh solution diluted 1:10).
• A careful record must be kept, in a special notebook: of the sources of blood and body fluids arriving at the laboratory, the names of the employees who treated them, the date, manner of use and place of work.
• In any case of malfunction / effluent, the PI/Lab manager and Control Center must be reported.

Garbage treatment: All contaminated material remains inside the hood!

The rule is: Removal of a pathogen used substance will be carried out only after either the pathogen has been completely neutralized, or it is in a closed vessel which is transferred for autoclaving.

Liquid will be sterilized in the hood by bleach. bins or bags with equipment will be tightly closed (after adding about 50 ml of water) inside the hood, and will be taken to autoclave sterilization.

Using a centrifuge:

Centrifuge with a fixed angle: Opening and closing of the rotor will be done inside a biological hood.

Centrifuge with variable angle: Cups with a lid should be used. Opening and closing of the cups will be done inside the hood only.

Do not fill the test tubes to the end. After centrifugation, make sure that no liquid is spilled from the test tubes inside the rotor and centrifuge, and disinfect with a detergent or 70% ethanol if liquid is spilled.

Centrifugation in a centrifuge that does not belong to the parent laboratory: Coordinate with the person in charge of the centrifuge, and thoroughly disinfect the rotor and the walls of the centrifuge cavity after use.

Airborne-infecting pathogen: Two of the following three barriers must be used: cupped caps, rotor lid, and a rubber gasket around the capsule lid. If any of these demands are missing - all those present in the room are required to wear a respiratory during the centrifugation.

Observation under a microscope:

It is advisable to wrap the cling film / plate in plastic before placing it on the microscope. Alternatively, if it is a microscope pathogen dedicated, the work surface should be disinfected after use.

Observing the pathogen under a microscope that is not part of the parent laboratory equipment requires the approval of the person in charge of the microscope.

Mobility of tools containing pathogen between rooms in the university:

When transferring pathogen-containing vessels within the university, the vessels should be transported within a tightly closed vessel made of non-fragile clay. The gloves should be replaced after placing the tool with the pathogen in the tool, so as not to contaminate the tool from the outside. On the external vessel there will be a clear marking of biological risk. The vessel should be disinfected with ethanol after use.

Receipt and delivery of pathogens outside the university:

Pathogens must not be introduced and / or removed from the university without the approval of a safety officer.

The pathogen will be transported in three packages, ie, 1) a test tube inside 2) a tightly closed vessel made of unbreakable material 3) an outer package (cardboard or styrofoam) closed with a "biological hazard" marking.

Guidelines for working with bacteria at risk level 2

work instructions:

Do not work with open wounds.

Be sure to change gloves frequently.

Any work that has an aerosol risk must be carried out in a glove box or hood, or with everyone present wearing a respirator (N95).

As much as possible, it is advisable to always work in a glove box. Or at the very least, in a hood. If this is not possible, processes with a low exposure risk can be performed on the desktop.

Be very careful about spills: place dishes far from table edge, place vessels in a spill pallet.

A container with disinfectant (70% ethanol or 0.5% bleach) will be placed near the work area.

Centrifugation:

Will be performed only in centrifuges with two covers (fixed-angle centrifuge: cover and rotor. Variable-angle centrifuge: cover and cup lids).

Opening of the rotor/cups after centrifugation will be done in a hood only.

Bacterial growth in shaker:

A "Risk Level 2" sign should be hang on the shaker. All presents will be notified that the shaker contains risk level 2 bacteria.

The growth volume will not exceed one tenth of the vessel's volume.

Wait 5 minutes after stopping the shaker and before opening the shaker's lid, or open the shaker while everyone present in the room wear respirator.

Before opening the shaker, look through the window or listen and hear that there are no dishes that have fallen during the shaking. If it is seen or heard that a vessel has fallen and its contents spilled into the shaker, turn off the shaker, wait half an hour, then open it and clean the spill, while wearing a respirator.

Waste treatment:

When working in a hood, place the bin inside the hood.

Place the contaminated waste in the bin gently. The creation of aerosols due to throwing waste from a height into the bin must be avoided. At the end of the work, close the bin tightly. Do not leave an open bin containing risk level 2 bacteria in the laboratory at the end of the working day.

Spill of a small amount: disinfect with 70% ethanol or 0.5% fresh bleach.

Spillage on a floor: evacuate the laboratory, close doors, wait 20 minutes for aerosols to settle.

Cover the spillage with an absorbent material. Splash bleach on the spillage, from the outside in. Collect the material with a dustpan and brush. Further disinfect again the floor / spill area with bleach. The absorbent material should be disposed of as a chemical waste.

Spill in a centrifuge or shaker: close the centrifuge/shaker, wait for aerosols to settle, disinfect with 70% ethanol or 0.5% fresh bleach.

Work procedure with cytotoxic substances

The purpose of the procedure: regulation of safety procedures for working with cytotoxic substances at the university, based on the circular of the director of medicine 05/2022 and based on the recommendations of the committee for working with cytotoxic substances Nov. 2018.

Cytotoxic substances are used in chemotherapy treatment when the ability of these substances to damage cells causes tumor cell death. In addition to their toxicity, some of the substances also have mutagenic and teratogenic potential and damage the reproductive system.

- "Cytotoxic preparation": a preparation known or suspected to be carcinogenic and/or teratogenic or mutagenic, which is used for human or veterinary treatment, listed in the NIOSH list that is updated from time to time.

Restrictions for working with the material -

- Before working with cytotoxic substances, contact the safety department for safety instructions and training regarding the use of the substance. Do not work without safety training.
- The person authorized to work with the material is only a person who:
  - Is a university employee or an advanced degree student.
  - Has no impairments in liver or kidney functions or the hemopoietic system.
  - Does not have a compromised immune system.
- Women's work with cytotoxic substances will be subject to the Women's Work Regulations (Prohibited Work, Dangerous Work, and Restricted Work) - 2006. At the same time, it is recommended that pregnant or breastfeeding women do not work with these materials at all.

- Do not order powders of cytotoxic substances.
- Do not crush or break tablets containing cytotoxic substances.
- Do not bring cytotoxic substances from outside laboratories to the university without permission from the safety section.

Storage -

- Cytotoxic substances will be stored in secondary packaging that will be marked in a manner that allows clear identification that it is a toxic substance.

Working with the material -

• Opening of the secondary packaging will be done in a hood.

• All work with these materials will be carried out in a biological or chemical fume hood.

Conveyance -

• Transportation of cytotoxic preparations within the university will be carried out in a secondary container.

Waste treatment -

• The remains of the materials and tools that contained these materials will be disposed of as chemical waste.

• Biological waste containing cytotoxic substances will be sterilized with bleach and disposed of as chemical waste. Do not sterilize these materials in an autoclave.

Procedure for ordering Disease-causing factors

Substances that were defined as Disease-causing factors in the law regulating research on biological pathogens, 2008 , will be ordered only after receiving the approval of the university committee for Disease-causing factors. For details, contact the biological safety officer.

Procedure for ordering dangerous drugs

Ordering dangerous drugs for use on animals requires prior approval by the university veterinarian and the safety department for permission to order these types of materials. (Ordering dangerous drugs for non-animal experiments requires approval from the Ministry of Health). In order to receive the permission, researchers or teaching staff are required to fill out the "Application form for opening a permission for dangerous drugs", after which a visit to the laboratory will be conducted by the university veterinarian and/or the safety representative who will confirm the existence of the maintenance

requirements for the material. The storage of these materials will only be permitted in a safe or a lockable iron cabinet.

Ordering these materials in the bar-net system will be done under an appropriate category for each material, and not under a general category.

Below are the instructions for ordering and using the materials:

- Filling the form is required for every dangerous drug that appears on the existing list in the bar-net system for use on animals, and for every other substance defined in the Narcotics Ordinance.
- Lab workers who may submit this form: researchers and teaching staff who wish to purchase for their professional needs.
- Submitting the form will only be possible after a veterinarian or a member of the safety department confirms that the laboratory has a safe or a steel cabinet to store the materials.
- The prescription will be issued by a veterinarian only.
- Care must be taken to keep an orderly record, in a bound notebook, of the use of drugs and medicines, including details of dates and amounts of use.
- It is absolutely forbidden to transfer drugs or medicines, without a veterinarian's approval, from one laboratory to another.
- The material and the documentation about its use must be presented to the university veterinarian or any subject in the position authorized for this, during an audit in the laboratory or at any other time determined by the veterinarian or the authorized person.
- After submitting the application for the veterinarian's approval, and his approval, the category will be opened for the researcher to be booked in the bar-net.
- The applicant will be responsible for carrying out the procedures.

Working with transgenic plants

Any experiment with transgenic plants or transgenic organisms related to plants in any way in their life cycle is subject to the approval of the plant protection services, before the experiment is carried out, according to the regulations for transgenic plants that came into effect on June 8, 2005.

Any researcher who intends to conduct an experiment with transgenic plants or transgenic organisms related to plants (insects, fungi, bacteria, etc.) at the laboratory, greenhouse, and field level and/or to import transgenic plant material must request through the Institutional Safety Committee (ISC), which will forward the request to the National Committee for Transgenic Plants (NCTP). It is necessary to obtain two types of permits: one is the laboratory's permit to work with plants and transgenic organisms and the other is a permit to perform the experiment. The laboratory and the breeding facilities where the experiments are intended to be carried out must be inspected and approved in advance by the plant protection services inspector.

The safety guidelines for a laboratory that deals with genetically modified plants are similar to those of all laboratories. In general, most genetically modified plants do not pose a danger to humans, but procedures must be followed to prevent the cultivation of plants outside the laboratory and the growing areas.

some pointers for working with genetically modified plants:

- Care must be taken to keep an accurate record of the name of the experimenter, the type of experiment, the project number, the name of the host cell (bacterium, plant or animal), and vectors used to build the construct, the insert, recording the time the experiment began and ended and the number of the room or laboratory where the experiments are conducted.
- Coats intended for work in the nurseries and greenhouses must be worn. The coats are not to be taken out of the nurseries.
- Doors should not be left open in the nurseries and the windows should be protected with insect nets.
- The nurseries will be locked, and there should be a double entrance.
- The trays on which the plants were placed in the growing rooms must be cleaned and disinfected.
- Removing plants from the nursery will be done in a bag or a non-fragile container.
- The drainage water from the growing room will be inactivated before being discharged into the sewer.
- The placement of the pots will be done, if possible, so that the plants do not protrude beyond the trays, to prevent friction with the lab workers that will lead to seed scattering.
- All biological waste must be collected in suitable containers and sterilized (using an oven, autoclave or an approved chemical) before disposal. If the sterilization or purification takes place outside the laboratory, care must be taken to collect the biological waste in closed containers or means suitable for transfer from the laboratory to the place of purification or sterilization.
- When finished working with genetically modified organisms and after leaving the laboratory area, wash your hands thoroughly.

Safety instructions for working with pesticides

1. The head of the laboratory must instruct each new employee regarding the hazards that exist at work and the safety guidelines for working with pesticides.
2. Carefully read the manufacturer's instructions , the manufacturer's label of the material , the accompanying information sheets, the safety data sheet (SDS) and follow the instructions.
3. Store the pesticides only in the original packaging with its contents clearly marked.
4. Store all pesticides and poisons together in a closed, ventilated, shaded, marked, and locked away cabinet and strictly follow the storage instructions of the material manufacturer. Minimum quantities needed for current work must be stored.
5. Only pesticides approved by the safety department will be used.
6. Make sure that the work tools and equipment are adapted to their purpose and that they are in good condition. Be sure to follow the manufacturer's instructions for the tools and equipment you have.
7. The preparation of the material and their dilution will be done exclusively in a chemical hood.
8. Excess pressure in a sprayer will be released by controlled opening of the lid in a chemical fume hood.
9. When handling a pesticide, personal protective equipment must be used:

- Nitrile gloves
- Protective glasses
- Full face mask with ABEK filter.
- In field extermination, you must wear a Tyvek/rubber suit and in confined extermination (on a table), you must wear a long-sleeved tyvek/rubber coat.

10. The use of breathing masks will be done with a suitable universal filter, which will be monitored for its use and the length of the filter's life.
11. If a defect is discovered in personal protective equipment - it must not be used and it is required to supply proper replacement equipment.
12. People must be prevented from entering while spraying.
13. Do not smoke, drink or eat while spraying.
14. Pesticide operation in a closed place will start in the far place and from there towards the exit.
15. The pesticide must be sprayed away from the lab worker's body.
16. Pay attention to the air gust and its direction, and avoid spraying while it is moving towards the lab worker.
17. When spraying small drops, you must stay a minimum time in one place.
18. When the work is finished you must wash your hands.
19. After spraying, ventilate the sprayed area for several hours.
20. After spraying, conspicuous warning signs must be placed in the area, indicating the name of the sprayed substance, the date and details of the lab worker.
21. Pesticide waste, including the containers, will be disposed of according to the university's waste disposal procedure.
22. Ensure order and cleanliness in the workplace.
23. In the event of a spill/spray, care will be taken in accordance with the safety guidelines for handling a safety incident at the hazardous materials.
24. Immediately notify the emergency department of any safety incident by calling 03-5317777
25. Notify the head of the laboratory and the emergency center by phone 03-5317777 about any hazard and safety incident.
26. Medical examinations will be carried out as needed as defined in the Occupational Safety and Health Regulations of Lab Workers with Organic Phosphorus and Carbamate Pesticides, 1992.

working with animals

1. The risks of working with animals include the transfer of pathogens from the animal to the worker, exposure to a large number of pathogens in the bedding and developing an allergy to the animal.
2. The ways of exposure to pathogens are divided into active transmission (bite or scratch), and passive transmission (aerosol, fur, bedding).
3. Every worker who works with animals must be vaccinated against the tetanus bacteria.
4. The required personal protective equipment includes a gown and gloves. If procedures are performed that may cause splashes and/or aerosols, safety glasses and respiratory protection should be used, respectively.
5. It is highly recommended to use restraining equipment during injections, and to avoid as much as possible injecting into an animal held by another person. It is not allowed to inject dangerous

substances into an animal that is not restrained or anesthetized. It is recommended to anesthetize with isoflurane before injecting anesthetics.

6. Be careful when working with sharp surgical instruments from injuries that penetrate the skin and introduce the biological agents into the body.
7. Care must be taken when handling an animal bedding. Personal protective equipment must be used.
8. Do not keep animals in laboratories after the end of the experiment conducted in them.
9. Animal carcasses will be transferred immediately after the experiment to a freezer designated for this purpose in the animal houses.
10. Working with wild animals requires a dedicated risk assessment and consultation with the biosafety officer regarding safety guidelines. Workers who are engaged in trapping mammals in the field need to be vaccinated against rabies. Do not work in an isolated area alone. Personal protective equipment: long clothes, high shoes, a hat, and a metal mesh glove.
11. In the event of a bite or scratch, wash the area with soap and water and disinfect with iodine or alcohol (70%). The incident must be reported to the head/director of the laboratory, the control center and a consultation with the family doctor should be sought.
12. Do not bring people who are not laboratory workers into the laboratory while working with animals.

Chemical waste treatment

Contaminated waste- any type of equipment/tool that comes into contact with hazardous materials (solid/liquid/gel) that is not volatile and the vessel is not clean. Hazardous materials is any chemical, biological or radioactive substance. Depending on the type of contamination, the contaminated waste is divided into three subgroups - chemical waste, biological waste and radioactive waste.

Sharp waste- any tool that may cause mechanical injury to a person. Sharp waste can be contaminated sharp waste or non-contaminated sharp waste.

The laboratory waste will be disposed of according to the following guidelines:

General instructions:

1. Chemical, biological, radioactive and sharp waste should not be thrown into regular trash and should not be poured into the sink.
2. Each container containing waste for disposal will be clearly marked with a standard label suitable for the type of waste (available from the central warehouse). The name of the head of the laboratory and the date must be indicated on each label.
3. The upper lid of the sharp container will be sealed when full. This lid can not be easily opened if sealed by mistake.
4. Any disposure of contaminated waste will be done **after approval** (a sticker indicating approval will be affixed to the container) by the disposure supervisor from the safety department.
5. It is forbidden to put tools or objects contaminated with dangerous chemicals into the autoclave (for fear of dispersal of toxic decomposition gases).
6. Do not put any container in the autoclave if it contains chemicals.
7. The waste containers (Jerrycans, jars, and rigid containers) and the stickers are provided upon request from the central warehouse (free of charge).
8. Removal of glass bottles will be done by opening and evaporating the materials in a chemical hood overnight, before placing the bottle without the cap for removal by the cleaning workers.

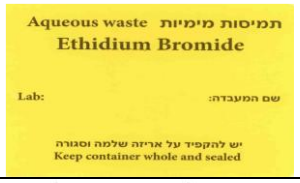
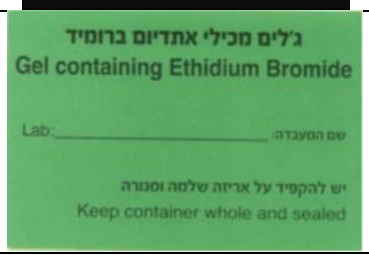
Non contaminated sharp waste

- Non contaminated sharps will be disposed in sharp bins with the hereby label.
- Sharps that came in contact with volatile organics and were left to evaporate in the hood overnight, can be disposed as non contaminated sharps.

Chemical waste:

1. All liquid chemical waste will be collected in 5litter container and will be sealed with a glove under the cap for leak prevention.
2. All liquid chemical waste will be labaled with a sticker as described below.
3. All labels will contain the name of the head of the laboratory.
4. Contaminated sharp waste that will contain liquid (at any amount) will be carry a fine to be paid by the laboratorv.

The following table indicates the different types of waste, the content definition, the appropriate sticker and the sticker code to order in the bar-net system

	Chemical waste	Sticker
Aqueous waste	Neutral aqueous waste Aqueous waste, colorless, odorless, and without sediment, which contains organic or inorganic impurities in an amount of no more than 1% and the pH of the solution is 4-10 Aqueous waste, pH lower than 4 - Use the same sticker. Erase the word 'neutral' and write 'acidic'. Aqueous waste, pH above 10 - Use the same sticker. Erase the word 'neutral' and write 'basic'. (The pH must be measured) Aqueous waste with large amounts of salts. Use the same sticker. Delete the word 'neutral' and write 'inorganic'	
	Aqueous solutions of ethidium bromide Aqueous solution of ethidium bromide (check and record pH)	
	Halogen-free liquid organic waste Aqueous waste with organic materials and solvents that do not contain halogen. An aqueous solution with a biological agent that has been neutralized by bleach.	
Organic waste	Liquid organic waste does not contain halogen Liquid organic waste without halogens.	
	Liquid organic waste contains halogen Liquid organic waste with halogens and also a mixture of liquid organic waste without halogen with liquid organic waste with halogen.	
Gels	Gels containing ethidium bromide Gels containing ethidium bromide	

Chemical waste for disposal	<u>Chemical waste for disposal</u> Gels containing DNA Stain Clear G . Unused materials. You can also use the original container of the material. Gels that do not contain ethidium bromide. The following materials will be packed separately in a marked container (each separately): • Chemical waste contains arsenic. • Chemical waste contains mercury. • Catalysts (such as palladium on charcoal or Raney Nickel). Active metals and hydrides of metals will be packed separately, the packaging will be done according to the safety instructions. Examples: Sodium, Lithium, Powders and chips of metals such as iron powder, aluminum powder, magnesium powder and chips, Lithium aluminum hydride, sodium hydride, sodium borohydride, Parts of open batteries with residual lithium.	
Contaminated equipment	<u>Chemically contaminated equipment</u> • Used gloves, syringes, needles, contaminated vials (which do not contain solutions and substances), tips, filter papers, broken glassware. • Used silica plates. <u>Note:</u> Vials found with liquids or solids incur a "handling fee" fine. The fine will be paid by the laboratory from which the waste was received.	

<u>Remarks</u>

- Acidic non-organic liquid waste is considered acidic waste.
- Basic non-organic liquid waste is considered basic waste.
- Aqueous waste with organic substances/solvents is considered organic waste.
- Organic waste with sediment is considered organic waste.
- Broken container/broken cap is required to be sealed before disposal.
- Lithium /sodium - seal in a nylon/welded bag.

Guidelines for treatment of contaminating biological waste

- Biological waste will be sterilized and then disposed of as regular waste. Biological waste is sterilized by bleach or autoclave.
- Do not sterilize biological waste containing toxic chemicals in the autoclave. The residual chemicals may be emitted along with the steam into the room space. This waste must be sterilized with bleach.
- Do not perform "double sterilization", that is, sterilize liquids or utensils treated with bleach in the autoclave.
- Do not leave untreated biological waste outside laboratories / near the autoclave. If it turns out that the autoclave is occupied, the waste must be returned to the laboratory by the time of sterilization.

Bleach sterilization. (Final concentration: 0.5%).

- Wait 20 minutes before rinsing / disposing of waste.
- Sterilized liquids can be emptied into the sink (See procedure below) or disposed of in a jerrycan as chemical waste. It is recommended to carry out the transfer to the jerrycan in a chemical hood.
- Surface disinfection: bleach at a concentration of 0.05%.

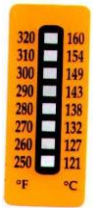
Autoclave sterilization. (Steam sterilization).

- Solutions and equipment will be sterilized at 121OC for 20 minutes. Sterilization of waste: 30 minutes at a temperature of 134OC or 40 minutes at a temperature of 121OC.
- Do not fill bottles with more than two-thirds of their volume, to prevent 'overflow' of liquids during sterilization. Do not tighten the bottle caps to prevent explosion inside the autoclave.
- Solutions sterilization will be performed in a bucket or tray that can contain liquids to prevent leakage of the sterilized materials into the autoclave piping.
- The 'shutter' of the bucket must be left open to allow steam to penetrate. After sterilization the shutter should be closed. For dry waste it is advisable to add 50-100ml of water.
- A closed bucket or a tied bag can be sterilized, provided that 50-100ml of water has been added to them, before closing.
- Be sure to write the name of the lab on the autoclave tape or directly on the tin.
- An autoclave tape and a temperature indication sticker should be affixed to the bag or bucket.
- Opening an autoclave containing equipment will be done after the pressure gauge has reached zero and the thermometer indicates a temperature below 80OC. After sterilization of solutions, wait until the temperature drops below 60OC. The equipment will be removed with heat-resistant gloves.
- When opening the door, stand at its side and not in front of it, in order to avoid possible damage of the door and the breathing of the emitted steam.
- Once every six months, each lab will report to the Safety Department that they have checked the heat stickers and they have indeed come out proper.

Sterilization and disposal of biological waste in bags / recycling bins.

- There is an option to recycle the sterilization bins and throw only the bag in the waste. This option is subject to compliance with the following rules:
- The waste must be placed in a bag inside a rigid bin. Bags should not be sterilized directly in the autoclave.
- The required stickers (heat sticker and autoclave tape) should be stuck on the bag and not on the bin.

- Be sure to write the name of the laboratory on the autoclave tape.
- If the bag is tied before sterilization, make sure that there are liquids in it (at least 50 ml).
- Do not put sharp waste in a bag (surgeon blades, Pasteur pipette, broken glass, etc.). Sharp waste should be sterilized in rigid plastic bins and trash with the bin.
- After sterilization, the bag with the waste must be transferred into another, new bag, and placed in the cart intended for biological waste.
- The cleaning workers should be instructed to collect the sterilized biological waste bags in bags (as they collect the rest of the waste) and clear off these bags in a cart, to the garbage and not by carrying/dragging, which then has a greater chance of tearing the bag.



Heat sticker. Must be ordered when ordering bins for autoclave.

Stock catalog number: 300283

Guidelines for pouring sterilized liquid biological waste into the sink

The permission to pour liquid biological waste into the sink is given subject to the following guidelines:

- Sterilization of biological liquid waste will be carried out with bleach at a final concentration of 0.5%.
- After adding the bleach, wait 20 minutes before pouring into the sink.
- Do not pour bleach into the sink with a concentration exceeding 3%. Bleach with a concentration exceeding 3% must be disposed of as chemical waste.
- Water must be flowed in a strong current while pouring the waste into the sink.
- Do not pour the bleach-sterilized waste into the sink if there are other chemicals in the solution (organic solvents, etc.).
- Do not pour a large amount of bleach at one time. If a large amount of biological liquid waste has accumulated (over 4 liters, including the bleach), it must be emptied as chemical waste, or separated to several times of pouring, a few hours apart.
- This approval does not permit the pouring of any other laboratory material or other sterilizing material into the sink.
- As in any laboratory work, be sure to use personal protective equipment while pouring the waste into the sink.

Ionizing radiation safety

Any work with radioactive materials requires approval from the Radioactive Radiation Safety supervisor - Itay Lazar - Mobile 054-6603398.

You can also get informational material from the Radioactive Radiation Safety supervisor.

The Ten Commandments for radiation safety

1. **Get to know the nature of the radioactive material you intend to use and receive appropriate guidance from the safety services regarding the desired way of working with it.**
2. **Plan your actions so that the treatment of the radioactive material lasts as little time as possible.** The shorter the working time - the smaller the radiation dose. Do 'cold' experiments to acquire skill.
3. **Work at a maximum distance from the radiation source.** Double the distance from the source, reduces the radiation dose by a quarter. (The law of the inverse square ratio)
4. **Use appropriate masking against radiation.** Perspex will stop beta radiation. Lead (of suitable thickness) will stop X-rays and gamma-rays. Work with certain radioisotopes must be carried out in a fume hood, using appropriate protective measures. Do not use the I^{125} isotope.
5. **Wear a coat and appropriate radiation regulation badges**. Also wear latex gloves and safety glasses (if needed). Working with certain radioisotopes (strong gamma emitters) requires wearing badges or other dosimeters to measure radiation.
6. **Work according to safety laws and instructions.** Work on a work surface designed for working with isotopes. The surface must be covered with a bench liner. All equipment and devices intended for working with isotopes must be marked with a standard label for this. Never work with radioactive materials when there are open wounds on the hands. Do not drink, eat, smoke or apply make-up in an area where there are radioisotopes. Do not pipet by mouth. Appropriate means of bathing must be used (elbow or electronic faucet, foot soaps, hand wiping device) when finished using radioisotopes. Order must be maintained at the workspace and make sure the area is free of contamination when finished.
7. **Check the work area frequently with a Geiger counter so that you can detect the possible occurrence of contamination.** In case of contamination at work: A. loudly warn those around you. B. Limit the movement of people in the area. C. Report to the Radiation Safety Unit.
8. **Store radioactive materials in designated and marked areas.** There must be a separation between normal materials and radioactive materials. Store compounds according to the conditions recommended by the manufacturer. The storage cabinets must be closed and marked with the appropriate labels, plus the name of the user and the date of storage.
9. **Do not store radioactive waste.** Get rid of it as quickly as possible according to the instructions. Use the minimum amount of material needed for the experiment. Get rid of the radioactive waste as quickly as possible after the end of use according to the instructions of the Radiation Safety Unit.
10. **Check yourself - after finishing the work.** At the end of the work, check yourself with a Geiger counter. In case you discover contamination - immediately report to the Radiation Safety Unit and follow its instructions.

Laser safety

Laser laboratories are required by law to be certified for work by an external certified inspector. Audit and certification is carried out in coordination with the laser safety supervisor.

Safety procedure for working with lasers - Bar-Ilan University

1. **Purpose:**
   1.1. Provide safety procedures for working with dangerous lasers.
   1.2. To provide guidelines regarding the design of the laboratory and the design of experimental systems that use dangerous lasers.

2. **The nature of the laser and definitions:**

Classification of lasers and laser systems:

* Class 1: A laser that cannot cause damage to the eye even with direct exposure for 8 hours per working day. Class 1M – class 1 laser that can cause damage if viewed through focusing optics.

* Class 2: A laser, which in visible light, cannot cause damage to the eye, unless the viewer overcomes the blink reflex and continues to look into the beam. Class 2M - class 2 laser as described, which can cause damage if viewed through focusing optics.

* Class 3R: A laser whose intensity is up to 5 times higher than that of a laser in class 2, regarding CW lasers in visible light, and up to 5 times that of a laser in class 1 regarding all other lasers.

* Class 3B: A laser that can cause damage to the eye when viewed directly in less than ¼ second (blink reflex time), cannot cause damage when viewed from light reflected from a diffusing surface, and will not normally cause damage to the skin.

* Class 4: A laser with high damage potential. May cause irreversible damage to the eye upon direct viewing and upon reflection from a scattering surface, can cause skin damage upon direct exposure and upon reflection from a scattering surface and may ignite flammable materials.

   2.1. Maximum Permissible Exposure Level (PEL): The level of exposure to laser radiation to which almost all lab workers can be exposed during the work shift, over time, without health effects. The exposure level / method of calculation of maximum exposure level allowed for each type of laser is detailed in the standard IEC-60825 part 1. The standard is available in the offices of the university's safety center.
   2.2. Dangerous laser: a laser of class 3R, in invisible light, and any laser of class 3B and 4.
   2.3. Accessible exposure limit (AEL) the energy determined the laser class, determined by charts at the IEC 60825
   2.4. Laser hazard zone: any area where there is a danger of exposure to laser radiation beyond the maximum permitted level, normally or in the event of a malfunction.
   2.5. Laser hazard lab worker: any lab worker who is routinely, on the occasion of his work, in a laser hazard zone.

2.6. Protective glasses for lasers: Protective glasses adapted to a specific laser in that the lenses of the glasses absorb the laser's wavelength/wavelengths, with an optical density that lowers the beam's intensity to at least the maximum permitted level, and the lenses are resistant to the maximum energies that the laser can emit normally or in the event of a malfunction. The protective glasses should be marked according to their protective properties, and have a standard mark according to the EN207/EN208/IS4141 standard.

2.7. Do not use protective glasses for lasers that do not have a standard mark. For the use of protective glasses with a different standard mark than the one indicated above, permission must be obtained from the laser safety supervisor / the inspector for laser work safety issues.

3. **Working methods:**

3.1. General:

3.1.1. Only those who have undergone safety training regarding work with lasers and have received approval for the training, are authorized to work with dangerous laser systems. Laser safety training will be given to every new employee who starts working with a dangerous laser. Refresher training will be given once a year. The responsibility for organizing the training: the university's safety unit.

3.1.2. Every class 2 laser or higher will be marked with a standard warning label according to the danger presented by the laser system.

3.1.3. In any case of a malfunction, the system must be turned off immediately and not turned on until the malfunction is repaired.

3.2. Protection from the laser radiation beam:

3.2.1. Never look directly into the radiation beam or into the path of the beam. Direct or reflected viewing may cause irreversible damage to the eye, depending on the class of the laser.

3.2.2. In any work with a dangerous laser, which has the possibility of exposure to a radiation intensity higher than the maximum permitted level, in routine or in the event of a malfunction, protective glasses must be worn, suitable for the wavelength of the laser radiation and its intensity and have standard association stamp as defined in section 2.5. The protective glasses will be marked with the wavelength and absorption density corresponding to the laser system for which they are intended. The use of protective glasses that do not meet the requirements is conditional on receiving the approval of a qualified tester for laser systems, or a work inspector.

3.2.3. Choosing the appropriate protective glasses will take into account the following parameters:

- The wavelength of the laser
- The intensity of radiation that the lab worker may be exposed to on a routine basis or in the event of a malfunction
- The maximum exposure level allowed for that laser
- The optical density of the glasses at the wavelength of the laser
- Requirement for transmission level in visible light
- The intensity of the radiation that can cause damage to the protective glasses
- The need for optical glasses
- Wearing comfort, ventilation

- Degradation of the lenses, even temporary or transient
- The resistance of the lens to shock or blow
- Peripheral vision requirements
- Compliance with the standard and regulations

3.2.4. Despite what is stated in section 3.2.2, in exceptional cases, in which it is not possible, in practice, to use protective glasses suitable for lasers in the visible light field, the requirement can be reduced, provided that a definition is given in the procedure for how to work with the laser, and with the approval of the laser safety supervisor only.

3.3. Engineering and mechanical protection measures required in the laser systems:

3.3.1. If possible, make sure to have shields around the radiation path of the laser. These shields should protect the lab workers in the laboratory from random exposure to the radiation beam of the laser.

3.3.2. The end of the useful beam will be blocked by a shutter, filter or radiation absorbing body or by a suitable shield that will be mounted on the laser or on the optical table.

3.3.3. Shields must not be removed and the laser system must not be operated without shields or with damaged shields. In places where it is necessary to remove shields or it is not possible to install shields, for the purpose of research, appropriate measures must be taken to prevent exposure to laser radiation, and protective glasses suitable for the type of laser and its power must be worn at all times while in the laboratory.

3.3.4. When in doubt, contact the laser safety supervisor / safety department for instructions.

4. **Safety measures required in the laboratory where the laser is placed, according to the classes:**

4.1. Class 3R:

No special measures are needed, except for the measures mentioned above and suitable protective glasses found in the laboratory.

4.2. Class 3B:

- The laser hazard zone must be defined.
- Access to the laser hazard zone will be limited to authorized personnel only through barriers, protective drapes and signage.
- A warning sign for visible / invisible laser radiation will be installed on the laboratory door from the outside. Appropriate signs can be ordered from the university's safety unit. A warning light will be activated whenever a dangerous laser is on.
- Inside the laboratory and/or outside the laboratory door, a sign will be installed requiring the use of suitable protective glasses whenever there is a risk of exposure to any laser radiation.
- An organizer (shelf, cabinet, drawers) must be installed in the laboratory to hold suitable protective glasses for all the dangerous lasers found in the laboratory. The shelf / cabinet will be labeled accordingly.
- Ensure that a fire extinguisher is available in or near the laboratory.
- The laser will be installed in the laboratory in such a way that the emission of radiation will be below the eyes of a person standing or sitting and, in any case, not at eye level.
- The laser will be installed in such a way that the radiation emission will not be in the direction of the laboratory door.

- The hazardous laser systems must undergo an annual inspection by an approved tester / certified laboratory. Contact the safety department for details.

4.3. Class 4:

• A warning sign and a warning light will be installed above the door of the laboratory from the outside, indicating the danger of laser radiation, which will include a warning against visible or invisible laser radiation depending on the situation, the obligation to enter only authorized personnel, and the obligation to use protective glasses suitable for the type of laser in the laboratory.
• At the entrance to the laser laboratory, a suitable and accessible organizer (cabinet or drawer) will be installed to hold protective glasses intended for the laser systems.
• The laser will be installed in the laboratory in such a way that the radiation beam will be below the level of human eyes and will go towards an opaque wall and not towards the door of the laboratory.
• Every window installed in the laboratory walls or door of the laboratory must be coated with a coating that absorbs the laser radiation, lowering it to a non-dangerous level (an accurate characterization from the laser safety supervisor / safety department must be obtained).
• Alternatively, the laser system can be surrounded by curtains that prevent the passage of radiation towards the windows of the room. The curtains will be kept closed at all times when working with the lasers.
• The laser system will be equipped with a light and/or a buzzer indicator, which will warn when the laser is activated and have a standard warning label for a class 4 laser.
• The path of the laser beam must be contained as much as possible in such a way that will prevent the placing of the head, hands or objects inside that reflect or scatter light, into the path of the beam. Do not use shiny or reflective components in the beam path.
• Make sure there is an emergency switch in the laser system or at the entrance to the room, to stop the operation of the laser in an emergency.
• Absorbers will be installed at the used end of the beam to prevent the beam from hitting the wall or a person passing between the optical table and the wall. Beam stoppers made of non-flammable materials that do not reflect light must be used.
• Avoid shiny or reflective walls and elements.
• All the optical components must be fixed in place on the optical bench with screws, and in such a way that the freedom of movement of the components is only in a horizontal plane to prevent the possibility of tilting the laser beam towards the lab worker's eyes.
• An interlock (micro-switch) will be installed in the laboratory door that will stop the laser operation when the laboratory door is opened. If this affects the operation of the laboratory, alternative measures can be taken (in coordination with the laser safety supervisor), such as:

- Installing a black curtain or a unique curtain suitable for all the wavelengths of the lasers in the laboratory, behind the entrance door to the laboratory. Any working passage beyond this curtain will require the use of suitable protective glasses for the lasers found in the laboratory. A warning sign will be placed accordingly, and a container/cabinet with appropriate protective glasses.
- Installation of a black curtain or a unique curtain that absorbs the laser radiation according to the wavelength and radiation power, around each laser system (including the optical path), with signage prohibiting entry into this area without suitable protective glasses. This solution is required in any case where separation is required

between the laser system lab worker, and other activities in the laboratory, where the lab workers wish to work without protective glasses.

- The curtain / partition will be installed in such a way, that it will not be possible to divert them and leave them diverted, for example, by grasping the curtain on one side up, in such a way that after the person enters, the curtain will automatically return to its place. If possible, it is recommended to install an interlock on the curtain, which will stop the laser operation and/or will not allow the laser to be activated when the curtain is pulled down / moved to the sides.
- The curtains will be made of non-flammable fabric (self-extinguishing or equivalent).

5. **Considerations in planning a laser laboratory / experimental system with a laser**
   5.1. The laser system will be assembled in such a way that the direction of the emission will not be in the direction of the room openings and will not be in the direction of the eyes of a sitting or standing lab worker.
   5.2. In an open optical table, the optical components (mirrors, lenses, etc.) must be fixed to the optical table in such a way that they cannot be tilted upwards, but rotated in a horizontal plane only.
   5.3. If it is possible to plan and install a cover on the optical path, which would prevent the possibility of placing one's head into the optical path, this should be done. The cover will be completely sealed or made of material that absorbs the laser radiation depending on the wavelength and maximum power of the laser. Regarding class 4 lasers, a cover must be installed that will also prevent the placing of hands or other body parts into the optical path.
   5.4. Barriers / permanent beam stoppers must be installed at the end of the used beam path. Such barriers must be installed even if the beam is blocked by a mirror that deflects the beam, and this is in case the mirror is not assembled in its place due to error or obliviousness. The beam stoppers will be made of a fireproof material that absorbs the laser radiation.
   5.5. If possible, the aiming should be done with reduced laser power as much as possible. Aiming will always be performed using appropriate protective glasses and additional personal protective equipment according to requirements.
   5.6. It is important to remember that ultraviolet radiation can cause cumulative damage to the skin with continuous / repeated exposure. When working with lasers in the UV field, long clothes and protective gloves (latex or nitrile) must be worn.
   5.7. Do not use shiny objects near the emission path of a class 3B or 4 laser. Light-diffusing parts should be used as much as possible. It is recommended that optical components and accessories used when working with class 4 lasers be blackened and roughened.

6. **Actions in case of injury:**
   6.1. In any case of injury or suspicion of injury from laser radiation, the laboratory manager / department manager and the laser safety supervisor / safety department must be informed immediately. You should go to an eye clinic for an examination.
   6.2. The accident must be investigated, lessons learned and applied to prevent the recurrence of a similar case in the future.
   6.3. Any safety incident related to working with the laser systems must be reported to the laboratory director.

7. **Additional information:**
   For more information about safety when working with lasers:
   • Safety standard for working with lasers, IEC-60825-1, last update: May 2014. A copy of the standard can be obtained from the laser safety supervisor.
   • Israeli standard 4141, part 10 and 11 for laser safety glasses. A copy of the standard that implements the European standard EN-207-208 is available at the laser safety supervisor.
   • The regulations on safety at work, occupational safety, and the safety of those dealing with laser radiation, 2005. The regulation can be found on the ministry of economy and industry website, laws and regulations database: https://www.osh.org.il/uploadfiles/takanot_lazer_6438.pdf

Behavior during a fire

1. When fire and/or smoke is detected, warn the lab workers in and around the laboratory and ensure evacuations.
2. Notify the security center about the fire and its exact location (7777).
3. In a limited fire (flame covering an area of up to 1 square meter), at your discretion and provided you have undergone appropriate training, use the fire extinguisher located in the laboratory or in the corridor. Do not use water for extinguishing.
4. Before turning on the fire extinguisher, remember the stages of its operation: check the pressure in the fire extinguisher is intact (the clock is green), disconnect the zip tie, pull the pin out, point the fire extinguisher in the direction of the fire, squeeze the handle and spray the extinguishing agent towards the base of the flame.
5. If the fire is more extensive, evacuate yourself and the others from the building through nearby doors and stairs that are free from fire. Do not use the elevators.
6. Before leaving the lab, turn on the emergency power cut-off switch, located near the laboratory door. Activate the fire emergency button and close main gas valves if present.
7. On your way out, close windows and doors behind you, if possible, in order to prevent the fire from spreading.
8. Upon arrival of security, safety, firefighting and MDA teams, follow their instructions and provide them with information regarding casualties, the possible cause of the fire, hazardous materials in the laboratory, and more.
9. Wait together with the other evacuees outside the building in a safe place and check whether the people who were in and around your laboratory have been evacuated.

Treatment of fire victims:

A. Extinguishing a person on fire: Roll the person on the floor and/or cover them with a blanket or item of clothing and/or place them in an emergency shower. Do not try to take off his clothes after extinguishing the fire.
B. Smoke victims: should be taken out to the fresh air.
C. Report the victims to the security center and contact MDA services with their help.

Electricity safety 

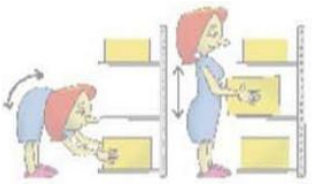
The electric current at any voltage may be dangerous to the human body, this requires every lab worker who handles devices, installations, etc. that operate with electricity, to maintain maximum caution.

Below are safety rules for using electricity/electrical devices:

1. All electrical maintenance services, including new installations, will be performed by a qualified electrician who will ensure that the installations/devices meet the requirements of the law.
2. The electrical system is be protected by means of a trip switch as required by law, it cuts off the current in the event of a risk of electrocution. The trip switch must be checked once a month by pressing the "test button" above it and documenting the test and its results in the laboratory.
3. Power cables connecting electrical appliances to the electrical grid will be checked by a qualified electrician and approved for work.
4. Power cables that are worn out or not working properly will be replaced.
5. Always use proper electrical appliances and use them according to their purpose.
6. All electrical and electronic devices that are used by lab workers in the laboratory and are not insulated with double insulation (double insulation marking is as follows: ⊡ on the device) or in an insulated casing must be grounded.
7. Equipment that is received from abroad without a suitable Israeli plug - the plug must be replaced by an electrician with a plug suitable for use in Israel.
8. Devices with double insulation will be operated through a permanent trip switch in the distribution board or a mobile trip switch (next to the device).
9. Electrical equipment must be kept away from chemicals or water. If liquid is spilled on an electrical device, the device must be immediately disconnected from the power supply, and it must not be used until after it has been cleaned and inspected by a qualified electrician.
10. Do not remove the plug from the socket by pulling the cable, but pull on the plug head.
11. Make sure that the electrical equipment environment is free of flammable materials. Electric motors located where flammable solvents are present must be explosion-proof.
12. Make sure all the switches on the electrical appliances are in the "off" mode before connecting the plugs to the sockets in the electrical grid.
13. Do not touch the plug/electrical equipment with wet hands or while standing on a wet floor.
14. The plug must be removed from the socket when the device is before maintenance and cleaning.
15. Do not pull or carry the device using the power cable, do not injure the cable by closing it or pulling it around sharp corners, keep the cable away from heated surfaces.
16. Use the device only according to the manufacturer's instructions and the accessories provided and authorized by the manufacturer.
17. Every lab worker must know the exact location of the main "emergency button" switch so that they can be activated quickly in an emergency.
18. Do not burden the plug beyond its limits.
19. Do not make regular use of the power strip but install proper sockets. The use of an extension cable is allowed one time only and only if there is no other way.
20. Do not install a socket in a place where there is a humid atmosphere without the permission of a qualified electrician.

Ergonomics

General instructions



- Bending and rotating movement with a load, are actions that are important to avoid. Heavy loads and those that are in frequent use should be placed at waist level.

Use of mechanical means to carry loads and move them. A cart or conveyor reduces the effort in the horizontal transfer of loads.

- Using the correct lifting technique reduces the load placed on the lower back, and it should be applied in all lifting operations - at home and at work. Bend your knees, not your back, and hold the load close to your body.
- Adjust the height of the work surface to your dimensions and the nature of the work. Arrange the work station in a semi-circular shape so that routine tasks are performed in an area that can be reached relatively easily. Organize the work station so that the necessary objects are within reach: do not put them behind you; do not place them above shoulder height.
- Change body positions often.
- It is advisable to take regular breaks (5 minutes every hour) for release and stretching exercises.

Source: http://oldsite.osh.org.il/uploadfiles/b_124_shmor_alhagav.pdf

Correct seating

- Sit symmetrically in front of the computer screen.
- Adjust the height of the chair according to the height of the work station so that the hands are at a 90 degree angle between the forearm and the arm, parallel to the table and the shoulders are effortless.
- The hip and calf angle should be 90 degrees. A footstool can be added to allow a sitting position and support for the legs.
- Lean back on the back of the chair at an angle of 105 degrees, this allows reducing pressure on the back.
- The height of the backrest must be adjusted for full support in the lower back socket.
- The top edge of the computer screen should be at eye level. A screen should be located front and center. The desired distance from the screen is about 60 cm, which is approximately the distance of the hand extended in front.
- Place the keyboard and mouse side by side in the center in front of you and at a distance that allows you to place your palms straight with the mouse and keyboard. Make sure that in the typing position you maintain a straight position in the wrist and do not cause a big bend or deviation in the joint. It is desirable that the entire armrest be supported either by the table or by the armrests of the chair.
- Choose an ergonomic mouse that allows a natural hand rest suitable for the size of your palm and operation with minimum force.

Safety regulations at work (Occupational safety and hygiene while working with hazardous agents in medical, chemical and biological laboratories)- 2001

Full regulations (in Hebrew) at - תקנות הבטיחות בעבודה (בטיחות וגיהות תעסוקתית בעבודה עם גורמים מסוכנים במעבדות רפואיות, כימיות וביולוגיות), התשס"א - 2001

Women's work regulations (prohibited work, restricted work and hazardous work) – 2000

Full regulations (in Hebrew) at - תקנות עבודת נשים (עבודות אסורות, עבודות מוגבלות ועבודות מסוכנות), התשס"א - 200

Guidebook of The Israel Institute for Occupational Safety and Hygiene (IIOSH) on women's work (in Hebrew): https://www.osh.org.il/UploadFiles/11_2015/t_196.pdf