SAFETY REGULATIONS FOR WORK IN LABORATORIES

TABLE OF CONTENTS

1. Laboratory Equipment

1.1. Laboratory work can only be done in rooms approved for this purpose by the competent authorities and adequately equipped according to relevant legal rules and regulations.

1.2. Special rules apply for laboratories working with explosives, infectious material, radionuclides, biological material, high-voltage electric current, with animals and for pilot laboratories.

1.3. Ventilation, lighting, noise and other sanitary conditions must comply with the relevant legal regulation as amended, which specifies the conditions of occupational safety and health.

1.4. The equipment of laboratories with machines, devices and other apparatus as well as water installation must comply with the regulations in force, must be maintained in perfect condition and undergo prescribed inspections.

1.5. The laboratories must further have:

- a sufficient amount of personal protective equipment, which must be maintained in perfect condition. The types and number are determined by the head of the workplace according to the relevant internal guidelines of the IOCB.
- a sufficient amount of suitable extinguishers, which must be located in a place that is visible and easily accessible, kept clean and undergo prescribed inspections. Each use of a fire extinguisher must be reported to a person competent in fire safety or to the head of the Technical Unit.
- first-aid equipment – the items are determined by the senior employee responsible in cooperation with a physician
- a suitable flashlight, permanently maintained in usable condition
- the appropriate cleaning and neutralizing agents necessary, which may be used outside the laboratory only in the event of an accident or a fire at an adjacent workplace.

1.6. In a laboratory or the adjacent corridor, the following must be posted in a visible place:

- The Principles of First Aid
- Workplace Fire Regulations (if determined)
- Operating Rules (for work with technical gases, machines, devices, etc.)
- Emergency Instructions (if prescribed)

1.7. The entrance to a laboratory must be marked with prescribed warning signs (“Radiation hazard”, “Biohazard”, “Do not enter with an open flame”, the labeling of technical gases, chemical pollutants and others).

1.8. In a suitable place always accessible to all the staff, the laboratory must have “Safety Rules for Work in a Laboratory” in the extent of the work performed. If necessary, these rules must be complemented by further instructions by the head of the workplace.

1.9. In the laboratory, order and cleanliness must be maintained. Emergency escape routes, handling spaces, water and gas shut-off valves and power switches must be kept clear of obstructions.

1.10. Laboratories with an increased risk of fire must be equipped with a safety shower or fire blanket.

1.11. This directive is also fully applicable for laboratory support rooms (preparation rooms, balance rooms, glass washrooms, etc.).

2. The Principles of Safe Work in a Chemical Laboratory

2.1. In the laboratories, it is forbidden to perform work of operational or pilot character. Every exception is subject to approval of supervisory authorities.

2.2. In the laboratories, it is permitted to carry out only such work that has been assigned by a direct supervisor or work directly related to the assignment.

2.3. The laboratory staff must be professionally qualified for work to the extent necessary for the safe performance of work assignments.

2.4. Every new employee – even transferred from another workplace – must be, before starting work, acquainted will all the safety and fire regulations and directions of senior staff applicable for the workplace or the work performed. Furthermore, he/she must be warned of the possible danger to life and health, acquainted with the placement of extinguishers and their proper use, equipped with personal protective equipment (PPE) and informed about its use and treatment, the IOCB fire-alarm guidelines, instructions for the case of emergency and occupational injury, about the placement of water, gas and compressed-air shut-off valves, and the main power switches.

2.5. The knowledge of safety regulations must be verified through training at least once a year and continuously complemented by new knowledge. In the case of the introduction of new principles and the use of new chemicals or devices, all the employees must be acquainted with all information available also in the area of occupational safety. The knowledge of fire protection must be verified at least once every two years.

2.6. The reactions that can be explosive or with an increased risk of ignition, poisoning, radiation, infection, contamination and an electric shock can only be performed by qualified personnel, who must be acquainted with all safety and fire regulations for this work and observe them. For the performance of such work during working hours as well as outside of them, it is necessary to ensure the permanent presence of at least two employees at the workplace and issue guidelines in case of emergency.

2.7. The laboratory staff must wear the allocated PPE. If required by the character of the work, the staff must use appropriate protective equipment, face shields, safety goggles, gas masks with a filter suitable for the given activity or a combined filter, rubber or leather gloves, respirators, etc. When working with organic solvents, it is recommended that underwear and socks made of natural fibers be worn (to eliminate the possibility of static electricity).

2.8. All the handling of irritable, fuming and odorous substances, of toxic gases, vapors of hazardous substances and flammable liquids (in an amount exceeding 5 liters) is allowed only in a hood with adequate exhaust.

2.9. When working with noxious substances, care must be taken to avoid all unnecessary contact of the chemicals with the skin, the mucous membrane, respiratory organs and the digestive system. The maximum permissible concentrations of the substances in the air must not be exceeded. Solid chemicals are to be scooped with a laboratory spoon. Liquid substances are pipetted using a vacuum or safety pipettes. It is prohibited to test chemicals with one's mouth. Odor testing should be conducted with special caution – a substance is not to be smelled directly, but only by waving one's hand above the container. When handling materials in open containers (test tubes, flasks), particularly during heating, the mouth of the containers must be kept facing away from both bystanders and the entry door. Solid CO_2 must not be touched with bare hands. The substances whose dissolution is exothermic must be dissolved in parts under constant stirring and cooling. When distilling combustibles of the BP below 150°C, it is necessary to control cooling water supply to the cooler and remove other combustibles from the surroundings. When distilling combustibles of the BP below 50°C, the distillation apparatus must be vented into a fume hood or open space.

2.10. When a combustible is spilled, it is necessary immediately to turn off gas appliances and the main electricity switch, announce that it is forbidden to enter with open fire and that unauthorized persons are not allowed to enter, and ensure good ventilation. A spilled combustible must be soaked into a suitable material, which must then be removed to a safe place. Spilled non-polar solvents must not be spread on the floors or plastic mats. The staff not involved in the decontamination must leave the laboratory.

2.11. If the laboratory is contaminated with acutely toxic flammable or corrosive gases, it is necessary immediately to close gas appliances, turn off electricity and ensure ventilation. Decontamination can be performed only after gas masks with a suitable filter or breathing apparatus are put on. The masks are put on and tested outside the contaminated area. Ventilation into the corridors of the IOCB is forbidden. The staff not involved in the decontamination must leave the laboratory.

2.12. Laboratory glassware must not be used for eating, drinking and food storage.

2.13. Neither food nor beverages can be placed in the refrigerators and freezer boxes intended for the storage of chemicals and products.

2.14. In the laboratories, it is strictly forbidden to eat, drink and smoke. Wherever it is impossible to establish common break rooms (dining areas, snack rooms and smoking rooms), a senior employee shall select (after a consultation with a safety technician) a suitable place for this purpose, which must be kept clean.

2.15. It is forbidden to heat the laboratories using direct fire and to leave Bunsen burners burning without permanent supervision.

2.16. Every employee that is the last to leave the laboratory after finishing work must ensure that all power and water supplies have been closed and preventive measures for fire safety of the workplace have been taken (the storage of combustibles, pyrophoric substances, technical

gases and others following the instructions of senior staff) and must make sure that the windows have been closed and the fume hood has been turned off.

2.17. Each employee that has discovered an unannounced interruption of cold water supply must immediately inform the IOCB maintenance about it.

2.18. When working with ultraviolet light, the staff must protect their eyes with safety goggles or corrective eyeglasses.

2.19. Benzene, carbon tetrachloride, methylene chloride and chloroform can only be used when it is impossible to utilize other solvents.

2.20. According to the relevant decree of the Ministry of Health, which determines the work and workplaces prohibited to pregnant and breastfeeding employees, and employees-mothers until the end of the ninth month after childbirth, the work and workplaces prohibited to youthful employees, and the conditions under which youthful employees can exceptionally perform this work as part of vocational training, the above-mentioned staff categories are forbidden to perform some types of work.

In the conditions of the IOCB, this concerns mainly the following activities:

a) work with carcinogens and mutagens and work processes with the risk of chemical carcinogenicity

b) work with chemicals and chemical products classified as having acute and specifically toxic attributes

c) work with biological material (virology)

- causing acute or chronic poisoning with severe or irreversible health consequences
- damaging fertility or the fetus in the womb
- damaging an infant through breast milk
- causing health damage through skin absorption or with significant sensitizing effects on the respiratory system or the skin
- limiting cell division
- and causing all of the above-mentioned combinations of side effects

d) work connected with exposure to lead and its ionized compounds

e) connected with exposure to mercury, carbon monoxide and other chemicals not included under categories II. - IV. under special legislation

f) in controlled zones of workplaces with sources of ionizing radiation where working conditions do not ensure the same level of radiation protection for the fetus as for every member of the public

g) in areas where the maximum allowable levels of electromagnetic radiation and electromagnetic fields set for the population by special legislation are exceeded.

In practice, this prohibition is applied within the organization by pregnant women not being allowed to work in the laboratory and being temporarily transferred to another job.

3. Devices, Apparatus and Mechanical Work

3.1. It is forbidden to use unsuitable or damaged apparatus, devices, tools and laboratory glassware. Before the beginning of work, their condition and prescribed covering must be inspected.

3.2. The devices and apparatus made by the workers themselves must be adjusted such that their use would not lead to the workers' injury or risk to their health.

3.3. The operation of apparatus without permanent supervision must be safe and reliable. They must not be heated by a flame or exposed-coil electrical appliances. If combustible or dangerous substances are used, adequate supervision must be ensured.

3.4. Outside working hours, Class I and II combustibles, pyrophoric and toxic substances must not be used in apparatus without permanent supervision. Their operation must be fully automated; in addition, they must be marked with the name and telephone number of the employee responsible, operation time and instructions in case of an accident. The security sign 'Reported Operation' must be placed on the entrance door. The operation of the apparatus without permanent supervision outside working hours is to be announced by the respective head in writing at the main entrance gate. The gatekeepers are not obliged to supervise the operation of the apparatus. The provisions of this article do not apply to electric refrigerators, freezer boxes, thermostats and shakers designed for continuous operation.

3.5. Chromatographic cabinets and containers containing flammable liquids can only be used in rooms designed for this purpose, equipped with effective ventilation.

3.6. The placement and operation of laboratory centrifuges must comply with safety regulations and instructions of the manufacturer. Centrifuge containers must be placed opposite and perfectly balanced. The lid of the centrifuge lid must be securely closed during the operation. It is forbidden to use damaged centrifuges.

3.7. When working with a vacuum and a small overpressure in glass, it is necessary to use suitable containers (with a round bottom), whose perfect condition must be checked in advance. The glass parts of the apparatus must be properly covered with a plexiglass plate or a metal net. Where the apparatus cannot be covered for operational reasons, the staff must be protected by a face shield, or in justified cases by safety goggles with side shields. The provisions of this article also fully apply to pressureless hydrogenation and Dewar Flasks.

3.8. When hydrogenation has been completed, it is necessary to displace hydrogen by nitrogen through repeated evacuation of the apparatus. It is forbidden to add a catalyst without the prior removal of hydrogen. The catalyst used, which is pyrophoric, can only be filtered by vacuum in the case of a permanent protective layer of a non-flammable liquid. For potential recovery, the catalyst must be stored under a protective layer of water. During the evacuation of the catalyst, the catalyst must never dry out on the filter.

3.9. With all machines and equipment, the gear train and the mobile machine equipment must be securely covered. On/off switches must be easily accessible from the operator's position.

3.10. Oil baths can only be heated to the temperature corresponding to the oil used. In the case of the intrusion of water into the bath being heated, the heating must be interrupted and the oil replaced.

3.11. If electric heating mantles are used for heating and distillation, it is necessary to take into account the possibility of local overheating (decomposition!) and considerable thermal overrun (boilover!). The bottom of the flask inserted must be protected by a glass cloth. Electric heating mantles are subject to the approval and supervision of an electrical-equipment inspection technician.

3.12. When glass tubes, thermometers etc. are inserted into rubber stoppers or tubing, hands must be protected by nylon-knit gloves or it is necessary to use sufficiently thick cloth folded into multiple layers as needed. The end of a glass object must be lubricated with suitable grease or glycerin and the ends of glass tubes must have melted ends.

3.13. The glass tubes with melted ends in which chemical reactions are carried out must be protected by a metal cover. When handling, particularly opening, them, the staff must be protected by a face shield and protective gloves.

3.14. Wood's metal bath must be made of iron. It is forbidden to use glass or aluminum containers.

3.15. When working with liquid (especially pressure) thermometers, it is necessary to count with the possibility of their explosion – mainly if they overheat.

3.16. The equipment, devices, tools, apparatus and laboratory glassware to be repaired must be handed over clean and dry, without the residues of chemicals and substances harmful to health.

3.17. When heating a liquid to boiling, it is necessary to prevent secret boiling: by stirring or by placing a boiling stone, or a capillary, into a cold liquid. If a hot liquid is suddenly stirred or a boiling stone or a capillary is tossed into a hot liquid, the liquid may boil over.

3.18. When heating to boiling under a reflux condenser, or during distillation, the apparatus must communicate with the ambient atmosphere through a sufficiently large hole to prevent overpressure in the case of sudden boilover in the apparatus. If drying tubes are used, they must not be obstructed.

3.19. Diazomethane must be prepared and worked with in glass containers without grinding and chips.

4. The Storage of Chemicals

4.1. Chemicals must be stored in containers made of suitable material, labeled with the exact name and data on the concentration and purity. The closure of the container must be selected based on the properties of the substance stored. It is forbidden to store chemicals in plastic

and paper bags.

4.2. Substances reacting with glass (e.g. hydrofluoric acid) must be stored in plastic or metal containers or in glass containers that have been paraffined inside.

4.3. Substances decomposing in light must be stored in dark-glass or opaque containers.

4.4. Containers with liquids, in particular glass flasks, must be protected from direct sunlight and heating.

4.5. Volatiles with vapors heavier than air must not be kept in enclosed spaces or below ground level.

4.6. Alkali metals must be stored under a layer of an inert, high-boiling liquid (kerosene, paraffin oil) and white phosphorus under a layer of water. The lost liquids must be regularly replenished.

4.7. The storage of alkali metals and alkali-metal hybrids requires a metal cabinet located in a fire-safe place outside the laboratory. The cabinet must be marked with the words and symbol “Never use water” as well as the name of the employee responsible.

4.8. Glass containers with pyrophoric substances (alkali metals, white phosphorus, Raney nickel, etc.) must be stored in an unbreakable container of such a size that the pyrophoric substance would remain under the protective liquid if the glass container broke.

4.9. Mercury in the amount of more than 3 kg can only be stored in steel cylinders with screw-on caps.

4.10. Mutually reacting substances (acids, hydroxides, oxidizing agents, combustibles etc.) must be stored separately.

4.11. Containers with aggressive liquids must not be stored higher than 165 cm from the floor (shoulder height).

4.12. Solutions of organometallic compounds can be stored in suitable, well-adjusted covers in refrigerators located in fire-safe places.

4.13. Substances subject to spontaneous explosive decomposition (e.g. N-nitrosomethylurea) must be stored according to their chemical nature (e.g. separately in a refrigerator).

4.14. Bromine must be stored to prevent the escape of vapors into the surrounding space.

4.15. If the chemicals are toxic, they are also governed by the regulations concerning the storage of highly toxic substances and products (or chemical pollutants).

5. The Storage of Flammable Liquids

5.1. In the hallways and common areas of the IOCB, flammable liquids may be stored based on the written consent of the authority executing the State Fire Supervision. The same applies

to the establishment of intermediate storage rooms.

5.2. Flammable liquids must be stored in a dedicated area, at a sufficient distance from flames, sources of ignition and radiant heat. It is forbidden to smoke near the place of storage, which is subject to increased preventive supervision in terms of fire protection.

5.3. Containers of flammable liquids of a higher volume than 0.5 l must be marked with the label "Flammable Liquid" indicating the flammability class.

5.4. It is forbidden to store flammable liquids in easily breakable containers of a volume higher than 5 liters. If the character of flammable liquids, also with respect to their purity, requires their storage in larger, easily breakable (glass or earthenware) containers, these containers must be provided with a suitable protective cover.

5.5. If absolute flammable liquids are stored above alkali metals in glass containers, these containers must be placed in a suitable, breakable container, which, if the glass container breaks, can hold all the flammable liquids and prevent the spontaneous ignition of an alkali metal.

5.6. Flammable liquids with a boiling point below 50°C can only be filled to a maximum of 90% of the volume of the container while those with a boiling point above 50°C up to 95% of the volume of the container.

5.7. If a flammable liquid is also toxic, it must be stored according to the regulations applicable to flammable and highly toxic substances and products (chemical pollutants).

5.8. According to the flash point, flammable liquids are classified into:

Class I	flash point below 21°C
Class II	flash point between 21°C and 55°C
Class III	flash point between 55°C and 100°C
Class IV	flash point between 100°C and 250°C

Unless the class of a flammable liquid has been proven, it is considered to be a flammable liquid of Class I.

The flash points of some flammable liquids:

Acetone	-17°C
Acetonitr	l6°C
n-Butanol	34°C
sec. Butanol	24°C
terc. Butanol	10°C
Cyklohexan	-18°C
Benzen	-11°C
Etanol	13°C
Ethyl acetate	-4°C

Ethyl formate	-19°C
Acetic acid	38°C
Metano	l1°C
Methyl formate	-22°C
n-Octane	13°C
n-Octanol	64°C
Pentane	-49°C
Pyridine	17°C
Tetrahydrofuran	20°C
Toluene	4°C
o-xylol	32°C

5.9. Flammable liquids must not be pushed out by compressed oxygen.

The flammable liquids that can form pyrosulfites with iron can only be pushed out by inert gases.

Flammable liquids of Class I must not be pushed out by air.

Flammable liquids of Class II can be pushed out by air with the maximum overpressure of 0.01 MPa provided that the temperature of the air or the displaced liquid is below the flash point.

Combustibles of Classes III and IV can be pushed out by air with the maximum overpressure of 0.017 MPa without limitation.

5.10. At the workplaces (in the laboratories), it is possible to store a maximum of 50 liters of combustibles of Class I (with the exception of diethyl ether and carbon disulfide) in one room in lockable cabinets. Breakable containers can only be used in the volume of up to 5 liters. Diethyl ether and carbon disulfide can be stored in the maximum total amount of 10 liters separately from the other combustibles. Breakable containers can only be used in the volume of up to 1 liter. Carbon disulfide must be stored under a layer of water of at least 20 mm.

6. The Storage of Substances and Products with Acute and Specific Toxicity

6.1. Acutely toxic substances are labeled with standard Hazard Statements (H-Phrases) indicating specific hazards or combined Hazard Statements, consisting of these simple H-Phrases and the respective hazard pictogram.

6.2. Hazardous chemicals and chemical products classified as acutely toxic must be stored in spaces that are lockable, secured against burglary and unauthorized entry. During the storage, it is necessary to eliminate accidental confusion and the mutual harmful effect of the chemical substances and products stored and prevent their penetration into the environment and threats to the health of the staff as well as other people.

6.3. Hazardous chemicals must be stored in a special, permanently locked cabinet. The containers and covers must be precisely labeled with the name, standard Hazard Statements (H-Phrases) indicating specific hazards, and the pictogram of acute and specific toxicity

(with earlier packaging the name and the word “JED” (POISON) with the respective pictogram) and clearly arranged.

6.4. According to Act 258/2000 Coll. on Public Health Protection as subsequently amended, these substances are registered centrally in the chemical storage and in the so-called “Poison Books” at individual workplaces of the organization. The book of hazardous chemical records must be bound and the pages numbered. The records in the book must be legible and incorrect data crossed out in such a manner that the original writing is still legible.

6.5. The safe storage of hazardous chemicals in the laboratory falls under the responsibility of the respective senior employee of the organization.

6.6. If hazardous chemicals are spilled, it is necessary immediately to take measures to prevent harmful effects on the health of the staff.

6.7. The theft of any toxic substances and products must be immediately reported to the IOCB management, which is obliged to inform the Police of the Czech Republic without undue delay.

6.8. It is strictly forbidden to keep any narcotic and psychotropic substances in the laboratory!

7. Work with Caustics and Acids

7.1. Whenever handling acids and caustics, the staff must use the allocated personal protective equipment (rubber gloves, face shields, safety goggles, aprons) and work (depending on the properties of the substance and the character of the work) in a well-ventilated hood.

7.2. Containers with acids and caustics must not be moved uncovered. When pouring and decanting acids and caustics, the containers must be placed safely so as to be prevented from falling over or breaking. From carboys, they can only be poured using hinged holders.

7.3. For safety reasons, it is forbidden to suck acids and caustics into pipettes using one’s mouth. It is necessary to utilize safety pipettes or to perform the suction using the vacuum. Acids and caustics in solid state must be scooped with a scoop, laboratory spoon or a spatula.

7.4. The acids and bases whose dissolution or dilution is exothermic must be dissolved in parts under constant stirring and cooling. Concentrated acids shall be diluted by pouring into water and never vice versa!

7.5. Maximum attention must be paid when heating acids and caustics, when working with the solution of potassium dichromate and sulfuric acid, with sulfuric acid, nitric acid, oleum, concentrated hydroxide solutions, with liquid ammonia and bromine. Such work can only be performed with the express consent of the senior employee responsible.

7.6. Before working with hydrogen fluoride (both anhydrous and 40% aqueous solution) and boron trifluoride, it is necessary to check carefully the protective equipment (rubber gloves and face shields) and prepare cleaning agents. Work can only begin with the consent of senior employee responsible.

7.7. Spilled acid must be removed immediately by flushing with water, or neutralized with powdered soda. Spilled caustics must be flushed with water or neutralized following the instruction of the senior employee responsible.

7.8. For the cleaning of nitric acid and other strong oxidation mixtures (the solution of potassium dichromate and sulfuric acid), it is forbidden to use sawdust, rags and other organic substances.

7.9. The solution of potassium permanganate can be used to wash laboratory glassware only with the consent of the senior employee responsible (risk of explosion). For the treatment of burns, see "The Principles of First Aid".

8. Work with Combustibles

8.1. When handling combustibles, one must act so as not to cause a fire or explosion, endanger one's life and health and those of one's colleagues or cause material damage. Before working with combustibles, it is necessary to make sure that there is not an open flame or plugged-in devices with an exposed coil anywhere in the vicinity and that suitable extinguishers are available at the workplace.

8.2. When working with combustibles or creating explosive mixtures, it is forbidden to smoke, use open fire, incandescent objects and ignition sources.

8.3. The classes of flammable liquids:

Class I liquids with a flash point below 21°C (benzene, gasoline, methanol, ethanol, ether, petroleum ether, carbon disulfide, acetone, acetaldehyde, ethyl acetate, dioxane, toluene, pyridine, cyclohexane, etc.)

Class II liquids with a flash point between 21°C and 55°C (amyl acetate, amyl alcohols, butyl alcohol, butylbenzene, cyclohexane, cyclohexanol, chlorobenzene, dichlorbenzene, mineral spirit, kerosene, glacial acetic acid, acetic anhydride, diesel fuel, styrene, etc.)

Class III liquids with a flash point between 55°C and 100°C (aniline, benzyl alcohol, ethylene glycols, cresols, nitrobenzene, higher alcohols, etc.)

Class IV liquids with a flash point between 100°C and 250°C (oils)

8.4. The conditions of work with Class I combustibles:

- in open containers and apparatus (beakers, cylinders, open flasks, etc.) and amounts exceeding 10 liters, these combustibles can only be worked with in well-ventilated hoods; this provision does not apply to approved pilot and service workplaces; such combustibles must not be heated by a direct flame or by a bath heated by a direct flame;
- when working with an amount exceeding 5 liters in closed apparatus, it is forbidden to use an open flame in the room; all exposed-coil electrical appliances (including dryers!)

must be turned off and the formation of sparks must be prevented;

- when working with an amount exceeding 2 liters in closed apparatus, it is forbidden to use an open flame or ignition sources within a radius of 2 meters (on the same laboratory table – double desk);
- when working with ether and carbon disulfide in closed containers, it is forbidden to use a direct flame and heat baths utilizing a flame.

8.5. The dissolution and crystallization of substances using combustibles of Classes I and II in uncovered containers (without a bath) on electric cookers is subject to approval of the senior employee responsible.

8.6. Before distillation, the solvents easily forming peroxides (ether, tetrahydrofuran, dioxane, cyclohexane, etc.) must be deperoxidized by known procedures (see Work with Solvents Prone to the Formation of Peroxides. Their distillation must be performed such that ca 10% of the residue would remain in the distillation flask.

8.7. When distilling flammable solvents, it is forbidden to leave the apparatus unattended.

8.8. When distilling a combustible with a boiling point below 100°C, it is necessary to control water supply to the cooler and remove other combustibles from the surroundings.

8.9. When distilling a combustible with a boiling point below 55°C, the distillation apparatus must be additionally vented into a fume hood or open space.

8.10. When working with a higher amount of non-polar solvents, it is recommended that underwear, stockings and socks made of natural fibers be worn (to eliminate the possibility of static electricity).

8.11. Substances containing residues of flammable solvents must not be dried in electric dryers and furnaces.

8.12. When a combustible is spilled, it is necessary immediately to turn off gas appliances and electricity, announce that it is forbidden to enter with open fire and that unauthorized persons are not allowed to enter and ensure good ventilation (not to the corridor). A spilled combustible must be soaked into a suitable porous material. The material must then be removed to a safe place (waste solvent collection space), which must be marked with a warning sign for the entire period of the evaporation of the combustible. Spilled non-polar solvents must not be spread on the floors or plastic mats (a danger of static electricity discharge!). The staff not involved in the decontamination must leave the room.

8.13. For the provisions for work with flammable technical gases, see Work with Technical Gases.

8.14. If a combustible is also toxic, work with it is also governed by regulations for work with substances and products with acute and specific toxicity.

9. Work with Substances and Products with Acute and Specific Toxicity

9.1. When handling substances and chemical mixtures with acute and specific toxicity, everyone must protect human health and the environment and observe hazard symbols, the standard Hazard Statements (H-Phrases), indicating specific hazards, and Precautionary Statements (P-Phrases), providing standard instructions for the safe handling of chemical substances and mixtures according to special legislation. **A list of H-Phrases, P-Phrases and graphic warning symbols is available on the IOCB intranet.** Substances with acute and specific toxicity are labeled with standard statements indicating specific hazards (e.g. H 300, H 301, H 311, H331, etc.) and combined H-Phrases, consisting of these simple H-Phrases and hazard symbols.

9.2. (Generally) toxic substances can only be worked with by persons who have reached the age of 18 and are physically and mentally fit for that work. Acutely toxic substances and products can only be handled by professionally qualified staff in accordance with Section 44b, Subsections 1 and 2 or 6 of Act 258/2000 Coll. on Public Health Protection as subsequently amended (pursuant to Subsections 2, only such persons are professionally qualified that have received a university degree in chemistry). Individual activities within the handling of these substances and chemical products can also be performed by an employee demonstrably trained by a professionally qualified person. **This training is repeated at least once a year**. A record of the training must be made in writing and kept for three years. This training also applies to students and interns, including foreign ones.

9.3. During work with toxic substances and toxic gases, it is necessary to take measures against their abuse or theft. The staff must use adequate personal protective equipment (gloves, gas masks, breathing apparatus), which must be checked in advance. When using a gas mask, it is necessary to take into account the capacity and suitability of the filter. The staff must follow standard instructions for safe handling (P-Phrases). **A list of H-Phrases, P-Phrases and graphic warning symbols is available on the IOCB intranet.** Work aids must be selected so as to reduce the risk of accidental intoxication. It is particularly prohibited to suck chemicals into pipettes with one's mouth. All reactions with substances with acute and specific toxicity must be performed in a well-ventilated, regularly inspected hood. Because of occupational safety, it is forbidden to work with any toxic substances without the approval of the senior employee responsible, who must ensure the occupational safety of all the staff present at the workplace and provide instructions in case of emergency. For commonly used toxic substances, these guidelines may be of general and long-term character – in that case, the principles of handling these substances must be included in the training records. Pro acutely toxic substances, the work must be approved by the respective senior employee or his deputy always for a specific employee, specific substance and specific activity. When approving the work, the respective senior employee must always make sure – at least by requesting an explicit statement – that the conditions for the beginning of work with an acutely toxic substance (protective equipment, equipment for dealing with an accident and the first aid, a printed material safety data sheet, etc.) have been met. In addition, he shall appoint an employee to become acquainted with hazardous properties of an acutely toxic substance and to cooperate, if need arises, in dealing with the consequences of an accident. Students can only handle acutely toxic substances under the direct supervision of a professionally qualified person authorized by the respective senior employee.

9.4. When working with any toxic substances, it is forbidden to eat, drink, smoke and put on make-up. The staff must strictly observe the principles of personal hygiene. Before beginning the work, the employee must be acquainted with the hazardous properties of a

substance, the first aid in case of emergency and the procedure for dealing with an accident. This information can be found in the respective material safety data sheet. It is recommended that the parts containing the above-mentioned information be printed. When working with acutely toxic substances, it is necessary to have the material safety data sheet printed. **If medical treatment is required after an accident, the material safety data sheet is sent to the physician along with the person(s) affected**. The safety data sheets of the MERCK company are available for download at www.chemdat.info. The safety data sheets of the companies FLUKA, ALDRICH and SIGMA can be downloaded from the address www.sigma-aldrich.com. After the company and the respective chemical are selected, the safety data sheet is available under the abbreviation MSDS. If the safety data sheet is not available otherwise, it can be requested from the supplier through the purchasing department. If the safety data sheet has not been sent together with the chemical ordered, the supplier must provide it upon request. Work with acutely toxic substances must not begin until the employee has made sure that the appropriate personal protective equipment for occupational safety, the prescribed first-aid equipment and the means to manage a possible accident (e.g. a gas mask with a suitable filter, the solutions and materials for the cleaning of spilled acutely toxic substances, etc.) are immediately available. The employee must know the position of the closest personal protective equipment for emergencies (breathing apparatus, protective suits) and must be acquainted with the method of their use. The amount of acutely toxic substances in the laboratory must not exceed the amount necessary to perform the work.

9.5. The method of recording the work with acutely toxic substances at the IOCB and the responsibility for it are specified in an agreement between the IOCB management and the Public Health Authority for the Capital City of Prague. Acutely toxic substances can only be released from the storage based on an issue slip signed for this purpose by an authorized senior employee meeting the necessary requirements. The senior employee must inform the employee taking the substance over that it is acutely toxic. When an employee is taking over acutely toxic substances ordered for direct consumption, he/she is responsible for informing the storage staff about it and making sure that the substance is properly recorded. The records of acutely toxic substances at the entrance of the IOCB are kept centrally in the chemical storage. At the workplaces, further write-offs are recorded in the “Poison Book” and the employees responsible must ensure that the (generally) toxic substances are only used for the designated tasks and that the records of acutely toxic substances at the workplace are really kept. The records are kept for each hazardous chemical substance and chemical mixture and must contain information on the amount received and released, information on the stocks and the name of the person that has taken the chemical substance or chemical mixture over. The records are kept for at least 5 years after the zero stock level of a hazardous chemical substance or chemical mixture was reached (Section 44a, Subsection 12 of Act 258/2000 Coll. on Public Health Protection as subsequently amended). The safe storage of acutely toxic substances at workplaces falls under the responsibility of the respective senior employees according to organizational rules.

9.6. Toxic substances, including packaging residues, can only be disposed of by an employee authorized by the leader of the respective group (team). The cleaning method is determined by the senior employee responsible.

9.7. In the event of the spillage of toxic substances or the leakage of toxic gases, it is necessary to take immediate measures to prevent harmful effects on the staff. The cleaning can only be entrusted to experienced staff.

9.8. It is forbidden to pour any toxic waste with the exception of 0.5 l of methanol diluted with water (1:10) into the drain pipe, sewage and sanitary facilities. If possible, toxic residues from the reaction must be converted into stable non-toxic compounds. The cleaning process is determined by the employee responsible. Disposal in compliance with points 9.6, 9.7 and 9.8 must always be performed in accordance with Act 185/2001 Coll. (Act on Waste) as subsequently amended, including the labeling of containers with hazardous waste. Before they are handed over to an authorized company, the containers with hazardous waste are collected at a place selected for that.

9.9. Work with mercury shall be done on desks with a raised edge, whose desktop must be smooth and jointless, or it is necessary to use pedestal trays, which should also form part of stable devices with mercury.

9.10. It is forbidden to flush spilled mercury down the drain pipe. It must be carefully collected and the remnants, sprinkled with powdered zinc, swept.

9.11. Work with toxic technical gases is also governed by the respective provisions.

9.12. The storage of toxic substances is governed by the respective provisions (see Chapter 6).

9.13. Work with organophosphates is governed by special guidelines (see Chapter 15).

9.14. Every theft of toxic substances must be immediately reported to the IOCB management and the Police of the CR.

10. Work with Alkali Metals and Hydrides

10.1. Because of occupational safety, it is forbidden to work with alkali metals and hydrides, including the disposal of their residues, without the approval of the senior employee responsible.

10.2. Before the beginning of work with alkali metals and hydrides, suitable extinguishers must be prepared and instructions in case of emergency issued.

10.3. To extinguish hydrides, it is suitable to use particulate inert material (dry sand, dried waste silica gel, diatomaceous earth, etc.). Snow fire extinguishers are not suitable (the scattering of hydrides).

10.4. All operations with alkali metals, hydrides and solutions of organometallic compounds must be carried out with protective face shields, in justified cases with safety goggles.

10.5. Before working with hydrides and alkali metals, it is necessary to check the perfect condition of the apparatus, especially the integrity of the reflux condenser.

10.6. It is forbidden to use water or alcohol to cool reaction vessels with alkali metals and hydrides.

10.7. When opening cans with hydrides, it is necessary to be particularly careful and anticipate

hydrogen overpressure. It is recommended that they be opened under the protective shield of nitrogen in a polyethylene bag.

10.8. Alkali metals must not come into touch with chlorinated hydrocarbon. For the conditions of the storage of alkali metals and hydrides, see The Storage of Chemicals.

10.9. For the procedures for the safe disposal of alkali metals and hydrides, see Waste Disposal.

11. Work with Solvents Prone to the Formation of Peroxides

11.1. Prolonged exposure to atmospheric oxygen leads to the formation of peroxides mainly in the case of these solvents: dialkyl ethers, dioxane, furan, tetrahydrofuran, cellosolves, 2-propanol and unsaturated hydrocarbons.

11.2. Work with the mentioned solvents can only be done by qualified staff with sufficient practical experience. Wherever possible, it must be performed in a fume hood with protective glass down. Employees must use adequate personal protective equipment (fixed shields, face shields, safety goggles).

11.3. The principles of safe work when cleaning and handling tetrahydrofuran are defined in Organic Syntheses 46, 105, 1966.

11.4. Before operations where peroxides contained in the solvent may become concentrated (serious risk of explosion!), it is necessary to perform a qualitative test of the solvent on the presence of peroxides by the acidified potassium iodide solution. If the coloration is intense, titrations must be quantitatively determined by thiosulfate. Solvents containing peroxides must be, before their use or distillation, freed of them either by shaking with cuprous chloride or ferrous sulfate, or by filtration through a column of activated alumina. The effectiveness of the operation must be verified by a reaction with potassium iodide.

11.5. When containers with the mentioned solvents are heated, it is forbidden to use heating mantles or a direct flame (the danger of local overheating). It is necessary to use a bath with a suitable inert liquid (e.g. paraffin, silicone or mineral oil) heated by a cooker with a covered coil.

11.6. Longer distillation (e.g. on a column) must be performed under nitrogen atmosphere.

11.7. During distillation, it is necessary to leave a sufficiently large distillation residue in the distillation flask (10–15%).

11.8. For the storage of the mentioned distilled solvents, the addition of a phenolic antioxidant is recommended.

11.9. The method of the disposal of waste and distillation residue must be determined in advance by the employee in charge.

12. Work with Infectious Agents

12.1. Laboratory testing and examination of infectious agents can only be performed at workplaces equipped for this purpose and approved by the Public Health Service. The workplaces must be equipped with a sufficient amount of personal protective equipment and disinfectants and must be marked with the warning signs “No entry”, “No smoking”, “Danger of infection”, “Radiation hazard” etc.

12.2. Infectious material can only be handled by suitably qualified staff with medical and moral prerequisites who have been practically trained for the activity and demonstrably tested on the knowledge of health and safety regulations. Their knowledge must tested at least once a year.

12.3. When working with infectious material, the employees must wear the allocated protective suit, which is easy to wash and disinfect. It is forbidden to leave the actual infectious workplace in this suit. The protective clothing must be treated as infectious material – before it is handed over for washing or cleaning, it must be disinfected, and sterilized by autoclaving.

12.4. The employees working with infectious material must use adequate personal protective equipment and make sure not to threaten their health, the health of their colleagues and other people.

12.5. The organization of the workplace must make it possible to place the items used when working with infection (instruments, bowls, etc.) and the material examined on a layer of gauze soaked in a disinfectant solution or into a suitable container with a disinfectant.

12.6. The instruments, tweezers and other tools that were used during the work with infectious material must be placed into suitable containers and continuously disinfected in an appropriate manner.

12.7. During the work, it is necessary to use pipettes with a cotton wool plug or, wherever possible, safety pipettes. The pipettes that have been used must be disposed of in suitable containers preventing the contamination of the surroundings.

12.8. After the work is completed, the samples of the infectious material and cultures must be destroyed according to the instructions of the employee responsible (usually by autoclaving). Likewise the laboratory glass must be, before washing, safely decontaminated based on the instructions of the employee in charge (preferably by autoclaving as well).

12.9. All the employees must maintain their workplace (desktop, devices etc.) in perfect order and cleanliness. After the work and especially before eating and before leaving the workplace, they must perfectly disinfect their hands in a sufficiently effective disinfectant. After work, the workspace must be carefully cleaned and disinfected.

12.10. If the containers or other laboratory glass with infectious material or cultures break, it is necessary to disinfect the infected site immediately. Broken infected glass is disposed of in a special container with a disinfectant solution. This container must be clearly marked.

12.11. If some employee becomes injured or the infectious material reaches his/her mouth or conjunctiva or he/she becomes stained with a larger amount of infectious material, mainly on uncovered parts of his/her body, he/she must immediately report it to the employee

responsible and clean his/her entire body thoroughly. He/she must hand the contaminated clothing for sterilization wrapped in paper.

12.12. At infectious workplaces, it is forbidden to eat, drink, smoke and keep food and drinks. For these purposes, it is necessary to designate a space outside the workplace. This provision does not apply to items used as samples for analyses.

12.13. The employees requesting the transport of infectious material are responsible for the material being properly marked and secured in order to prevent the contamination of the people and the vehicle during the transport under normal conditions.

12.14. All the experimental operations must be performed in a laboratory designated for that purpose, specifically only in the space of a laminar box.

13. Work with Animals

13.1. It is permitted to keep experimental animals and carry out experimental work on them in compliance with applicable laws governing this issue. Workplaces approved for this purpose by the Public Health Service must be equipped with enough suitable personal protective equipment and disinfectants. The rooms must be marked with warning signs. The workplaces and hutches must be kept tidy and scrupulously clean.

13.2. The employees taking care of the animals and performing experimental work on them must be demonstrably acquainted with safety and hygiene regulations for the work performed, and also with further instructions by senior employees. This knowledge must be verified at least once a year.

13.3. When working with animals, the staff must use the prescribed personal protective equipment:

- leather gloves or a long hemostat for work with rats;
- rubber gloves, rubber aprons, rubber boots and a face mask when cleaning and disinfecting aquariums;
- rubber gloves, rubber aprons and a face mask when handling dead animals and waste.

13.4. During the work with animals – live, dead as well as waste – the principles of personal hygiene must be strictly observed, in particular before eating, drinking, smoking and after work. It is forbidden to eat, drink and smoke outside the designated place!

13.5. The animals that have died, been killed or dissected and tissue residues must be, immediately after the completion of the work, placed into a suitable container and handed over for disposal or stored in refrigerators until they are taken away. The animals that have died must not be skinned or used for any other purposes than experimental.

13.6. The entry of unauthorized persons to the workplace is prohibited.

13.7. The staff must have each injury treated in any health facility and reported to the head.

13.8. It is strictly prohibited to keep any private animals at the workplace.

14. Experimental Work with Open Radioactive Sources on Animals

14.1. The rooms with animals that have been fed radioactive material must be modified in such a way as to protect the staff taking care of these animals from the external radiation emanating from these animals and the radioactive substances that could penetrate into their body via the respiratory or digestive systems or damaged skin. For this reason, the room must be adjusted such that the air from the animal space would not come into the space for the staff taking care of the animals. Wherever the workplace cannot be adjusted in this manner, it is necessary to ensure a permanent air flow of a rate of 30 linear meters per minute to the space where the animals are kept.

14.2. Experimental work with radioactive materials on animals must comply with all the safety and hygiene regulations for work with animals, for work with radioactive substances, and for work with infectious material (in the extent of the work performed), including the approval of the workplaces and their equipment and work permit.

14.3. The animals that have died as well as organs after isotope experiments must be sealed in polythene bags, marked by the name of the employee, and the type and amount of the isotope used. The bag prepared and marked in this manner shall be stored in a special deep-freezer box until it is taken away.

15. Guidelines for Work with Toxicants (TOXs), Especially Organophosphates

15.1. Toxicants is an internal name for the substances that, according to the respective act on chemical substances and products as subsequently amended, are highly toxic but, even within this group, are extremely dangerous (they can seriously damage health already in the order of milligrams or amounts only slightly higher). This concerns mainly some organophosphates. An internal directive of the IOCB specifies the conditions, which are, at some points, stricter than the conditions for work with common highly toxic substances. Of course, all the conditions listed in Chapter 9 for work with highly toxic substances apply here too. TOXs can only be handled by staff well acquainted with their physicochemical properties, the means of protection when working with them, the decontamination procedure, their toxic effect and signs of being affected including the method of providing first aid.

15.1.1. Concentrated TOXs and solutions of TOXs with a concentration higher than 1 mg/1 ml (1 g/l liter) can only be handled by an employee qualified for this work. The qualification is recognized through an examination – the testing of the knowledge necessary. TOXs with the concentration below 1 mg/l ml can be handled by employees without recognized qualification only if explicitly authorized by a direct supervisor after the required knowledge has been verified.

15.1.2. Concentrated TOXs can only be handled in the presence of another person. If all the other safety rules are observed, solutions of concentrations below 1 mg/1 ml can be handled by a single person without direct supervision, but he/she must inform his/her direct supervisor about the work and ensure a telephone or voice connection with the supervisor.

15.1.3. During experiments with concentrated TOXs or when handling them, only the staff of this laboratory and the persons involved in the experiments are allowed to be present. The laboratory must be marked by the sign “Do not enter – work with toxicants”.

15.1.4. In the laboratory where TOXs are periodically worked with, it is forbidden to eat, drink, smoke and keep food.

15.2. The distribution of TOXs into the laboratory and the method of their storage

15.2.1. The vials or ampoules with TOXs are taken to the laboratory by the shortest route in a transportable container partly filled with active charcoal. The employee transporting TOXs must have his/her protective mask in the protective – emergency position.

15.2.2. The intake, use and decontamination are confirmed in a notebook by the signature of the head of the laboratory.

15.2.3. The substances that are not used immediately are stored in a safe designated for that purpose. Vials with TOXs and stock solutions must be marked with labels containing the poison symbol and verbal warning. A particularly dangerous poison is subject to registration complemented by the code or the name of the TOX, the date of the opening of the ampoule or the day and the concentration of the solution prepared. This does not apply to solutions of concentrations below 1 mg/1 ml, but they must be marked according to common rules of laboratory work. The TOXs that are not being worked with must not be left in the laboratory. It is equally unacceptable to store in the safe vials that have not been decontaminated, residues of TOXs and their useless unused solutions.

15.2.4. The containers with TOXs that must be left in the laboratory for several days (e.g. in apparatus) must be secured in such a manner that if the apparatus cracked, the TOXs would be captured in a metal vessel – bowl placed below it. It is necessary to mark them with a warning sign, inform the laboratory staff, cleaners and watchmen, and secure the laboratory overnight. At the beginning of working hours the next day, the employee responsible shall open the laboratory, make sure that it is ventilated, and check the integrity of the apparatus and the condition of the personal protective equipment.

15.3. The procedure of work with TOXs in the laboratory

15.3.1. Before the beginning of work, the employee responsible (i.e. the employee carrying out an experiment with the approval of the respective head of the laboratory) must check:

- the easy availability of the personal protective equipment and its reliability (protective mask, work gloves, sleeve protectors, protective apron, etc.)
- enough decontamination means with respect to the extent of the work and their decontamination efficiency (see Point 6 below)

- the correct function of the equipment used (lighting, exhaust of the fume hood)
- the integrity of the laboratory glass, apparatus and devices
- the clear and effective arrangement of materials and the removal of unnecessary objects from the workspace and whether a doctor's office has been informed and the respective antidote is available.

15.3.2. In fume hoods, it is forbidden to perform other activities with concentrated TOXs and their solutions of concentrations higher than 1 mg/1 ml and with contaminated objects or materials. When working with concentrated TOXs in a fume hood, a fume hood can only be opened when it is necessary to handle them.

15.3.3. The decanting of TOXs and solutions, the pipetting, filling and opening of ampoules as well as decontamination must always be performed over a polyvinyl chloride (PVC) bowl or a sheet-metal vessel, on a small scale over a Petri dish. It is strictly forbidden to pipette TOXs with one's mouth! The objects used during the work with TOXs that have come into direct contact with TOXs (glass, tweezers, forceps, tampons, etc.) shall be placed into a prepared beaker or immersed into a prepared decontamination bath (see Point 5).

15.3.4. When working with TOXs, it is necessary to comply with the regulations and rules of personal protection and use the designated place of manipulation (see the table below).

	Type, amount	**Place**	**PPE and TOX concentration**
a)	all concentrated TOXs above 5 g	below a fume hood	gloves with a rubber sleeve protector, a plastic or rubber apron, rubber boots, protective mask
b)	sarin, soman above 0.2 g, the other TOXs above 1 g	below a fume hood	like a), rubber overshoes instead of boots
c)	the amount of TOXs smaller than a) and b) and solutions of concentrations above 10 mg/ml	below a fume hood	gloves with a rubber sleeve protector, apron, protective plexiglass face shield
d)	solutions of concentrations 10 mg/ml and lower	below a fume hood	gloves, protective face shield
e)	solutions of concentrations 1 mg/ml and lower	below a fume hood	gloves, exceptionally without them if they do not enable the safe handling of instruments
f)	solutions with TOXs of concentrations 0.1 mg/ml and lower, up to a total volume of 20 ml	outside the fume hood, permitted application by a closed gauging device	strict personal hygiene, frequent hand washing
g)	solutions of concentrations 0.01 mg/ml and lower, with no restrictions on the volume	outside the fume hood, with a suitable valve and provided that the containers are secured by placing a PVC bowl	strict personal hygiene, frequent hand washing

		below	

15.3.5. When working with TOXs, it is necessary to work calmly and deliberately, to touch, by hands covered by protective gloves, only the objects absolutely necessary, and not to touch fittings and one's clothing, face, etc. It is not permissible to interrupt the work for no good reason. Decontamination is part of the work; work is not completed without proper decontamination.

15.3.6. If the fume-hood ventilation is unexpectedly interrupted, the staff in the laboratory must put on a protective mask and interrupt the work, close the fume hood and open the window. The staff then must leave the laboratory, lock it and mark it with a warning.

15.3.7. Special steps to be taken when opening ampoules: the bottom of the ampoule shall be wrapped in a cellulose wadding tampon. The bottom with the tampon shall be severed and placed into a bowl and the content of the ampoule transferred into a reservoir bottle. The empty ampoule and its bottom shall be held by forceps in the tampon used. Everything shall be decontaminated. The gloves shall be, without being removed, decontaminated by rubbing with a decontamination solution, washing with soap and rinsing.

15.4. Decontamination

15.4.1. Technical material contaminated with organic phosphates with the exception of V-series agents shall be decontaminated by a 4–5% NaOH solution; in the case of the mentioned substances (sarin, soman, DFP, tabun), the human body surface shall be decontaminated using sodium cresolate in alcohol solution (see Point 6 below).

15.4.2. Technical material contaminated with V-series agents, sulfur mustard and lewisite is decontaminated by 5% NaOH with a well-stirred addition of 50 g of calcium hypochlorite per 1 liter of solution. The human body surface shall be decontaminated using the alcohol solution of chloramine (see Point 6 below). The solutions must be fresh, because they are effective for one day.

15.4.3. Decontaminated laboratory glass shall be rinsed 3x times by a prescribed solution in a decontamination bath, where it is left for at least 24 hours.

15.5. Measures in case of emergency

If TOXs are spilled in a fume hood, all the employees in the laboratory shall put on a protective mask; some of those present shall help the employee that worked with the TOXs to put the protective mask on. The spilled TOXs must be immediately decontaminated. The accident is reported to the employee responsible, or the scientific group leader, through another person.

The procedure for the decontamination of spilled TOX:
The TOX is wiped with tampons, which are discarded into a beaker with decontamination solution; the affected part in the fume hood is decontaminated – the decontamination solution is left to act in a closed fume hood under a pressure of at least 30 min. The

employee must decontaminate the personal protective equipment and, accompanied by another person, he/she must go to take a shower. If TOXs are spilled outside the fume hood, chemical alert is sounded.

15.6. The minimum stock of decontamination agents.
A laboratory working with TOXs must have bottles with the minimum amount of decontamination agents at a marked place.
For technical decontamination:

calcium hypochlorite	250 g
NaOH	250 g
ammonia	250 ml

For the decontamination of human skin:

a 50% solution of sodium cresolate	100 ml
chloramine B	50 g
ammonia	250 ml

The solution of chloramine shall be prepared fresh by dissolving 50 g of chloramine B in 250 ml of 82% ethanol containing 28.6 g ZnCl2.
There must be a reserve of 5 l 5% NaOH 0.5 kg calcium hypochlorite at a marked location.

15.7. The symptoms of poisoning by chemical-warfare organic phosphates: headache, constricted pupils and sore eyes (only after direct exposure to vapors), breathing problems with chest tightness, nausea, sickness or even vomiting, excessive sweating, salivation, mental confusion, muscle twitches and spasms. High concentrations cause quick convulsions, severe breathing difficulties or respiratory arrest, unconsciousness.

Premedical first aid

- interrupt contact with the toxic substance – take the person out of the contaminated place to a safe place
- administer the first-aid antidote in the LIS (lay injection syringe with an antidote – for organic phosphates: 1 mg of atropine), or also decontaminate the skin through the clothing by the solution of sodium cresolate
- artificial mouth-to-mouth or nose-to-mouth respiration
- rinsing the eyes with water
- induce mechanical vomiting

Medical first aid

- repeated administration of antidotes

- suppression of convulsions
- artificial respiration, RC 32 or KPTT with oxygen supply
- gastric lavage
- activated charcoal

16. Work with Technical Gases

16.1. A laboratory must not contain more than two types of technical gases and two reservoir cylinders of the same gases. The entrance door must be marked with a sign indicating work with technical gases. The placement of technical-gas cylinder manifolds (at least 3 cylinders attached to one pipe) is governed by special regulations.

16.2. The cylinders must be placed at least 3 meters away from flames and 1 meter away from a heater. If it is not possible to eliminate a source of radiant heat, the cylinders must be protected from its effects by a suitable screen at a minimum distance of 25 cm from these cylinders. The cylinders must be secured against falling by shackles or chains in the upper part or secured in stationary or mobile racks. The cylinders can only remain at the workplace for the absolutely necessary period of time. Empty and damaged bottles, bottles with the inspection date expired and technical gases unused in the long term must be promptly moved to the storage. Cylinders of liquefied gases must be placed vertically, gases heavier than air must not be stored below ground level. The cylinders must be protected against corrosion and kept clean.

16.3. In the event of a fire, it is first necessary to remove (even empty) bottles with technical gases from the workplace. If the bottles cannot be removed, non-flammable and non-toxic gases must be released to prevent explosion. During the release of flammable gases, the gas being released must be ignited close to the cylinder valve. Heated cylinders must be intensively cooled. If a valve breaks or the apparatus is no longer tightly sealed during work, the employees follow the instructions of the responsible employee present, in his/her absence the operating rules of the workplace.

16.4. Technical gases can only be handled by persons demonstrably acquainted with applicable regulations and operating rules of the workplace. The knowledge of the employees must be tested once a year.

16.5. When technical-gas cylinders are transported and carried, even empty cylinders must be protected against falling or collision. The cylinders can only be carried by men, cylinders weighing more than 50 kg by two men. The valve of the transported cylinder must be securely closed and protected by a protective cap. The cylinders must not be held by the cap. The cylinders that have been dropped must be clearly marked and handed over for inspection.

16.6. Before working with technical gases, it is necessary to consider the spatial conditions (ventilation) of the workplace, prepare suitable extinguishing and decontamination equipment, check pressure-regulator seals and the seals of the apparatus and issue guidelines in case of emergency. For work with aggressive and toxic gases, it is necessary to ensure the permanent presence of at least two employees at the workplace. Before chlorine is released, it is necessary to prepare a proper device (a check valve) to prevent moisture or the

chlorinated liquid from being sucked into the cylinder. Acetylene must not be released earlier than one hour after the bottle was placed into a vertical position. Flammable gases must not be released until all gas and exposed-coil electrical appliances (including dryers!) have been turned off.

16.7. Technical gases can only be released through cylinder pressure regulators, corresponding to the type of the gas released. The low-pressure chamber of the reducing valve must have a suitable manometer and a spring safety valve set for the maximum allowable pressure with respect to reaction apparatus – this provision does not apply to propane/butane. Non-flammable gas cylinders have right-hand threaded valves, flammable gas cylinders have them left-hand threaded. Acetylene cylinders are designed to be shackled. Oxygen cylinders must not have gaskets made of greasy, leather or combustible materials – only fiber gaskets can be used. Oxygen valves must not be greased. Work with toxic and aggressive gases can only be done in a fume hood.

16.8. When opening and closing aggressive-gas cylinder valves (by a square drive), it is possible to hold the cylinder at the bottom part of the valve by a spanner No. 30 (and No. 32 for ammonia) while moving the valve by a (square drive) spanner No. 22.

16.9. Immediately after the completion of the work, the cylinder valve must be securely closed and the spring of the safety valve released. After the release of aggressive gases, toxic and flammable gases, the pressure regulator must be removed and a sealing with a gasket must be screwed on the threaded joint. The removed pressure regulators must be treated immediately. The empty cylinders, in which approx. 1 atm. of residual gas must be left, must be clearly marked and immediately handed over to the storage.

16.10. When working with technical gases, it is forbidden to:

- use cylinders with an expired inspection tag
- use inadequate or damaged pressure regulators
- to use gross violence or unsuitable tools including tubular extensions when opening and closing the valves
- transfer gases into other than reaction containers
- use the cylinders for other gases or other purposes
- repair the cylinders and valves or change their labels
- accelerate gas release by heating with the exception of water or air bath and the maximum temperature for: methyl chloride 25°C, carbon dioxide 30°C, chlorine 35°C, the others 40°C
- cylinders with propane/butane must not be heated!
- release gases freely in enclosed spaces with the exception of fire or accident.

16.11. The colors assigned to the most common technical gases

oxygen	blue
nitrogen	green
hydrogen	red
argon	brown

air	silver
chlorine, phosgene	yellow
ammonia	yellow and orange
carbon dioxide	black

16.12. Inspection periods for technical-gas cylinders

- for toxic and corrosive (aggressive) gases 2 years
- for the other technical gases 5 years
- for propane/butane (up to the volume of 27 liters) 10 years

16.13. The release of technical gases through pressure regulators is not required only in the cases when it is reliably ensured that the pressure in the pipeline or in the apparatus does not exceed the safety limit.

16.14. This guideline also fully applies to work and the placement of gases for medical purposes.

16.15. Work with flammable, toxic and aggressive gases outside working hours is subject to approval of the senior employee responsible, who determines security measures.

16.16. When working with liquefied gases (nitrogen, ammonia), the staff must always be protected by face shields and use protective gloves.

17. The Operation of the Technical-Gas Pressure Station

17.1. The conditions of the operation of a pressure station are determined by the relevant legal norms.

17.2. A pressure station is a set of devices used to collect gas from containers. It consists e.g. from a pressure cylinder or a pressure-cylinder manifold and other equipment (stop valves, connecting pipes, pressure-control devices, safety devices, measuring devices and others). The pressure station ends with a shut-off valve for the distribution of gas into the piping system or for the withdrawal of gas for direct use. A pressure station is practically any distribution of technical gas from a pressure vessel by permanently installed pipework.

17.3. Pressure stations can only be created, repaired and inspected by persons with an authorization issued by the Regional Labor Inspectorate (hereinafter as the RLI), and that only in the permitted scope of activities.

17.4. The creation of such a pressure station, the material used and prescribed inspections must be documented, with the documents being available at the workplace.

17.5. A pressure station can only be operated by persons physically and mentally fit for that work who have reached the age of 18 and have been issued a certificate for the operation of a pressure station after they underwent a one-month practical training and passed the examination required. The certificate is valid for 3 years.

17.6. If a pressure station comprises a safety device, it is necessary to perform a functional test of the safety valve at least once a week. Functional tests of the safety valve can only be carried out by persons with a valid certificate for the operation of a pressure station and their records must be kept in a special notebook.

17.7. If a problem has been discovered at the pressure station, gas supply must be shut off immediately and the defect must be reported to the direct supervisor or to a safety officer.

17.8. If gas leak is discovered, the staff shall follow the respective instructions of the guideline "Work with Technical Gases", which also fully applies to the handling of technical gases used in a pressure station.

18. Work with Fuel Gases

18.1. Work on the distribution of natural gas and compressed air as well as the repairs of gas appliances can only be done by persons with a valid authorization according to the relevant legal norm.

18.2. Natural-gas and compressed-air distribution as well as gas appliances are subject to appropriate inspections and tests.

18.3. All the staff working with gas appliances (burners, gas heaters, stabilizers, etc.) must be demonstrably acquainted with their function, the manufacturer's instructions, the properties of the gas and this safety directive. This knowledge must be verified once a year.

18.4. Whoever has discovered a problem on natural-gas and compressed-air distribution or a gas appliance must immediately report it to the employee responsible or a gas-equipment inspection technician.

18.5. During the mentioned gas leak, with the exception of a negligible amount, every employee must immediately close gas supply, turn off electricity outside the affected area, announce a ban on smoking, prevent unauthorized entry and ventilate the workplace (contaminated space). The employee must then report the problem to the head of the workplace or the IOCB safety officer. These shall then ensure the repair and, if necessary, mark the contaminated space with safety signs.

18.6. Gas appliances must be placed in a fire-safe place with no flammable materials stored close to them. They can only be connected to the gas for which they are designed (natural gas, propane/butane) using connections (hoses). Gas appliances can only be adjusted in the extent given by the manufacturer in the manual. It is forbidden to change the labels and registration numbers of gas appliances.

18.7. Ignited burner must not be left burning unattended. If the flame penetrates inside the burner or the flames are blown away, the gas supply must be shut off immediately and the burner adjusted.

18.8. For safety reasons, it is forbidden to heat laboratories using a direct flame and to use natural gas to heat apparatus without permanent supervision. The consent of the respective senior employee is required for every work with fuel gases after 8 p.m., on weekends and public

holidays.

18.9. For more details on the prohibition to use a direct flame when working with combustibles, see the respective directive.

18.10. Steel cylinders for propane/butane burners can be replaced and these burners adjusted only by the employee designated with the consent of the gas-equipment inspection technician.

18.11. Compressed and liquefied flammable gases are governed by the guideline "Work with Technical Gases".

19. The Operation of Stable Pressure Vessels and Manipulation with Them

19.1. Stable pressure vessels (boilers, cookers, heat exchanger, sterilizers, electric boilers, autoclaves, etc.) and the conditions of their operation are governed by the respective legal norms including Czech Technical Standards. Laboratory autoclaves up to the volume of 250 cm and atm. pressure of 400 and technical-gas pressure cylinders are not considered to be stable pressure vessels.

19.2. Only such stable pressure vessels can be put into operation that meet the relevant technical requirements, are equipped with the appropriate documentation and have passed initial inspection. The beginning of their operation must be reported to the technician inspecting stable pressure vessels. The vessels must be subjected to inspection and testing according to a plan of the inspection technician.

19.3. The operation of pressure vessels can only be entrusted to reliable, physically and mentally fit persons who have reached the age of 18 and have been demonstrably trained to the extent required, both theoretically and practically, and examined by the stable pressure vessel inspection technician. The testing of their knowledge must be repeated at least once a year.

19.4. The employees responsible for the operation of stable pressure vessels (operators) must:

- know the entrusted vessels including accessories perfectly in terms of operation
- know and observe the respective norms and regulations for the operation of the vessels
- know and be able to control all the devices at their workplace used to ensure safe and economic operation and safely intervene even under exceptional circumstances to maintain operational safety
- follow the orders of the senior employee unless they are inconsistent with the respective regulations and the obligations of the operators
- make records according to operating rules
- report immediately any fault, defect or abnormality during the operation of the vessel and its accessories to a senior employee, report an occupational injury or accident immediately to the IOCB safety technician, put the vessel out of operation immediately

if a delay may pose a danger or if the senior employee does not take measures to eliminate a serious danger immediately

- participate in the inspections of the vessels if possible in order to be acquainted with their condition
- keep the area where the vessels are placed clean, tidy and accessible
- prevent the presence of unauthorized persons in the working space of the vessels
- make sure that the factory labels of the vessels are not damaged and are kept clean and legible

20. Work in a Hydrogenation Laboratory

20.1. High-pressure hydrogenation or other high-pressure reactions, with the exception of work with laboratory autoclaves below the volume of 250 cm, can only be performed at a workplace approved for this purpose by the competent authorities and equipped in accordance with applicable regulations (electrical installation, heating, fume hoods, technical-gas distribution, controls and monitoring outside the room).

20.2. A hydrogenation laboratory must be equipped with extinguishers, personal protective equipment and suitable tools. The following must be posted there: emergency instructions, operational guidelines, guidelines for work with technical gases and the safety signs prescribed. It is recommended that the workplace be equipped with a fire blanket and the basic first-aid equipment.

20.3. The operation of the hydrogenation laboratory is ensured by an employee authorized by the IOCB management. The employee must be at least 18 years old and must meet the qualification, physical and mental requirements for this responsible work. In addition, the employee must be practically trained and acquainted with the safety and operating rules for the operation of stable pressure vessels and this knowledge must be tested by the pressure-vessel inspection technician once a year.

20.4. The employee in charge of the operation of a hydrogenation laboratory must

- follow all the operating and safety rules as well as the supervisor’s orders
- warn all the authorized visitors (the staff carrying out repairs, maintenance and checks or prescribed inspections) about potential dangers and acquaint them, to the extent necessary, with the regulations of the workplace
- ensure continuous oversight of the device during operation; if the employee in charge entrusts another employee with the supervision, he/she must acquaint him/her with the regulations of this workplace in their entirety
- continuously monitor the operation of hydrogenation autoclaves in terms of safety and reliability, know the maximum allowable overpressure as well as the working temperature and function of individual containers
- not allow pressure vessels without prescribed documentation and without prescribed

inspections in the operation

- prepare autoclaves and other equipment for inspections and tests carried out by the RLI in cooperation with a pressure-vessel inspection technician
- inform the supervisor immediately about all the defects in workplace equipment, defects of the devices and the unusual course of the reaction performed
- maintain working order
- keep clear records of the work performed
- use adequate personal protective equipment
- maintain order and cleanliness and keep emergency escape routes clear of obstructions
- ensure before leaving the hydrogenation laboratory that the workplace is secure and fire-safe and that all the energy, water and technical-gas distribution systems (outside the laboratory) have been closed

20.5. The obligations of the head of the workplace

a) He/she ensures that the hydrogenation laboratory is equipped in accordance with applicable regulations.
b) When approving the work assigned, he/she assesses the safety of the reaction in terms of occupational health and fire protection and specifies working conditions in writing (suitable autoclaves, the maximum pressure and temperature etc.).
c) He/she inspects the workplace at least once a month and makes written records of the inspection results in a book of work reports.

20.6. Work assignment

a) When assigning work in a hydrogenation laboratory (in a prescribed form), the assigning employee must provide a reference to the literature and his/her own findings.
b) This does not apply to Raney nickel, in whose case it is necessary to provide one's own catalyst.
c) Based on the instructions of the head of the hydrogenation laboratory, the assigning employee ensures the occupational safety of the employee entrusted with the operation of the hydrogenation laboratory (the permanent presence of another employee, optionally supervision at specified intervals).

20.7. The principles of safe work

a) During work in a hydrogenation laboratory, it is forbidden to smoke, use open fire, keep combustibles, chemicals, catalysts and any objects not directly connected with the operation.

b) Because of occupational safety, it is forbidden to perform any work with pressure vessels and other equipment without the written consent of the senior employee and use unsuitable tools. Work on one's own initiative is not allowed!

c) Before work, the pressure vessel and its accessories (the integrity of the mounting, the suitability of the pressure gauge, etc.) must be carefully inspected.

d) When an autoclave is being filled, operated and emptied, the red warning sign "HYDROGEN" placed at the entrance to the hydrogenation laboratory must be lit.

e) The hydrogen needed is drawn from pressure cylinders placed outside the laboratory. The cylinders must be secured against falling and abuse.

f) All the autoclaves are controlled (i.e. the mixing is turned on, the temperature and pressure monitored) from the next room using controls. The presence of (an) employee(s) in a hydrogenation laboratory during the operation must be limited to the time necessary.

g) Excess hydrogen is released through a hose into free space outside the laboratory. Before the autoclave is opened, it is necessary to rinse residual hydrogen repeatedly (at least 3x) with nitrogen. It is forbidden to add a catalyst during the operation without rinsing the autoclave repeatedly first.

h) The catalyst used must be sucked out while the walls of the autoclave are being rinsed. The catalyst used can be filtered using vacuum filtration only if there is a permanent protective layer of a non-flammable liquid above the catalyst. For possible regeneration, the catalyst must be stored under a protective layer of water and placed outside the hydrogenation laboratory.

i) Substances, solutions of substances, and the catalysts used (with the exception of nickel) shall be delivered without further treatment after the desired reaction has been performed.

j) It is strictly forbidden to loan autoclaves outside hydrogenation laboratory!

k) Work with combustibles, technical gases, aggressive substances, toxic substances, the operation of electrical equipment, the operation of pressure vessels and waste disposal are fully governed by the respective guidelines.

20.8. In the case of an accident, it is necessary immediately to turn off electricity outside the laboratory, close the inflow of hydrogen, ensure ventilation and inform the head of the workplace about the accident. If a delay may pose a danger, it is necessary to summon help from the nearest workplaces and, if necessary, sound a fire alarm. It is strictly forbidden to enter the affected area without ensuring the safety of the staff and a sober assessment of the situation.

21. The Operation of Electrical Installations and Work on Them

21.1. Both stable and mobile electrical equipment is used for electrical energy production, distribution and consumption. This equipment must be maintained in a state complying with electrical codes, standards and the manufacturer's guidelines and undergo prescribed inspections, examinations and tests.

21.2. The levels of professional competence (qualifications) in electrical engineering are specified in the Czech Occupational Safety Office Decree No. 50/1978 Coll. as subsequently amended and the allowed scope of activities is set by the relevant Czech Technical Standards.

21.3. The operation of electrical equipment comprises activities connected with their normal operation, e.g. the switching, control, the reading of the data of permanently installed devices, common inspection of the equipment etc.

21.4. Work on electrical equipment involves its installation, maintenance, the establishment of new and the reconstruction of already operated devices as well as inspection and measurement by portable instruments.

21.5. Acquainted employees are employees without professional electrical-engineer qualification who have been demonstrably acquainted, within the scope of their activities, with regulations on the handling of electrical equipment and informed about the dangers represented by this equipment. Their knowledge must be verified once a year. These employees can independently operate simple extra-low voltage and low voltage electrical equipment adjusted in such a way that the employees would not come into touch with live parts. These employees must not remove the covers of electrical appliances, replace fuses and bulbs. They can touch only such parts that are intended for the operators. These parts of electrical devices must always be freely accessible.

21.6. Instructed employees are employees even without professional electrical-engineer qualification who have been trained within the scope of the activity entrusted, informed about possible dangers, tested on the knowledge of the respective regulations and acquainted with the administration of first aid for electric shock. They must be examined at least once every two years. Their training and examination can only be entrusted to an employee with electrical-engineer qualification. Instructed employees can independently operate electrical equipment of any voltage, work on parts of low-voltage electrical equipment without voltage (within the scope of their training) and near exposed live parts at a distance greater than 20 cm under supervision. Further details on the scope of the activities of instructed employees are given in the relevant Czech Technical Standard. The employees that can come into contact with electrical equipment during the performance of their work assignments (e.g. when cleaning in the switch room, an el. workshop or the section of electronics) must be considered acquainted employees.

21.7. Knowledgeable employees are employees with professional electrical-engineer qualification (trained in an apprenticeship or graduates of vocational electrical-engineering schools). Having been trained and passed the prescribed safety regulation examination before a committee, they can work (based on a valid certificate) on electrical equipment in the extent determined by the relevant Czech Technical Standard. Only these employees can maintain, repair and expand electrical installations (distribution to the appliances).

21.8. The employees of scientific, research and development institutes who passed an examination in electrical engineering, electronics or physics as part of their university studies, or who have passed a final examination in electrical engineering or nuclear physics at a secondary school and perform experimental work at defined scientific, research and development workplaces are considered persons qualified for independent work on electrical equipment once they have passed the prescribed examination.

21.9. The employees that are to operate electrical equipment and work with it or near it must have the physical and mental qualities (knowledge, skills, experience, health condition) required by the responsibility and danger of the actions performed by them. They must be demonstrably acquainted with the operated equipment and its functions. If further safety and work instructions are prepared for some electrical equipment, they must be demonstrably acquainted with them and these regulations or instructions must be accessible. If personal protective equipment is prescribed for the operation of electrical equipment or work with it, it must be used.

21.10. Any employee that discovers a defect on the electrical equipment (both appliances and installations) must immediately report it to the employee responsible or the head of the Technical Unit. These must then ensure its repair.

21.11. Electric cookers must be placed on a fire-proof surface. When immersion heaters are being used, they must be immersed in water as designated by the manufacturer´s making (nozzles).

21.12. It is forbidden to remove the residues of flammable solvents from substances by drying in electric dryers or furnaces.

21.13. When infrared lamps are used, it is necessary to preserve the distance from the objects being heated specified by the manufacturer.

21.14. For the guidelines for the use of electrophoresis apparatus, see the section below.

22. Operation of electrophoresis equipment

22.1. The guidelines concern high-voltage electrophoresis apparatus (HV-E) whose design and installation comply with the relevant Czech Technical Standards and which demonstrably underwent professional inspection before they were put into operation. The guidelines specify the minimum requirements for the safe operation of these types of electrophoresis:

Type A – a HV - E with a voltage source providing a line-to-ground voltage of 300–1200 V and an electric current of 25–100 mA

Type B – a HV - E with a voltage source providing a voltage of more than 300 V and an electric current of more than 100 mA and a HV-E with a voltage source providing a voltage of more than 1200 V and an electric current of more than 25 mA

Type C – HV - E with direct heat removal by a flammable liquid with a voltage source providing a voltage of more than 300 V and an electric current of more than 25 mA.

22.2. The guidelines do not apply to electrophoresis apparatus with a line-to-ground voltage source providing a voltage below 300 V with no current limitation and electrophoresis apparatus with a voltage source providing a voltage of more than 300 V with electric current being limited to 25 mA. All voltages and currents are constant (DC).

22.3. During the classification of HV-E, one has to consider the maximum voltage and current that the particular source for HV-E can achieve no matter if the maximum parameters of the

source are used for the actual work or not.

22.4. HV-E of Type A:

The entrance door of a laboratory using HV-E of Type A must be marked on the outside with the warning sign “Caution! High voltage .....V”. Inside the laboratory with HV-E, there must be guidelines for the administration of first aid for electric shock including a medical emergency number.

The apparatus must be equipped with protective barriers (covers, cages) to prevent direct contact with live parts.

The source of voltage must be provided with a red signal light signaling the operation of HV.

A brief instruction manual with the controls clearly indicated must be available at each HV-E.

The HV-E of Type A can only be operated by at least “instructed” employees above 18 years of age (instructed persons are those without electrical-engineer qualification but demonstrably instructed and acquainted with the operation and work that they are to perform and informed about possible dangers). The competence is examined at least once every two years.

Electrophoresis apparatus of Type A must undergo inspection by a professional authority of the IOCB (electrical inspection technician).

22.5. HV-E of Type B:

The entrance door of a laboratory using HV-E of Type B must have the illuminated sign “Caution! High voltage .....V” and the signs “ACCESS FORBIDDEN TO ALL UNAUTHORIZED PERSONS” and „NEVER USE WATER“ in the immediate vicinity of the entrance door. The illuminated sign of a laboratory using HV-E is lit up when the electric current for the HV-E is turned on. Inside the HV-E laboratory, guidelines for the administration of first aid for electric shock including a medical emergency number must be visibly displayed.

22.6. The HV-E of Type B must be equipped with protective barriers (covers, cages) to prevent direct contact with live parts. These barriers must be lockable or they must, when removed, automatically disconnect high voltage and ground all the parts that might have residual voltage.

All the controls must be clearly marked.

The source of voltage must be provided with a red signal light signaling the operation of HV.

All electrical circuits of the laboratory with HV-E – except for lights – must be connected via a special, clearly marked, central switch.

In the immediate vicinity of the laboratory with HV-E, there must be enough suitable extinguishers. Their number shall be determined by the respective Fire Rescue Service based on the fire-safety design of the laboratory.

For every HV-E of Type B, it is necessary to designate a responsible employee qualified as a “knowledgeable person with a higher qualification”. This employee is responsible for the operation of a HV-E and prepares (in cooperation with the manufacturer of the equipment if necessary) the operating rules for the operation of the equipment.

HV-E of Type B can only be operated by at least “instructed” employees above 18 years of age.

The entry of other people than the operators into the laboratory with HV-E is to be authorized by the employee responsible for all Laboratory operations.

Regular inspections (of the voltage sources and apparatus) are performed once a year by a professional authority in cooperation with the electrical inspection technician.
If it is necessary to perform some actions on the apparatus near live parts when HV is connected, it must always be done under the supervision of a knowledgeable person with a higher qualification (if this person does not do it himself/herself). During this work, it is necessary to follow the instructions given in the relevant Czech Technical Standard and use additional insulation (dielectric overshoes, gloves, etc).

22.7. The HV-E of Type C:
The guidelines for the operation are the same as those for the electrophoresis apparatus of Type B in the paragraphs above.
The HV-E shall be filled with inert liquids with the highest boiling point and point of flammability, e.g. Varsol (BP: 140–200°C, etc.) with a maximum volume of the flammable liquid being 50 liters.

23. Waste Disposal and the Collection of Waste Solvents

23.1. Before the beginning of any work, the employee responsible must also consider the possibilities of waste disposal. Should the waste disposal be hazardous, he/she should consider the possibilities of another technological procedure or the implementation of waste disposal at a better equipped workplace.

23.2. The method and place of the disposal of waste and unwanted by-products are determined by the employee responsible. Waste disposal must be performed, with the exception of waste solvents, without undue delay.

23.3. Waste solvents (including halogenated), toxic substances, explosives, acids, hydroxides and heavy metal containing compounds must not be poured into the drain. It is also forbidden to pour there substances that release toxic or irritating gases when combined with water, acids or lyes.

23.4. It is forbidden to pour chemicals as well as reactive waste into sanitary facilities.

23.5. After the thorough removal of the residues of pyrophoric substances and neutralization, waste solvents are collected in clearly marked containers. At the workplaces, they can be stored in a designated place that is subject to increased preventive supervision only until the next collection. Waste solvents in the amount exceeding 20 liters must be handed over for disposal immediately.

23.6. Alkali metal and alkali-metal hydride residues after the reactions and drying of solvents must be immediately disposed of. The disposal of alkali metals must be carried out in a fume hood using 96% ethanol; the disposal of potassium using ethanol must be performed in an inert gas atmosphere. Alkali metal hydrides are disposed of, depending on their reactivity, using ethyl acetate or acetone. The procedure of disposal is determined by the employee responsible.

23.7. It is forbidden to flush spilled mercury down the drain pipe. It must be carefully collected and the remnants, sprinkled with powdered zinc, swept.

23.8. It is forbidden to throw substances that can cause fire or spontaneous ignition into garbage cans. It is forbidden to discard flammable material into the containers for waste glass placed at blast burners. Garbage containers must be made of metal and covered with a lid.

23.9. Shards and sharp-edged waste must be disposed of in a special container. They must be placed separately at a landfill as well.

23.10. Waste contaminated with oil (rags, sawdust, etc.) or flammable substances must be disposed of in closed sheet-metal containers. These must be emptied at a designated place.

23.11. Glassware that has been damaged or contaminated with strong acids, bases, toxic substances or irritants rapidly decomposing with water must not be sent to be washed.

23.12. For the disposal of toxic waste and mercury, see Work with Substances and Products with Acute and Specific toxicity.

24. Work with Hazardous Substances and preparations that are Carcinogenic, Mutagenic or Toxic to a reproduction

24.1. These are substances labeled with the following standard Hazard Statements (H-Phrases) indicating specific hazards.

H 350	May cause cancer
H 351	Suspected of causing cancer
H 340, 341	May cause genetic defects
H 360, 361	May damage fertility or the unborn child
H 362	May cause harm to breast-fed children

All of these substances must be labeled by the respective hazard pictogram (the Globally Harmonized System of Classification and Labeling of Chemicals /GHS/).
The handling of these substances is, without exception, governed by the same rules as the handling of acutely toxic substances. In particular, it is necessary to emphasize the obligation to become thoroughly acquainted with the relevant standard instructions for safe handling, with the hazardous properties of these substances and with the guidelines for the administration of first aid. It is necessary to be entirely familiar with the procedures in case of an accident and the principles of the protection of the environment from the adverse effects of these substances – this information can be best obtained from a material safety data sheet.
If required, the latest information of the MERCK company is available on the website www.chemdat.info. The safety data sheets of the companies FLUKA, ALDRICH and SIGMA can be downloaded from the address www.sigmaaldrich.com. After the company and the respective chemical are selected, the safety data sheet is available under the abbreviation MSDS. If the safety data sheet is not available otherwise, it can be requested from the supplier through the purchasing department. If the safety data sheet has not been sent together with the chemical ordered (which is the supplier's duty), the supplier must provide it immediately upon request.

Work of pregnant women with these substances should also be mentioned (see Chap. 2).