

# Safety Regulations

Faculty of Science

*Established by the Board of the Faculty on 10 March 2004  
(revised 2006, with introduction remarks 2010)*



University of Leiden

## **Preface**

The Faculty of Science aims at exercising care for working conditions and environment in a systematic manner. This implies a system of care within the Faculty. Safety regulations are part of this system. These are basically a reflection of a number of agreements established within the faculty (by the Faculty Council) concerning safe and healthy working conditions.

Safe and healthy working conditions are everyone's responsibility. Nevertheless, it will be the Board of Governors that will have the ultimate responsibility for the care for working conditions and the environment on the campus. The Board has delegated its responsibility for this care to the Faculty Boards. Therefore, within the Faculty of Science the Faculty Board is responsible for policies concerning working conditions and the environment, and their implementation. For the Faculty Boards to be able to bear this responsibility certain mandates have been issued, along with the proper authority. The scientific directors, for example, by mandate have been given complete responsibility for the working conditions and environmental protection within their institute. It is up to the scientific directors to establish responsibilities and competence within their institutes enabling them to carry this responsibility. These Safety Regulations are a guideline for this and lay down a number of rules that apply within the Faculty.

Of course, the Faculty must observe the regulations laid down in the Dutch Occupational Health and Safety Act ("Arbowet"), government-granted licenses, and regulations established by the Board of Governors of Leiden University. The Safety Regulations will serve as a guideline for complying with these regulations too.

## INTRODUCTORY REMARKS

### How to read this edition of *Safety Regulations* (version 3B, 2010)

The Faculty's Safety Regulations are momentarily subject to complete renewal and will be converted into a general printed document referring to more elaborate information and procedures, which will become gradually available on the AMD website ([www.amd.leidenuniv.nl](http://www.amd.leidenuniv.nl)) in the near future.

The document that you are reading right now is an intermediate reprint of the Safety Regulations version 3 (2006) with a summary of changes to the text, which - if read in combination- will provide you with the most necessary safety information and regulations in the meantime.

### Summary of changes and additions

#### Article 7: Ban on smoking

**Remove sentence beginning with “the sole exception....”.**

Legislation has changed; no exceptions can be made anymore.

#### Article 8: Ban on eating and drinking

**Splitted into 8A Ban on eating and drinking (no changes) and**

**8B: Ban on working under the influence of alcohol, drugs and certain medication.**

Medication has been added: some medication can influence reaction speed, can cause dizziness, can affect equilibrium etc. Consider these factors and tell your supervisor: you might need to change your activities in order to continue work safely.

#### Article 17: Safety and limiting risk

**To be included are consideration of risk of working with carcinogenic, mutagenic or reproduction toxic substances before start-up of activities and risks for pregnant women. (See also description of appendices 6 and 7).**

#### Article 18: Personal Protective Equipment.

**Include in the note this text about colour codes for lab coats.**

Red label: only use in radionuclide laboratories.

Green label is for work with GMO.

White lab coats are for general use.

By applying the right coat in the right laboratory –and keeping it there- we can avoid spreading of (possible) contamination through the building.

#### Article 29: Regulations after hours use of apparatus

**The “green label” has been replaced by the new procedure for OverNight/Weekend (ONW)**

**Experiments (outside office hours in Gorlaeus/LMUY building).** Permission from the Centre for Safety and Environment (AMD) is no longer obliged, as long as two qualified persons review the risks together.

The background information, procedure (in Dutch) and ONW form (bilingual) are available on the AMD website: follow “Arbo- en Milieudienst” => “digitale formulieren / digital forms” on the Faculty's website or ask your lab supervisor.

#### New appendices 6 and 7 (Dutch only, English summary below):

In 2008, two new appendices were included in the Dutch version of the Safety Regulations. Translation is not yet available, therefore we provide you with this short summary.

#### Appendix 6 (NL) “Working with carcinogenic, mutagenic or reproduction toxic substances”

Appendix 6 is about considering safety information from MSDS and labels, so you know with which kind of substances you are dealing. Substances you use may not only harm your own health, but may also affect your co-worker (who has a child wish or has not yet informed others about her pregnancy, for instance) Especially look for R-phrases R40, R45, R46, R49, R60, R61, R62, R63, R64 and R68.

Please note that some substances can also have effects on *male* fertility!

#### Appendix 7 (NL) “Working safely during pregnancy and nursing period”.

Appendix 7 handles about the procedure you should follow when you are pregnant and about making a risk inventory of your activities (together with your supervisor.) **A checklist for this is provided on the AMD website (in Dutch and English).** Roles and responsibilities are described.

When you are (trying to get) pregnant and work with ionising radiation you are advised to contact your

coordinating radiation safety officer or the company doctor in a very early stage! If you are pregnant and need more information, e.g. on different types of risk, you can contact the AMD (Mrs. Marjolijne Samwel, tel. 4010 or [samwel@science.leidenuniv.nl](mailto:samwel@science.leidenuniv.nl)) or the company doctor by calling 071- 526 8015.

### **Appendix 10 General Information**

Contact information and emergency phone numbers were updated to reflect the situation in 2010.

**If you need more information, please contact the AMD/Centre for Safety and Environment at [amd@science.leidenuniv.nl](mailto:amd@science.leidenuniv.nl) or dial 4333.**

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# Safety Regulations of Faculty of Science

## General

- art.1. These regulations apply to everyone present on the grounds, in the buildings or at the installations of the Faculty of Science (hereafter referred to as "Faculty of Science").
- art.2. Everyone is required to take the greatest possible care for his/her own safety and health and those of others.
- art.3. Everyone is required to report situations that s/he feels are unsafe or near accidents to the Working Conditions and Environment Department (AMD) of the Faculty of Science.

**Commentary:**

*Promptly reporting dangerous situations, damage or accidents (or near accidents) is important for the creation of preventive measures. Along with pointing out defects in the buildings and installations, this article aims to stimulate reporting of health-endangering properties of apparatus or chemicals. Also suggestions for improving apparatus, set-ups or experimental methods are important. Reporting can be done by using the digital report form on the web site AMD. For information on the AMD: see APPENDIX 6*

- art.4. Everyone is expected to understand the meaning of all prohibitory, warning, mandatory and safety signs found within the Faculty of Science and to follow the associated regulations.

**Commentary:**

*Regulatory signs are reproduced in APPENDIX 5 along with explanations of their meaning*

- art.5. The presence of persons in the buildings outside of the normal working hours is only permitted if required for continued progress of the normal activities.  
When present outside of office hours, a person is required to report his/her name, room number and telephone number in the register located at the reception.

**Commentary:** *Normal working hours are defined as the period between 07:30 am and 18:30 pm on weekdays. Outside of working hours, registration is required if activities other than office activities are carried out by one person.*

- art.6. Carrying out activities and experiments outside of office hours is only permitted after receiving approval from your supervisor. This does not apply to office activities or activities of a similar nature.

- art.7. Ban on smoking

In accordance with the Tobacco Act, a ban on smoking applies in all rooms of the Faculty of Science. The sole exception involves lounges and studies where smoking is permitted, if colleagues and visitors do not object and no ban on smoking applies because of safety precautions.

**Commentary:**

*From 1 January 2004 every employee is entitled to work in a smoke-free environment.*

- art.8. Ban on eating and drinking

In laboratories and workplaces it is forbidden to consume or store food and drink. It is forbidden to carry out activities under the influence of alcohol and/or drugs.

**Commentary:**

*Working Conditions Decree article 4.5 paragraph 2 forbids the consumption and storage of food in places where substances are present that according to the Environmentally Hazardous Substances Act meet the criteria for classification in one or more of the categories "extremely poisonous", "poisonous", "carcinogenic", "mutagen" and "toxic to reproduction".*

*For the Faculty of Science this means that the "ban on eating and drinking" applies to all workplaces, technical areas, experimental rooms, laboratory spaces and supply rooms. This ban also applies to rooms where collections are stored, like archives, libraries, plant and animal collections (for both safety reasons and the preservation of the collections). Eating and drinking are permitted in the lounge/studies.*

- art.9. Waste  
Everyone must be acquainted with and strictly uphold the Waste Regulations of the Faculty of Science.

**Commentary:**

*The Waste Regulations of the Faculty of Science are reproduced in APPENDIX 1.*

- art.10. Environmental licenses and permits for use  
Everyone must be acquainted with and strictly uphold the regulations of the environmental licenses and permits for use.

**Commentary:**

*The environmental licenses can be consulted on the website of the internal AMD.*

- art.11. Use of means of transport of persons within the buildings is only permitted for handicapped individuals and in times of disaster.

- art.12. Everyone must comply with the regulations established by the University.

**Commentary:**

*A summary of the university regulations is included in APPENDIX 2.*

## **Fire and accidents**

- art.13. In case of fire or accidents during office hours, you are required to inform the emergency call line in that building immediately, giving information about location, number of people injured and if possible the nature and extent of the fire or accident. The emergency number is printed on every telephone.

If a fire is discovered outside office hours, you are required to activate the manual fire alarms immediately or to inform the Fire Department (telephone number 4444; direct connection to the regional emergency centre).

Do not use the lifts in case of fire.

For accidents occurring outside office hours, you are required to call the emergency telephone number 4444.

In case of fire or accident outside office hours, you are required to wait for the emergency services at the reception.

Every accident must be reported to the Faculty's AMD.

**Commentary:**

*Reporting a fire or accident in any way other than that specified here can lead to serious delays in the rescue efforts. Reporting accidents to the AMD should be done if at all possible by those directly involved (victim or rescuer). The report of the accident can lead to the creation of necessary measures and support any damage claims made (for the initial report, use the red label, available at the reception or on the website AMD).*

- art.14. When the acoustic evacuation signal sounds, you are required as necessary to turn off apparatus, shut windows and doors, and leave the building as quickly as possible via the stairs and signposted escape routes. You are required to strictly follow the instructions of the institution's emergency response team, the fire department and instructions broadcast over the public address system.

- art.15. The acquisition, placing and moving of general safety devices (like fire extinguishers and mandatory signs) is only permitted after receiving approval from the Faculty's AMD.

- art.16. All fire extinguishing devices, manual fire alarms, circuit breakers, hallways, stairs, exits, passageways and escape routes must be kept free of obstacles.  
Walkways in laboratories, experimental spaces and workplaces must always be able to act as escape routes.

## Duties

art.17. When commissioning and carrying out activities, sufficient measures must be taken to ensure within reason that fire, explosion and/or exposure of people to hazardous chemical, physical or biological agents will not occur.

Everyone is required before starting new activities (for her/him) to obtain the necessary information about:

- the risks which may be associated with these activities for personal health and safety and those of others
- risks for the environment which may be associated with these activities
- the available alternatives to reduce the risks associated with these activities,
- the safety measures that must be taken,
- the safety equipment required for these activities.

**Commentary:**

*Information must be obtained from the supervisor, colleagues, administrator, laboratory managers and technicians, chief of staff, or by personally consulting documentation.*

*To obtain information and advice concerning the carrying out of activities, measures to be taken or safety equipment, you can consult the Faculty's AMD.*

art.18.

Wearing work clothes and/or personal protective equipment (PPE) is required in all classified areas and in areas specified by authorized persons.

**Commentary:**

*Work clothes are to be supplied by the employer.*

*Students are required to obtain laboratory clothing (at their own expense) and are responsible for cleaning, repairing and replacing it as necessary.*

*PPE is available from the supply rooms.*

*Special regulations apply to PPEs that require personal adjustment and PPEs that must be used in specific workplaces and for specific activities.*

*For advice concerning PPEs, you can consult the Faculty's AMD.*

art.19. Persons who are responsible for supervising laboratory practicals or workgroups, experts who supervise the classified areas, and authorized personnel can enact further rules which apply only to their field of activity.

These rules must be approved by the Faculty Board.

**Commentary:**

*The further rules mentioned here are or will be recorded in regulations, and those who work in the areas to which the regulations apply must be informed of the contents of these regulations, as well as any other people who wish to be kept informed. Regulations always apply to classified workplaces which can be obtained from the Faculty of Science AMD.*

*A list of the types of classified workplaces is given in APPENDIX 3.*

## Chemicals, apparatus and installations

- art.20. Transport of chemicals, compressed gasses and cryogenic fluids may only be undertaken with the appropriate means of transport.  
Connecting cylinders containing compressed gasses to installations and valves may only be done by trained personnel.  
If a building has a goods lift, the transport of the aforementioned substances must take place in this goods lift.

### **Commentary**

*There are more rules associated with the transport of cryogenic fluids in lifts, for information please consult the Faculty's AMD.*

- art.21. The acquisition, storage, use and transport of apparatus, chemicals, radioactive substances, pathogenic material and genetically modified material must comply with the guidelines set by the Faculty Board.

### **Commentary:**

*Per laboratory the following guideline applies: maximum on average 1 liter combustible fluid per m<sup>2</sup> floor surface area. In a normal laboratory the maximum quantity of a highly inflammable solvent which can be used per test is 2 liters.*

*For workplaces and experimental areas, the guideline applies that only the amount of chemicals necessary for that day's work may be present.*

*Inflammable solvents and degreasants may only be present in laboratories outside of office hours if they have been placed in flame-retardant containers.*

*In every location where highly inflammable substances can be found, an appropriate extinguishing agent must also be present.*

*For various types of chemicals, restrictions apply concerning their use, according to the Working Conditions Decree chapter 4: Hazardous substances and biological agents.*

*In this chapter, the general use of benzene, pentachloroethane, 1,1,2,2-tetrachloroethane and tetrachlorocarbon as solvent, cleaning agent or thinner is forbidden. The same prohibition applies to products which contain one or more volume-percent of these substances. Their use is only permitted in a closed system or in a manner that offers at least an equivalent level of protection. For the Faculty of Science this means that use of the above-mentioned chemicals is forbidden, unless authorisation has been obtained from the AMD.*

*Furthermore, it is forbidden to prepare or use the following substances: - 2-naphthylamine and its salts,*

- 4-aminodiphenyl and its salts,*
- benzidine and its salts,*
- 4-nitrodiphenyl.*

*It is forbidden to maintain stocks of these chemicals.*

*The prohibition does not apply if the substances are present in a mixture or solution at a concentration less than 0.1 percent by weight.*

*Highly poisonous, explosive or reactive chemicals may only be used with the greatest possible care in specially designated and equipped spaces (fume cupboard, **point suction**, explosion-proof). For further information, please consult the Faculty's AMD.*

- art.22. Repairs or modifications to an installation or apparatus may only be done or ordered by authorised personnel.

### **Commentary:**

*All repairs, modifications or construction of permanent installations must be done by trained personnel. This also includes the sites and mountings of apparatus, framework, **blackboards and portrayals**.*

*A breakdown of technical installations should be reported to the appropriate department (see APPENDIX 6).*

*Outside of normal office hours, you should call the fault-clearing telephone of the Technical Service (see APPENDIX 6).*

- Art.23. Application of ionizing radiation is only permitted:
- after internal permission has been granted,
  - in designated workplaces (radionuclide laboratories),
  - by fully qualified personnel (radiation hygiene level 5B) and those permitted to take part in the activities by the radiation technician in charge,
  - entry to the designated workplaces is allowed only after approval by the local technician.

**Commentary**

*The use of apparatus that emits ionizing radiation and the acquisition, use and disposal of the radioactive waste (open radioactivity) is bound by the aggregate permit granted to the University (Nuclear Energy Act) and all supplementary regulations and rules set by or on behalf of the Faculty Board.*

- Internal permission can be requested via the radiation technician in charge and is ultimately granted by the senior radiation specialist of the University of Leiden.
- Registration for the radiation hygiene course is done through the radiation specialist in charge.
- Acquisition of radioactive substances is done through the radiation specialist in charge and the financial administration (therefore not via the supply department or directly). Material received must always be registered with the radiation specialist in charge who is responsible for numbering.
- The stocks of radioactive substances are stored in a flame-retardant container. In the radionuclide laboratory only supplies for current use are permitted and must be stored in the designated containers.

- Art.24. The preparation and carrying out of activities with GMO, including storage and transport, can only be done:
- after a project has requested and received a permit from I&M,
  - in designated workplaces (areas of contained use, incubators, greenhouses and animal housing),
  - by fully qualified or experienced personnel who have been certified for these tasks by the Biological Safety Officer (BSO),
  - by personnel in training, who are being directly supervised by the above-mentioned personnel and who have applied for certification to the BSO.

**Commentary**

*For more detailed information on the following points, please refer to the GMO manual:*

- the procedure for submitting and changing projects (via BSO),
- workplaces with different classification levels,
- requirements imposed on the arrangement of areas of contained use,
- regulations for work to be carried out there,
- procedure for registration, training and certification of employees,
- checks, registrations and supervision required.

- Art.25 To carry out experiments with biological agents, certain regulations apply which vary according to the classification of the organisms used or the substances produced. If the agents belong to class 3 or 4 (pathogenic for humans), the experiments can only take place:
- after reporting this to the Labour Inspectorate via the BSO of the AMD.

**Commentary:**

*Information and advice can be obtained from the BSO of the AMD.*

- Art.26. Laboratory animals
- Before experiments are done on animals, approval must be obtained from the Animal Experimentation Committee (UAEC).
  - An affirmative resolution is required from the Ministry for Infrastructure and Environment (I&M) before housing and experimenting with genetically modified laboratory animals (restriction level DI, transgenic) or laboratory animals with an associated modified organism (restriction level DM-II, Gene therapy).
  - Before carrying out biotechnological treatment of animals, as described in the "Biotechnology and Animals Decree", article 66 paragraph a, points a and b, a permit is required from the Ministry of Agriculture, Nature Management and Fisheries.
  - Experiments on animals can only be done by properly authorized personnel (ex article 9 or ex article 12 officials).
  - Laboratory animals must be registered.
- Experiments with genetically modified animals are also subject to the points listed in article 24.

**Commentary**

See APPENDIX 3: classified workplaces.

- NB** The activities listed in articles 23, 24, 25 and 26 must be done as far as possible within normal working hours (art. 5).  
During the weekend and in the evenings, these activities can only be done under expert supervision.  
Written permission from the scientific director is required for activities to be carried out during the night.

- Art.27.  
The use of class 3b and class 4 lasers is only permitted in appropriately classified workplaces. Class 3b and class 4 lasers may not be used without the required safeguards listed in the "[Regulations on non-ionizing radiation, University of Leiden](#)".

**Commentary**

See APPENDIX 3 classified workplaces and appendix 4 'Working with NIS'.

- Art.28.  
Doors providing access to rooms where high-powered magnets are used which produce intense magnetic fields (leakage field higher than 0.5 mT=5 Gauss) must have warning stickers affixed to them. Also access doors to adjoining rooms in which the leakage field could exceed 0.5 mT (5 Gauss) must have warning stickers affixed to them.

**Commentary**

See APPENDIX 3 classified workplaces and appendix 4 'Working with NIS'.

- art.29. All apparatus must be turned off outside of normal office hours or labelled.  
Apparatus required to maintain particular conditions (cooling, heating, vacuum, etc.) is exempt.

**Commentary:**

Apparatus operating outside of office hours: permission is required from the administrator or an employee of the AMD for the continuous operation of equipment (see back of the green label). After inspection of the apparatus (by the aforementioned employees), approval is indicated by a label placed on the equipment that states that the apparatus may remain on after office hours. Approval is granted for a maximum of one year.

# **Legal aspects of the safety regulations.**

## **The Working Conditions Act**

The Working Conditions Act 98 defines what employers and employees must do to ensure good working conditions. Monitoring of compliance is the responsibility of the Labour Inspectorate. These safety regulations of the Faculty of SCIENCE are based on the Working Conditions Act 98 and the associated Working Conditions Decree.

## **Responsibilities**

The Faculty Board has been charged by the Board of Governors with the responsibility for safety within its faculty. The dean of the Faculty of Science has mandated this responsibility to the scientific directors of the institutes (see Foreword).

Not complying with the different conditions of the safety regulations can be regarded as a dereliction of duty in the sense of the CAO for Dutch universities (art.11.1, paragraph 3). These regulations apply also to students, trainees and visiting staff members. Not complying with the different conditions of the safety regulations can lead to the person being denied access to the laboratory practicals and/or the buildings of the Faculty of Science for a short or a longer time.

## **Legal liability**

Members of staff of the University of Leiden, registered students and visiting staff members are covered by the insurance for third-party liability arranged by the University of Leiden (see memo 312980 of the CvB dated Aug. 1973). This insurance is paid out only if the University of Leiden is held liable or partly liable. Intentional damage is excluded from the insurance, the perpetrator is then held personally responsible.

In the case that a member of staff intentionally or through carelessness damages the property or buildings of the university, that person shall be held liable for the damage caused - whatever is not insured by the university.

## Appendix 2:

# University regulations

This summary is not complete. The regulations can be consulted at the Faculty's AMD. For a complete summary of the applicable regulations, surf to the website of the Internal Safety, Health and Welfare Service of the University of Leiden: <http://www.leidenuniv.nl/arbodienst/>

- Regulations for coordination of crisis management
- Regulations for emergency response team
- Regulations for chemical waste
- Regulations for area classification
- Regulations for training radiology technicians
- Regulations for laser safety
- Non-ionizing radiation manual (draft form)
- GMO (genetically modified organisms) manual
- Regulations for accidents and incidents (including environmental)
- Regulations for ionising radiation and X-ray equipment
- Ionizing radiation manual (draft form)

## Classified workplaces

Use of certain equipment and/or experiments is restricted to a number of specialized or classified workplaces. Classified means that access to these areas is restricted, and other rules apply.

- **Lasers:** use of these light sources is restricted to classified workplaces, marked by warning signs. Whenever the laser, class 3b or 4, is operating, a light must be burning on the warning sign. Access to these workplaces is only permitted after obtaining permission from the employee responsible for the operation of the laser set-up. On the access door(s) to these workplaces, there must be a sign stating who is responsible for the operation of the laser set-up. See for further information the [Regulations for Laser Safety](#) (to be replaced by the [Regulations for Non-ionizing Radiation](#), University of Leiden).

- **Magnets:** in some workplaces high-powered magnets are used which generate intense magnetic fields. People with a pacemaker, implants of iron-containing materials (cardiac valves) and implanted electronic systems (electronic hearing aid, insulin pumps, electronically controlled prostheses and muscle stimulators) must not come within range of these strong magnetic fields. Not only is the static field dangerous for wearers of the above-mentioned prostheses, moving through such a field can pose an even greater danger for these persons.  
The information stored in bank cards can be erased by such magnetic fields.  
Watch out for warning stickers.

- **Cold-storage rooms:** when working in cold-storage rooms, you are required to wear protective clothing against the cold.

**Genetically Modified Organisms (GMO):** may only be created and/or used in specially designated workplaces (areas of contained use).  
The arrangement, modification or discontinuation of the classification of these rooms (both upwards and downwards change) can only be done after consultation with the BSO.  
See GMO manual.

- **Pathogene micro-organisms (classes 2, 3 and 4):** may only be used after consultation with the Faculty's AMD and only in specially designated workplaces.

- **Ionizing radiation:** activities involving radio nuclides may only be conducted in B, C and D laboratories.  
Equipment that emits ionizing radiation can be used exclusively in specially designated rooms approved as suitable.  
The access doors to rooms where radioactive radiation is being used must always be labelled with the names of the personnel in charge.  
Changes to or dismantling of a radionuclide laboratory may only be started after obtaining permission from the radiation technician of the Faculty's AMD.

- **Laboratory animals:** The housing and treatment of laboratory animals are bound by specific regulations.  
Access to the rooms for housing and treating laboratory animals is restricted to suitably authorised persons (art. 9 or art. 12 as listed in the [Laboratory Animals Act](#)).  
For the housing and treatment of laboratory animals in the Faculty of SCIENCE: see [Protocol for Laboratory Animal Facilities](#), Science, February 2002

#### Appendix 4

## **Working with non ionizing radiation (NIS)**

### *a. Lasers*

During the installation of a laser system, the directives of the Labor Inspection and the internal university regulations (Regeling Laser Veiligheid/Rules for Laser Safety). Be aware of the required warning signs. Laser light (class 3b and 4) can damage the retina, even if only reflected by an object. When working with a laser, always wear goggles with lenses which are adapted for the type of laser.

Use gloves when working with poisonous laser liquids. Clean up spilled fluids immediately. Use the laser waste containers for laser liquids with the black or red band (see waste disposal rules of LION).

Whenever the warning board above the door is lit (with the words 'LASER'), the laser is in operation, and before entering the room you are required to wear the prescribed safety equipment.

Someone is appointed as responsible for each laser system. This person is expected to provide a safety report and a users instructions. The laser safety report must be updated every two years, or sooner if there has been an extensive alteration of the laser system.

Be aware that dye liquids used in dye lasers are almost all poisonous and/or (suspected to be) carcinogens. Weigh them in a special place (fume hood) and don't spill them (even in solution).

### *b. Microwaves*

Microwaves pass through the whole body. The best known effect of microwaves in the body is the development of heat via the absorption of microwaves by body water. The amount of heating is dependent on the frequency (wavelength). Microwave radiation is especially damaging in the frequency range 1000-3000 MHz (microwave oven: 2450 MHz), whenever the energy per unit area (field strength and per unit time) is strong enough. An often-used norm is 10 W/m<sup>2</sup> (1 mW/cm<sup>2</sup>) by an exposure of 8 hours per day (5 days a week): whenever there is a continuous exposure during a working day below this norm, no damage is to be expected. The heat effect can be especially damaging in organs with little blood circulation (poor cooling).

Check if there is damaging radiation present. The group technician or the safety officer can obtain the necessary equipment.

### *c. Magnetic Fields*

Magnets with very large magnetic fields are in use in several work areas. People with a pacemaker, with iron-containing implants (heart valves), and implanted electronic systems (electronic hearing aid, insulin pump, electronically driven artificial body parts, and muscle stimulators) must not come into the direct neighborhood of these strong magnetic fields. Not only can the static field be dangerous for people wearing the above named artificial body parts, but even more dangerous for them is moving through such a field.

The information stored in giro- and bank passes can also be erased by these high magnetic fields.

Pay attention to the warning stickers.

#### ***d. Radioactive materials***

In order to be allowed to work with radioactive materials in the laboratory, it's necessary to have written permission from the Scientific Director.

The radiation safety officer carries out the actual supervision.

Normally, the time necessary to obtain legal permission to work with radioactive materials can take the not inconsiderable time of one half year to one whole year!

One should therefore place a request for such permission with the Scientific Director as soon as possible.

Everyone who works with radioactive materials should make him-/herself amply aware of the legal and university regulations, and should strictly follow them.

Generally extensive technical modifications of the building are necessary for obtaining a license.

Ordering radioactive material requires the consent of the radiation safety officer.

Also working with equipment which emits x-rays should be carried out under the supervision of the radiation safety officer.

A license must be applied for for x-ray equipment or—depending on the tube voltage—the Ministry of I&M (Decision Radiation Protection Nuclear Energy Law) must be informed. For x-ray equipment used for educational purposes, a license must always be applied for. The equipment may be taken into operation only after the license has been obtained.

## Appendix 5

# Cryogenic liquids

### Personal protection

- When working with cryogenic liquids, one should wear the prescribed personal protection equipment, such as:
- a face shield or safety goggles with side protectors, against splashes;
- cold-insulating gloves, which fit loosely enough to be quickly removed, should one catch a splash of cryogenic liquid in the glove;
- loosely fitting laboratory jackets, which can be quickly removed.

### Safety procedures

Pouring liquefied gases out of glass dewar bottles is inadvisable. The lip of the dewar bottle has been welded. Brining the weld into contact with the extremely cold liquid can create tension, whereby an implosion of the bottle can occur; for this reason, a transfer siphon should be used, or a specially constructed transportation ball.

Only the lid, which is meant for a dewar bottle, may be used to close the bottle, because this lid contains special openings, which allow continuous escape of the gas produced. Pay attention to the fact that these lids, when they come into contact with cryogenic liquid, can become brittle and can break easily.

In dewar bottles containing liquid oxygen, no glasses with activated charcoal or other easily inflammable organic materials should be cooled; cooling these materials should be done with liquid nitrogen.

For cooling inflammable gases or liquids to very low temperatures, neither liquid oxygen nor liquid air should be used, in connection with the danger

of explosion. Also in this case, one should use liquid nitrogen as coolant. When using liquid nitrogen in open air, one should be aware that, within a short time, liquid oxygen will also be present.

Provide glass Dewar bottles with a protective jacket (metal gauze, sheet metal, cloth, tape). Cool, during filling, with a limited amount of cooling liquid.

# Liquid helium

Whenever one works with very low temperatures, the safety aspect should play an important roll. There are various dangers which should be taken into account.

1. *The liquids mentioned are extremely cold;* as was mentioned, helium is the coldest of all liquids. Contact with the cold liquid (also cold helium gas!) results in serious freezing effects.
2. The extremely low temperature of liquid helium will cause air to condense and freeze. A typical example of this is the forming of *liquid droplets on helium evaporation pipelines*; these are droplets of liquid air, so be careful!
3. When working with liquid helium, keep external surfaces clean. Under point 2, the forming of droplets on the outside of pipelines was mentioned. During this condensation, the liquid nitrogen will evaporate first out of the liquefied air, because it has a lower boiling point than oxygen. The result is that an oxygen-rich liquid drips from the pipeline; where this happens, a spontaneous ignition of grease and oil is not impossible. *A clean work area is important.*
4. *NEITHER helium NOR nitrogen support life.* By high concentrations of helium gas or nitrogen gas there is a direct shortage of oxygen. Although helium is not poisonous, in poorly ventilated rooms it can cause breathing difficulties. High concentrations of helium gas are apparent through the effect on the vocal cords. The symptoms by oxygen deficiency are:  
19%-15%    A clearly decreased reaction.  
15%-12%    Deep breathing, fast pulse, comprehensive problems with coordination.  
12%-10%    A dizzy feeling, wrong estimates, and light blue colored lips.  
10%-8%        Giddiness, inclination to vomiting, unconsciousness.  
8%-6%         Brain damage after 4-8 minutes. Death after longer than 8 minutes.  
4% and <<    Coma after 40 seconds, then death.

5. With helium, cognizance should be taken of the *enormous volume expansion from liquid to gas*. Small amounts of liquid become huge amounts of gas by evaporation: 1 liter of liquid gives 750 liters of gas! Most cryogenic liquids require a good deal of heat to evaporate. For liquid helium, this is not the case; when helium is introduced into warm or only partially cooled apparatus, a spontaneous evaporation occurs. Rapid and violent evaporation takes place during careless filling of cryostats, and by breaking the vacuum. Therefore care should always be taken that adequate gas escape is possible.

**Comments with respect to safety:**

1. Burns caused by cold liquids should be treated just as normal burn wounds. Thus, immediate and extensive washing with running water.
2. If someone becomes dizzy or faints while working with helium, bring them immediately to a well-ventilated room.
3. The vapor that appears when liquid helium comes into contact with air is condensed pollution; this is mainly air and water vapor, not the helium gas itself, which is invisible.
4. Never become nonchalant with cryogenic liquids! Errors can be fatal!

**Special hazard with Helium**

It is forbidden to breathe in helium gas in order to demonstrate the change in sound velocity in helium. Through displacing of oxygen, breathing in helium gas can have far reaching consequences. More information is available from the safety officer.

## Appendix 6

# WASTE REGULATIONS FACULTY OF SCIENCE

In the laboratories there are four sorts of waste:

1. Industrial waste
2. Hazardous waste (chemical)
3. Biological and microbiological waste
4. Radioactive waste

All types of waste are subject to strict regulations with regard to safety and external processing. Not complying with these regulations can be dangerous and lead to delays in the research.

### 1. Industrial waste

All of the waste from lounges, workplaces and laboratories, unless it is harmless waste (or practically harmless), is disposed of as industrial waste. This includes all waste that is not specified in the groups of special waste types given below (no. 2 through no. 4).

A distinction is made between industrial waste and waste that can be recycled.

The following sorts of waste are collected separately:

- Batteries
- Bottles and other glass
- Sharps/injection needles.
- Metal
- Old computers/accessory equipment and/or parts
- Paper and cardboard
- Fluorescent lights
- Toner cassettes/ink cartridges
- Household Hazardous Waste (HHW)
- Plastics

For information/questions about hazardous waste, you can consult the Facility Services of the faculty. For questions about industrial waste, you can consult the general service.

The following are included under Household Hazardous Waste:

- leftover paint, glue
- diskettes, videotapes
- feltpens, correction fluid
- spraycans (empty or full)

### 2. Hazardous waste (chemical)

Hazardous waste includes all waste chemicals as defined in the [Regulations for Waste Chemicals](#), University of Leiden. This waste is divided into **liquid and solid** hazardous waste.

#### **Liquid hazardous waste:**

Liquid hazardous waste is stored in 10 liter drums according to type which are recognizable from the colored band.

When filling the drum, **the maximum limit is at least 5 cm below the opening** (otherwise it is very difficult to transport the drums).

Drums may not contain any solid parts (e.g. needles, pipette tips, stirring magnets, etc.). When filling the drum, use a filter or sieve/funnel.

Category 1A: Aqueous solutions (>pH5)

Colour code = black.

Contents: All more or less poisonous and polluting organic and inorganic substances that are dissolved in water.

Examples: aqueous solutions of heavy metals, dichromate-sulphuric acid (neutralize with lye), film developer, lead-containing dyes, inorganic sulphides, neutralized acids and bases.

Category 1B: Aqueous solutions (<pH5)

Colour code = black.

Contents: All more or less poisonous and polluting organic and inorganic substances which are dissolved in water.

Examples: aqueous solutions of dichromate-sulphuric acid, lead-containing dyes, inorganic sulphides, acids. This drum must be labeled with the extra sticker containing the pictogram "corrosive and caustic".

Category 2: Inflammable fluids

Colour code = red.

Contents: Inflammable fluids, with any substances dissolved in them, unless they fall under other categories.

Contents: Organic solvents and any solute contained in them, unless they contain more than 50% water (see cat. 1A).

Examples: toluene, ethylacetate, pentane, hexane, ether, pyridine.

Category 3: Halogen-containing organic-chemical fluids.

Colour code = blue.

Contents: F-, Cl-, Br- or I-substituted organic-chemical substances, both liquid and solid, if dissolved in organic solvents.

Examples: dichloromethane, chloroform, trichloroethylene, ethylene bromide, methylene chloride, DDT or hexachlorocyclohexane in alcohol, paradichlorobenzene in ether.

Category 4: Waste oils.

Colour code = green.

Contents: spent lubricants and grease, derived from workplace and laboratory equipment (e.g. oil pumps, oil baths, etc.).

**Metallic mercury**

Metallic mercury and mercury-containing equipment are collected separately. It must be delivered in well-sealed packaging.

**Solid hazardous waste:**

Solid chemical waste can only be accepted if the waste is in well-sealed packaging which is clearly labeled.

The label must state:

- name and department of the producer
- name of the substance
- quantity of the substance
- (basic) formula of the substance

Large quantities of waste deriving from clean-up actions or transfers should be disposed of in consultation with the staff member responsible for hazardous waste.

**3. Biological and microbiological waste**

Biological waste includes all left-overs from microbiological work, plants, bodies, and human waste.

Biological and microbiological waste should be stored in the designated container or room.

Biological waste produced during experiments in which radioactive material is used falls under the regulations for radioactive waste (see no. 4).

Bodies of laboratory animals must be decapitated before disposal. The bucket can be temporarily stored in a freezer or cold-storage room. The authorized person is responsible for this.

■ **Laboratory animals that are not infected:** collect in a plastic bag and deposit in a specially sealable bucket for the disposal of biological waste carrying the label "BIOLOGICAL WASTE, BODIES", and also the date, workgroup, room number and telephone number.

■ **Human waste** like tissues and sera: collect in a specially sealable bucket for the disposal of biological waste carrying the label "BIOLOGICAL WASTE, HUMAN", and also the date, workgroup, room number and telephone number.

■ **Laboratory animals infected with micro-organisms:** deliver in well-sealed autoclaveable garbage bags in metal containers, labeled with autoclave tape.

■ **Microbiological waste** can be disposed of in two ways:

- 1. as industrial waste after autoclaving: the waste must be delivered in well-sealed autoclaveable garbage bags in metal containers, labeled with autoclave tape.
- 2. as biological material: the material is disposed of directly and should be collected in specially sealable plastic drums.

■ **Plant waste**

Plant waste is disposed of as industrial waste.

If the material was experimentally brought into contact with micro-organisms and may have become modified, the waste must be treated as microbiological waste (see above).

■

■ **Sharps/injection needles.**

Sharps derived from biological activities must be placed in the designated yellow pots for sharps (with biohazard sign). The pots are labeled with autoclave tape and disposed of as industrial waste after autoclaving.

Other sharp waste must be collected separately in a designated and labeled container. This container will be disposed of as industrial waste.

An exception is sharp waste that must be explicitly disposed of as hazardous waste (chemical) (see hazardous chemical waste).

#### 4. Radioactive waste

Radioactive waste includes all waste produced when working in B, C or D laboratories.

Disposing of possibly radioactive material down the drain or as household/industrial waste is strictly forbidden.

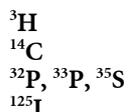
Distinctions are made between liquid waste, solid waste and counting vials:

■ **Liquid radioactive waste** should be collected in specially designated drums. There must not be any solid objects in the liquid waste (pipette tips, pasteur pipettes, paper, gel, etc.). Funnels must be fitted with a filter.

■ **Solid radioactive waste** must be collected in the designated drums.

■ **Counting vials** must be well sealed before collection exclusively in the designated waste drum.

A distinction should be made among the isotopes:



**Tape, stickers** and cartons with symbols or text concerning radioactivity should exclusively be disposed of in drums designated for  ${}^{14}\text{C}$  (solid waste).

The authorized service or employee will provide empty waste drums with the appropriate cards. When a drum is full, the local radiation technician submits the completed card, deposits it in the pigeonhole for radioactive waste or brings the waste to the storage area at the designated times.

The authorized employee is responsible for the further disposal and administrative processing of this waste.

## Appendix 7

### **Regulation concerning: Registration of hazardous substances**

The new guideline PGS-15 (publication Hazardous Substances nr. 15) of June 2005 has to be followed. This guideline states how to register, label and store hazardous substances.

In the new environmental permits (a permit which is needed for work activities, e.g. research) is stated that this new guideline needs to be followed.

The faculty regulations (determined in 2005, in which there is stated a minimal weight for hazardous substances which decides whether a substance needs to be registered or not) are put aside because of this new guideline. According to PGS-15 all hazardous substances (substances with a pictogram with orange background) have to be registered.

Next to the "Arbeidsinspectie" (AI) the following government instances also take a part of the registration of hazardous substances to make sure it happens correctly:

- Omgevingsdienst West Holland (of the Municipal Leiden)
- FIOD/ customs

Aid instances also need to be informed about hazardous substances during disasters (e.g. which substances are there in the building, where are these substances located and the amount in which the substances are present).

A researcher is requested to register the next data on all hazardous substances (the characteristics can be found on the labels or on the internet, MSDS):

- Room number
- CAS number
- Name of the substance (in English)
- Quantity (max. weight and volume, on the label)
- Risk level (on the label, pictogram)
- Risk- & safety-sentences (numbers, on the label)

This needs to be written down on an computer database with a standard format supplied by the faculty.

The registration of hazardous substances needs to be updated every year and when there is a for example delivery.

The data of carcinogen, mutated or reproductive toxic substances needs to be updated at least once a month.

## Regulations concerning: Labeling of hazardous substances

### Labeling of chemicals:

As a result of a visit of the “Arbeidsinspectie” in 2000, the Faculty Board put together the “Regulations concerning labeling of hazardous substances”. These regulations came in to existence with the help of the “arbo- & milieudienst” and the safety committees of this Faculty.

From January 1<sup>st</sup> 2006 there will be a reference to PGS-15 in the environmental permit, this is a guideline concerning hazardous substances in which is stated how hazardous substances should be registered, labeled and stored. The permit states that this guideline should be followed. The Scientific Director of the institute decides which departments of this institute should label the solutions.

### Regulations concerning labeling:

1. All solutions and non-hazardous substances in non-original packaging should have a label containing the following data:
  - Name of the substance or structure formula and, if possible, the CAS-number and concentration of the substance
  - Name of owner/ user
  - Date of purchase/ productionThis way of labeling also goes for hazardous substances in non-original packaging that can stay in a room for no more than one week.
2. Concentrated solutions of hazardous substances and organic substances or mixtures of these two should have pre-printed labels. These labels should contain the following data:
  - Name of the substance (when possible the concentration of the substance)
  - CAS-number
  - Risk pictogram
  - R- & S-numbers
  - Date of purchase or date of production*Exception:* when concerning substances that only stay in a room for a maximum of one week, labeling as stated under number 1 should suffice.
3. For preparations with unknown risks the following should be clearly written down on the label:
  - Name of the person who experimented with the substance
  - Date and time
  - Name or structure formula of the substance
  - And where the R-sentence should be the sentence: “Preparaat, onbekend risico”.
4. Solutions of acids and bases from and above concentration 1 M should have pre-printed labels like the ones mentioned in 2.  
When concerning substances that only stay in a room for a maximum of one week, labeling as stated under 1 should suffice.
5. Aqueous substances: diluted solutions of hazardous substances (toxic, irritable or inflammable) that are no longer considered hazardous (the original risk characteristics are literally dissolved) can be labeled as stated under 1. For the name of the substance the main component should be used (e.g. TRIS-buffer) or a logical name for the substance.
6. R&S-sentences should be shown with the letter(s) and the regarding number(s). Often there is no room on the label for the full sentences concerning these letter(s) and the regarding number(s). In the laboratories there should be a poster clearly showing the R&S-sentences and which letter(s) and number(s) should be used and how.

## Appendix 9

The legal regulations provide guidelines for the colours used as well as the forms and symbols. Colours used for safety instructions are **red** ("stop"; "prohibited"), **yellow** ("caution"; "possible hazard"), **green** ("no danger"; "help") and **blue** ("directions"; "permitted").

**Prohibitory signs** are round, have a red rim and diagonal bar and a black symbol on a white background.

**Warning signs** are triangular, have a black rim and a black symbol on a yellow background.

**Mandatory signs** are round with a white symbol on a blue background.

**Safety signs** are square with a white symbol on a green background.

### Prohibitory signs

(red rim and diagonal bar and a black symbol on a white background)

1. smoking prohibited
2. open fire prohibited
3. not for drinking
4. access prohibited
5. no access for people with a pacemaker



**Warning signs**

(black rim and symbol on a yellow background)

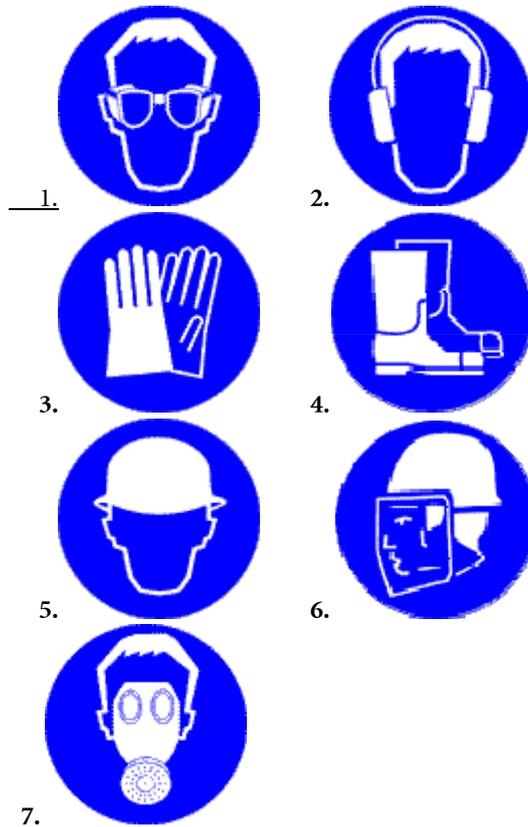
1. danger
2. hazardous electrical voltage
3. magnetic field
4. explosive substances
5. inflammable substances
6. oxydative substances
7. laser beam
8. biohazard
9. radioactive substances
10. corrosive substances
11. poisonous substances



**Mandatory signs**

(white symbol on blue background)

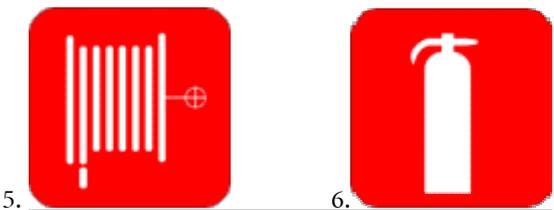
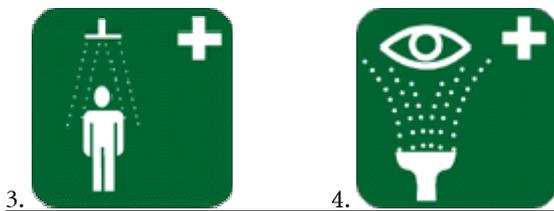
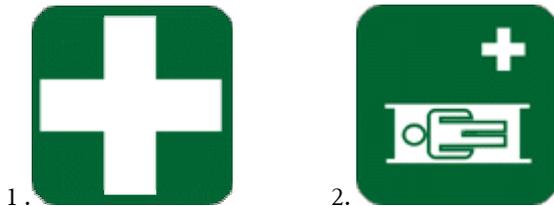
1. eye protection mandatory
2. hearing protection mandatory
3. gloves mandatory
4. safety shoes mandatory
5. safety helmet mandatory
6. face protection mandatory
7. respiration protection mandatory



**Safety signs (rescue)**

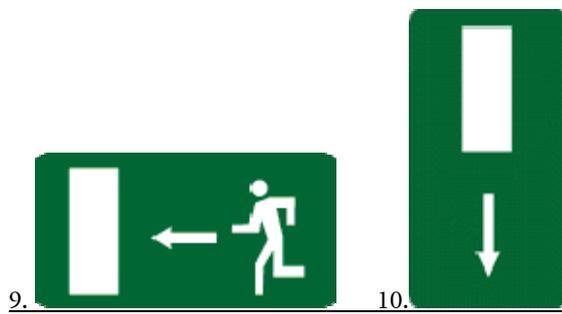
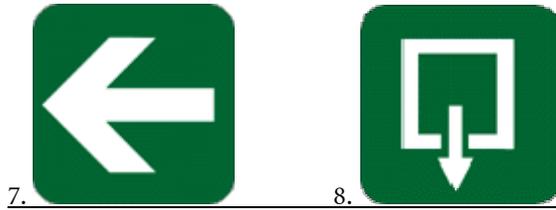
(white symbol on green or red background)

1. first aid post
2. brancard
3. emergency shower
4. eye shower
5. fire-hose
6. fire-extinguisher



**Safety signs (routing)**  
(white symbol on green background)

- 7. escape route direction
- 8. escape route – exit
- 9. escape route towards exit
- 10. exit



## Appendix 10: General information

### Reporting fire & accidents

Always dial the emergency number first! Remember that only a small fire can be extinguished without assistance. Also fill out an incident reporting form: online on AMD website or ask receptionist for a hardcopy.

<b>Building (reception)</b>	<b>Telephone reception</b>	<b>Alarm during office hours (08:00-18:00)</b>	<b>Alarm outside office hours (18:00-08:00)</b>
Gorlaeus Laboratory	4611/4400	4222	<b>4444</b>
Huygens complex	5700	5678	
Snellius	6969	6999	
Van Steenis	3500/3502	3501	
Sylvius	5000	5005	
Botanical Gardens	5144/5145	5001	

**Alarm outside of office hours: 4444 (18:00-08:00 hour)**

**Reporting general complaints:** the reception will refer you to the service or organisation which can handle your complaint..

### Reporting a technical disturbance

Gorlaeus/Huygens/Oortgebouw/ Kamerlingh Onnes/ Het Snellius: [TD@Science.Leidenuniv.nl](mailto:TD@Science.Leidenuniv.nl)

Outside office hours (emergency): 4600

### Department for safety and environment SCIENCE (AMD)

For questions or advice about work concerning safety, health or environment

Email: [AMD@Science.leidenuniv.nl](mailto:AMD@Science.leidenuniv.nl)

Info AMD: <http://www.amd.leidenuniv.nl>

### Contact information Centre for safety and environment (AMD)

[www.amd.leidenuniv.nl](http://www.amd.leidenuniv.nl)

For questions or advice concerning safety, health or environment per topic:

general:

[AMD@Science.leidenuniv.nl](mailto:AMD@Science.leidenuniv.nl)

biological safety:

[bvf@science.leidenuniv.nl](mailto:bvf@science.leidenuniv.nl)

ionising radiation:

[isotopen@science.leidenuniv.nl](mailto:isotopen@science.leidenuniv.nl)

emergency response:

[bhvorg@science.leidenuniv.nl](mailto:bhvorg@science.leidenuniv.nl)

### Employees AMD:

<b>Name</b>	<b>Phone/cell phone</b>	<b>Attention area</b>
<b>Marc Flutters</b> (Coordinator AMD)	4333 / 904333	(Biological) Safety Officer (BSO), Radiation Safety Expert, GROS
André Kamp	4662 / 904662	Biological) Safety Officer (BSO), AMD documents and website
Marjolijne Samwel-Luijt	4010 / 904010	Safety officer, chemicals, GROS, AMD documents and website
Peter Roemelé	5760 / 905760	Safety Officer Coordinator first aid/respons (BHV)
Jeroen Haars	4312 / 904312	Safety Officer Coordinator first aid/respons (BHV)