university of aveiro
department of chemistry
& CICECO

Safety First!
Booklet

Based on "*Guia de Segurança*"
by Pedro Domingues and Mário Simões

University of Aveiro
Department of Chemistry
& CICECO

Safety Booklet

February 2010

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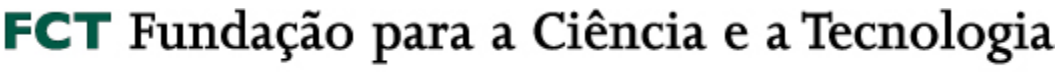


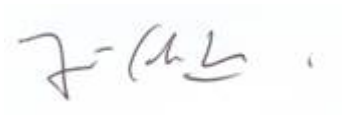
Preface and Acknowledgements

When safety rules are not carefully followed, accidents may happen in the chemistry laboratory, jeopardising the security of researchers. The main purpose of this booklet is to help you work safely and avoid accidents, presenting you with a summary of the most relevant information needed to work in the laboratory. It is, thus, crucial that you read and understand the content of this booklet before you start your laboratory work. When in doubt, please stop and seek expert advice.

This brochure was organised by Dr. Filipe Paz (the sections on biological materials and nanosafety were written by, respectively, Dr. Iola Duarte and Prof. Tito Trindade) and is based on previous documents produced by the Safety Committee of the Department of Chemistry, University of Aveiro, over many years, in particular the Portuguese book "*Guia de Segurança*", by Profs. Pedro Domingues and Mário Simões, and its short version in English, available only in electronic format. We would like to thank these colleagues and also Prof. Diana Pinto for their valuable contributions.

A booklet like this is never completely finished, it should be reviewed after a few years. Any suggestions for new sections, revisions, corrections, etc., to be included in a future edition are welcome and should be sent to the Safety Executives.

João Rocha



(Director of CICECO)

Carlos Pascoal Neto

(Head of Chemistry Department)

Contents

1. Useful Information

National Emergency Number: 112

University Security: 22244, 919727747 or 234370945

Hospital Infante D. Pedro (Aveiro): 234378300

Firemen – Bombeiros Velhos: 234422122

Firemen – Bombeiros Novos: 234422333

Intoxications: 808250143

Contacts

Safety Committee of the Department of Chemistry

E-mail: seguranca-dq@dq.ua.pt

Safety Committee of CICECO

E-mail: safetycommission@ciceco.ua.pt

2. Organization

The implementation of the safety policy described in this booklet is the responsibility of the Head of Department of Chemistry and Director of CICECO.

A joint Safety Committee has been established, composed of members of staff from all research areas. This Committee meets several times per year to discuss and plan relevant matters concerning safety aspects. These meetings are coordinated by the Safety Committee Chair who is also the Head of Department of Chemistry.

For each CICECO laboratory and Department of Chemistry group there is a senior responsible person. This scientist is in charge of ensuring locally the health and safety of students, staff and visitors.

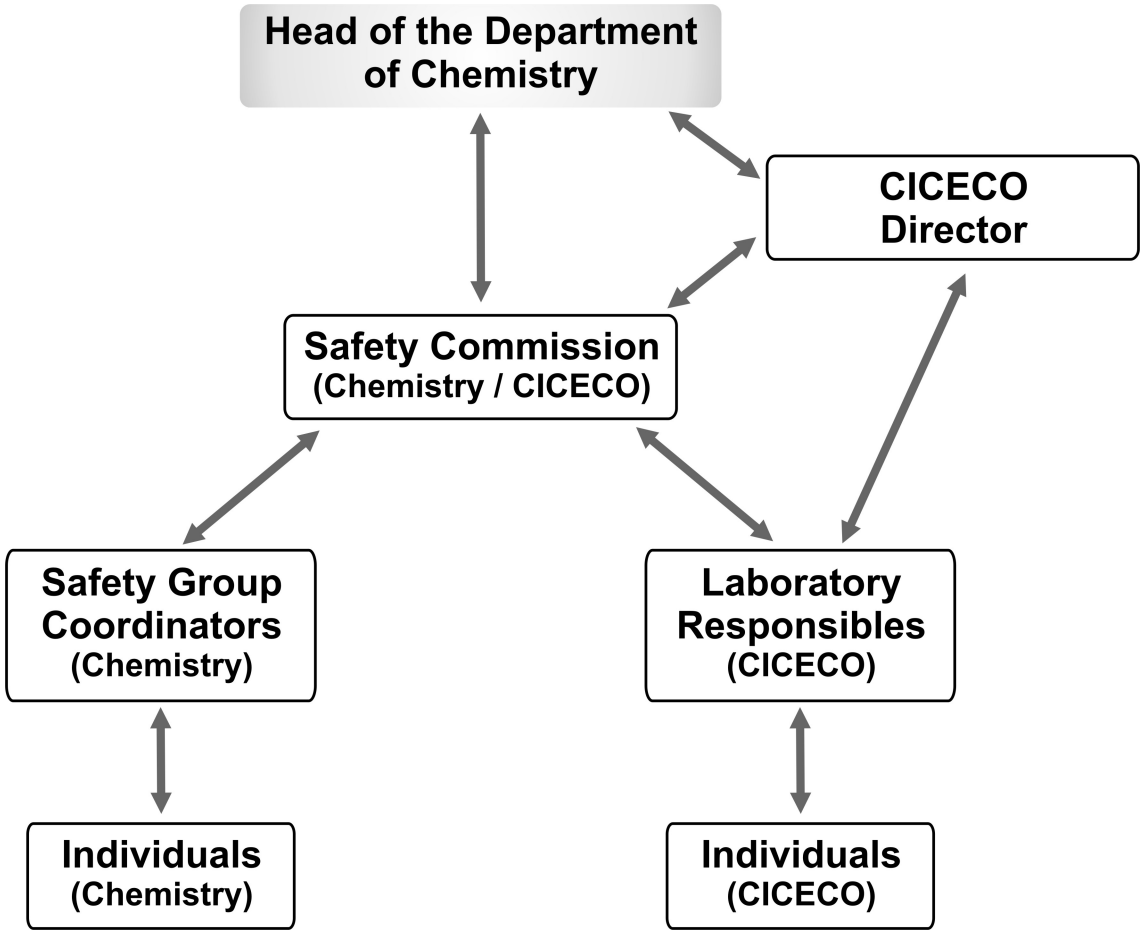


Figure 1 – Reporting lines for all safety aspects.

3. Personal Conduct Inside the Buildings

3.1 General

Do not ignore the safety signs and warnings. These have been installed in key locations throughout the two Chemistry buildings and aim at your personal safety.

Eating and drinking is not allowed inside laboratories and other working areas containing potential contaminants.

Maintain your working area clean and organized. Do not leave unattended experiments or unidentified substances.

Supervisors are expected to deal with minor breaches in the safety protocol summarized in this booklet. Major breaches or repeated unacceptable behavior should be reported to the Safety Commission and the Head of the Department of Chemistry.

3.2 Fire Safety

Do not store large amounts of paper inside the laboratories and especially in the vicinity of chemicals.

Corridors and staircases must be kept clear at all times as they provide the escaping routes for emergency situations.

Ensure that all provided fire-fighting equipment is immediately accessible to everyone. Do not use the sandboxes or the fire extinguishers as, for example, door stoppers.

4. Access to the Chemistry Buildings and Laboratories

4.1 Normal Working Hours

The normal working hours of the Chemistry Department of the Aveiro University is from 8:00 to 18.00 from Monday to Friday. The presence of students or post-doctoral researchers in the building after midnight (weekends included) is not allowed.

In case of a special need, you must consult your supervisor(s) who should contact i) the Safety Commission, ii) CICECO Directing Board and iii) the Head of the Department of Chemistry explaining the reasons why it is necessary to be inside the buildings after midnight.

4.2 Outside Normal Working Hours

All researchers/staff members working in the Department of Chemistry and Technological Laboratories after 20:00 in the evening (normal working days) and on weekends must sign the register log book, kept at the Northeast entrances of the Chemistry Department and Technological Laboratories. This register will be used by the emergency services to account for personnel working outside normal hours. It will assist night security patrol officers. Systematic fail to abide by this rule may result in the removal of the electronic access card to the buildings.

Category 1 work can be performed anytime after hours, as it poses no threat to safety.

Category 2 work should only be conducted until 23:30. However, it is recommended that category 2 work is completed by 22:00 every night. The presence of another person in the laboratory is strongly advised. If this requisite can not be fulfilled, at least, some one in the same floor of the building should be aware of the experiment in course

Category 3 work should not be carried out, under any circumstances, outside normal working hours. Any exception to this rule must be discussed with your supervisor(s) and the Safety Committee.

5. Procedures in Case of an Emergency

5.1 Injuries

For minor injuries there are several first aid boxes (two on each floor of the Technological Laboratories) which should be used only in case of an accident. If you need to use any product from the box, please inform the Safety Executive of your research area so it can be replaced.

In case of a serious injury you should follow these basic rules:

- Only remove the person(s) from danger if it does not risk your own safety;
- Apply first aid care if appropriate and only if you know what to do;
- Telephone immediately to the emergency services (**112**);
- Please ensure you give clear instructions in order to find the casualties;
- If there is more than one person in the vicinity, one should stay near the casualty while the other goes for help.
- If you are working outside normal working hours, call immediately the security staff: 22 244 or 234 370 945 or 919 727 747 (the security staff will call an ambulance, if required).
- Once help arrives do what they tell you. Please be prepared to answer questions regarding he casualty. Do not interfere with the treatment / aid.

Reporting accidents or safety hazards:

All accidents, injuries and any potential safety hazard must be reported within 24 hours to the Safety Committee members, to the Head of the Department of Chemistry or to the Laboratory Safety Coordinator.

5.2 Evacuation

On hearing the fire alarm or a request to evacuate the building or the laboratory, all occupants must leave immediately, in an orderly fashion, using the nearest exit.

In the case of an alarm, it should never be assumed that the alarm is being tested or has developed a fault.

The Laboratory Safety Coordinators will coordinate the evacuation. The Safety Committee and the Laboratory Safety Coordinators will ensure that all areas of the building have been evacuated.

5.3 Specific Evacuation Instructions

In the activation of the fire alarm, if possible switch off all electric equipment, close open windows and shut (**do not key lock!**) the room/laboratory door if you are the last to leave.

Make sure that your experiments are safe (switch off the heating, vacuum lines, etc.)
Do not stop to collect personal belongings
Do not use the lifts
Proceed quickly (do not run) to the nearest exit
Proceed as instructed to the area outside of the main entrance doors
Do not return to the buildings until the "all clear" is given.

5.4 Activating the Fire Alarm

If the alarm was triggered automatically, proceed as described in section 5.2.

If the situation is serious (*e.g.*, a major fire) and the alarm has not been automatically triggered, please operate manually the fire alarm by pushing the glass on the nearest fire alarm call point.

6. Risk Assessment

6.1 Identification/Risk Evaluation of Hazardous Substances

Many compounds located in the laboratories are known to have hazardous properties (*e.g.*, toxicity or corrosive properties, or both), which may cause harm if handled improperly.

The most important generalization regarding chemical safety in research is to treat all compounds as potentially harmful, especially new and unfamiliar materials, and work with them under appropriate conditions to minimize exposure to skin contact and inhalation.

For your personal safety, consult always the MSDS (Material Safety Data Sheets) of the chemicals with which you are going to work. This information should be kept in the laboratories, preferably nearby the chemical inventory, and in your personal lab notebook.

6.2 Experimental Risk Assessment

Before members of staff or students can start any new experimental work in the laboratory, a **Risk Assessment** must be carried out with the help of a supervisor. In case of a doubt, the responsible of the laboratory or a member of the Safety Committee should be consulted.

The aim of this assessment is to minimize the health risk from working with hazardous substances. This is achieved by:

i) ensuring the availability of adequate information about the substance;
ii) stipulating which assessments must be performed to determine if there is a risk of exposure to a given hazardous substance;
iii) if indeed there is a risk of exposure, which precautions should taken so it can be controlled.

*The **risk assessment** procedure requires the examination of materials and processes:*

1. Information on all substances to be used during the experimental procedure MUST be examined and reviewed (use MSDS and consultation with supervisors). This information must be registered in your laboratory notebook, which should always be kept in the laboratory. The MSDS of all chemicals should also be archived in your laboratory notebook and in the safety folder of your laboratory.
2. Assessment of the risk to health using any hazardous substance or process under the experimental conditions proposed.
3. A decision of the level of risk associated with the experiment must be performed.

Levels of Risk

Category 1 - Minimal Risk

The procedure does not involve the handling of chemicals except for spectroscopic or other measurements on small samples of non-hazardous material.

Category 2 - Low Risk

a) Fume hood recommended: procedures involving exposure to low-risk chemicals, *e.g.*, small scale reactions, solvent transfers, drying and extraction, chromatography, refluxing.
b) Fume hood essential for the following: procedures involving the small-scale use of chemicals known to be mildly toxic, irritant, corrosive or allergenic. Small quantities of non-commercial compounds not yet classified, where no data is available (could assume low risk based on personal experience of similar compounds). Reaction volumes restricted to less than 500 mL of flammable solvent or, if distilling, to less than 2 L of flammable solvent.

Category 3 - Significant Risk

Special precautions are required depending on the nature of the hazard.

7. Standard Procedures for Working with Hazardous Chemicals

7.1 Acquisition of Chemical Products

The decision to purchase a hazardous chemical is a commitment to handle and use it in a proper fashion from its initial receipt to the final disposal.

Please consult your supervisor for details about this subject.

7.2 Hazardous Chemical Storage

Received chemicals must be moved to the designated storage areas in your laboratory. Chemicals should be segregated by hazard classification and compatibility (see individual MSDS sheets for detailed information) in a well-identified area. Chemicals on top of benches should be kept to a minimum at all times.

The Group Safety Coordinator shall conduct monthly inspections of the laboratory to check for chemicals outside of the respective storage area. Chemicals not in use shall be returned immediately to the storage area.

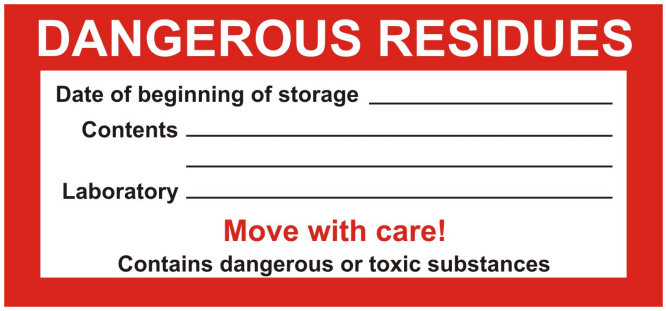
Substances which have been synthesized for the first time must be stored in a safe manner.

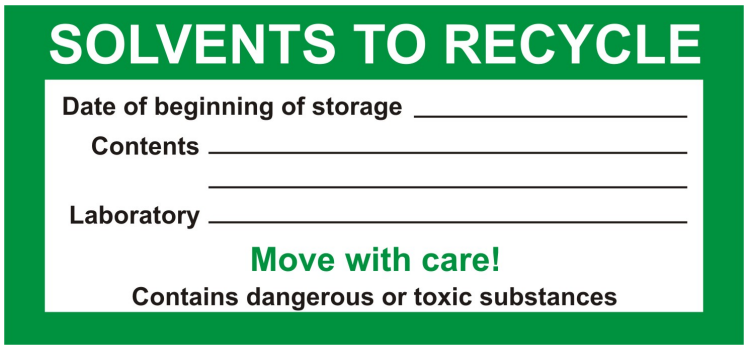
All products in the laboratory must be properly labeled. A chemical inventory for each laboratory should be kept updated and placed in a visible location for consultation.

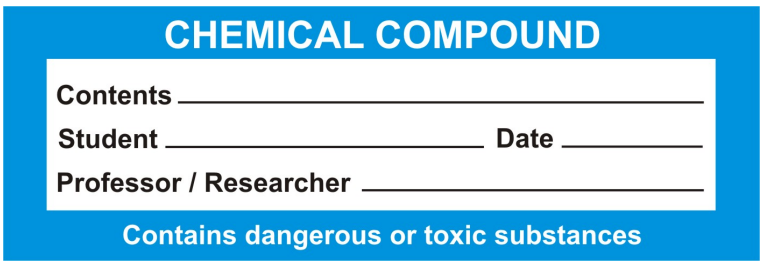
7.3 Handling Hazardous Chemicals

The following precautions should be followed during the handling and use of all laboratory chemicals:

- The use of lab coat and safety goggles is mandatory in all laboratories.
- Each laboratory worker is directly responsible for the cleanliness of the corresponding workspace.
- Wash all areas of exposed skin prior to leaving the laboratory.
- It is forbidden to eat, drink, smoke, chew gum or apply cosmetics in the laboratory.
- It is also forbidden to work in the laboratory while wearing personal music devices and headphones.
- Mouth suction for pipetting or starting a siphon is prohibited.
- Refrigerators, glassware and utensils used for laboratory operations shall not be used for the storage, handling or consumption of food.
- Substances of unknown hazard are assumed to be hazardous. Any chemical mixture are assumed to be, at least, as hazardous as its most hazardous component.
- Laboratory workers must be familiar with the chemical's hazards as determined from the MSDS.
- The presence of unlabeled chemical products is not permitted in the laboratory. Electronic files of the labels for the correct labeling can be downloaded from the safety pages of the Department of Chemistry:







- Specific precautions based on the hazardous characteristics of individual chemicals must be discussed with your supervisor.
- Flammable substances are among the most common hazardous materials found in the laboratory; these should be handled only in areas free of ignition sources (open flames, ignition sources that include electrical equipment, static electricity and, for some materials, *e.g.* carbon disulfide, even hot surfaces).
- Never heat a flammable substance with an open flame.
- A laboratory fume hood should be used whenever you work with appreciable quantities of flammable substances.
- Special precautions are required for the safe use of potentially explosive materials. It is of the responsibility of the researcher to evaluate the explosive hazards involved in his/her work and to consult with her/his supervisor(s) to develop adequate standard operating procedures for any work involving potentially explosive substances.
- Organic peroxides are among the most hazardous substances handled in research laboratories. As a class, they are low-power explosives, hazardous because of their sensitivity to shock, sparks and even friction (as in a cap being twisted open).

7.4 Gloves

Alongside with the lab coat and safety glasses, the use of gloves is mandatory for all laboratory work involving the use of chemicals. Appropriate gloves (selected according to the type of experiment and chemicals used – see table below) should:

- Be of adequate size and ergonomy.
- Protect the wearer from accidental contact with hazardous substances which may be absorbed by the skin, cause irritation or destroy tissues by corrosion.
- Allow protection of the wearer against extreme cold (*e.g.*, the use of cryogenic liquids), extreme high temperature (*e.g.*, when working with ovens), and against electricity.

Do not use gloves when working with heavy machinery with rotating parts. Gloves may be stuck in the components and lead to serious injuries. In addition, gloves should be carefully inspected for tears or holes before being used, and should be immediately disposed in a safe manner if they become contaminated.

Please remember: it is encouraged **not to reutilize gloves** because if a contaminant is transferred into the inside a glove, contamination will always occur, independently of the care in the selection of the most adequate type of glove.

Selection of the most suitable gloves

The following table summarizes the international standard recommendations of the most suitable gloves for one given application. *Source*: HSE guidance note INDG330.

Chemical Family	Natural rubber (latex)	Nitrile	Neoprene	PVC	Butyl	VitonTM
Water miscible substances	√	√	√	√	—	—
Weak acids and bases	√	√	√	√	—	—
Oils	—	√	—	—	—	—
Chlorinated hydrocarbons	—	—	—	—	—	√
Aromatic solvents	—	—	—	—	—	√
Aliphatic solvents	—	√	—	—	—	√
Strong acids	—	—	—	—	√	—
Strong bases	—	—	√	—	—	—
PCBs	—	—	—	—	—	√

In some experimental situations double gloving may be appropriate - if a spill occurs, hands will be protected after the contaminated outer gloves are removed.

Glove limitations

Be aware that, at one point, a protective glove will fail to protect the wearer from exposure to the chemical substances via, at least, one of the following processes:

Permeation: chemicals migrate through the glove at a molecular level.

Penetration: chemicals flow through pinholes, closures or imperfections.

Degradation: destruction of the physical properties / integrity of the glove leads to exposure to the chemicals.

Latex gloves

Latex allergy is a reality in all laboratories. Whenever possible, glove alternatives should be always be pursued. In this context, their use should be limited to only those situations where they are the safest possible way to work with the chemicals, and that a risk assessment study has been performed.

If you have been diagnosed with latex allergy, **you are obliged to inform** your co-workers, supervisor(s) and laboratory responsible. Ensure that they know how to proceed in case of emergency.

7.5 Laboratory Coats

The use of clean and properly fastened laboratory coats is mandatory in all laboratories and working places where hazardous chemicals are being handled

Their objective is to serve as a first barrier to the accidental spillage of chemicals. If you do not wear one, your clothes may be destroyed by a first aider in the case of the occurrence of an accident.

Laboratory coats should remain clean at all times and should be changed, at least, once per week or when they become contaminated. When exhibiting signs of deterioration such as permanent stains or holes they should be replaced.

7.6 Safety Glasses

Everyone (students, members of staff and visitors) present inside a laboratory or working place are **obliged to wear safety glasses at all times**. It is the responsibility of the person escorting the visitors that safety glasses are worn when required.

Ordinary glasses do not provide adequate protection.

7.7 Footwear

Footwear should provide full protection of the feet at all times against small accidents and spillage of chemicals. Open footwear such as sandals do not provide good protection and their use is not encouraged.

When transporting heavy equipment or gas cylinders ensure that you are wearing adequate footwear in order to avoid falling or tripping.

7.8 Masks

Masks should be worn when additional protection measures are necessary. Please note that they only provide protection to those wearing them.

As a good practice in the laboratory, their use should not be needed. They should be used in the following circumstances:

- during failures of the ventilation system of the laboratories.
- for short duration exposures (*e.g.*, while work with silica).

8. Standard Procedures for Working with Particularly Hazardous Chemicals

Some substances pose such significant threats to human health and are therefore classified as **Particularly Hazardous Substances** (PHSs). There are three categories of *Particularly Hazardous Substances:* carcinogens, embryotoxins and compounds with special toxicity. A complete and updated list can be found in the Safety pages of the Department of Chemistry web site.

Working with Carcinogens

A chemical product is considered a carcinogen if the International Agency for Cancer Research (IARC) has classified it as carcinogen, or potentially carcinogen, or if it is clearly stated in its MSDS.

The use of compounds classified as carcinogenic to humans (group 1) and probably carcinogenic to humans (group 2A) in the Department of Chemistry and Technological Laboratories is confined only to those research groups having the required laboratory safety conditions. Please consult your supervisor(s) for more information about this issue.

Laboratory work with compounds that are possibly carcinogenic to humans (group 2B) is permitted only after the submission to the Safety Committee of a specific form for each product. An example of the bilingual form is provided in the following pages. The electronic version to be filled can be downloaded from the web site of the Department of Chemistry.

Working with Embryotoxins

Working with embryotoxins is not permitted for pregnant women. Embryotoxins must be handled accordingly with the protocols established for compounds with special toxicity.

Working with Compounds with Special Toxicity

You can find a partial list of substances with a high degree of acute toxicity which may be present in the Department Chemistry on the safety web pages. The list is not intended to be complete, and it is the responsibility of the laboratory worker, in consultation with the Laboratory Safety Coordinator, to evaluate each compound involved in his/her work. In the web site you can also find the criteria for the classification of compounds with special toxicity.

Working with this class of compounds is only allowed after consultation with the Safety Committee. Please do not acquire or handle any product of this class before consulting with your Supervisor and the Safety Committee.

Working with Potential Explosive Substances

It is the responsibility of the laboratory worker, in consultation with his/her supervisor(s), to evaluate each compound involved in his/her work. Students **must** consult their supervisor(s) before working with one of the following substances: acetylenic compounds, aluminum chloride, ammonia (reacts with iodine), benzoyl peroxide, carbon disulfide, chlorine, dimethyl sulfoxide (with halogenated compounds), diethyl, diisopropyl and other ethers, ethylene oxide, sodium, potassium or other active metals, hydrogen peroxide stronger than 3%, liquid-nitrogen cooled traps, lithium aluminum hydride, oxygen cylinders, palladium or platinum on carbon, platinum oxide, Raney nickel and other catalysts, perchlorates, permanganates (are explosive when treated with sulfuric acid), peroxides (inorganic), phosphorus (red and white), phosphorus trichloride and m-Chloroperbenzoic acid.

Note: Residues from vacuum distillations have been known to explode when the apparatus was vented to the air before the residue was properly cooled to ambient temperature.

Requisição para a Aquisição e/ou Utilização de Substâncias Carcinogénicas, Embriotóxicas e Especialmente Tóxicas

Form for the Purchase and/or Utilization of Carcinogenic, Embryotoxic and Specially Toxic Compounds

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I. Docente / Investigador Responsável *Supervisor* **Contacto** *Contact*

II. Substância *Compound*

Nome *Name*

CAS ***Nota:* adicionar MSDS em anexo** *Note: add MSDS as an attachment*

Local de utilização *Room / Laboratory*

Tipo de utilização *Periodicity of Use* ☐ **Regular** *Regular* ☐ **Irregular** *Irregular*

Período de utilização *Period of Use*

Quantidade máx. a usar *Max. quantity to be used*

Local de Armazenagem *Storage location*

Quantidade a adquirir *Quantity to be purchased*

III. Descrição do modo de utilização da substância
Description how the compound will be used

IV. Investigadores que poderão ser expostos à substância perigosa
Researchers who may be in contact with the hazardous compound
- Investigadores autorizados a utilizar a substância
- Authorized researchers to use the compound

1.
2.
3.
4.

- Outros investigadores que trabalham no local onde a substância será utilizada

- Other researchers who work in the laboratory where the hazardous compound will be used

		Rúbrica *Signature*
1.		
2.		
3.		
4.		
5.		
6.		
7.		

V. Descontaminação e eliminação

Decontamination and elimination

- Métodos de descontaminação

- Decontamination procedures

- Métodos de limpeza da área de trabalho (inclui equipamento e bancadas)

- Workplace cleaning procedures (including equipment and benches)

- Procedimentos de eliminação (intermediários, resíduos e substância não usada)

- Removal procedures (intermediate compounds, residues and unused compound)

VI. Procedimentos de emergência (inalação, ingestão e inoculação)

Emergency procedures (when inhaled, ingested and for inoculation)

Assinaturas *Signatures*

Orientador(es) *Supervisor(s)*

Utilizador(es) *User(s)*

Data *Date*

9. Standard Procedures for Working with Human Body Fluids (e.g., Blood Plasma, Urine) and Tissues

When handling human body fluids (*e.g.*, blood plasma, urine), tissues and cells, Biosafety Level 2 practices and procedures must be followed. All samples should be treated as if they are infectious. For additional details on the Biosafety levels see the following manual from the World Health Organization: http://www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf.

9.1 General Recommendations:

a) Plan your work carefully and proceed conscientiously.
b) Use a well-delimited laboratory work surface, wipe it before using with 70% alcohol or an appropriate disinfectant solution and upon completion of the work activity. Clean up all spills immediately.
c) All samples must be kept in well-sealed vials and containers. A secure leakproof lid should be used for transport. Avoid external contamination of the outside of vials and containers.
d) Class 2 Biological Safety Cabinets should be used whenever there is a high potential to produce droplets or aerosols of infectious materials. This includes blending, sonicating, vigorous mixing (vortexing), and homogenization. Biological safety cabinets are not needed for other routine work.
d) Hepatitis B vaccination is recommended.

9.2 Personal Protective Equipment

a) Laboratory Coats: Long sleeved garments should be used to minimize the contamination of skin or street clothes; Protective clothing must be removed and left in the laboratory before leaving to non-laboratory areas.
b) Gloves: they must be worn at all times when working with biological samples following the guidelines of section 7.4. Gloves must be removed correctly in order to avoid contamination and discarded as infectious waste. Hand wash thoroughly immediately after removing gloves.
c) Masks and protective eyewear must be worn to prevent exposure of mucous membranes of the mouth, nose, and eyes during procedures which are likely to generate splashes or splatters of blood or other body fluids.

9.3 Pipettes

a) **Mouth pipetting is strictly forbidden**. Mechanical pipetting devices must be used in the laboratory.
b) When pipetting, avoid accidental release of droplets. Use a disinfectant soaked towel on the work surface and dispose as infectious waste after use.
c) Discard contaminated disposable pipettes using an appropriate sharps-container and autoclave the container when it is 2/3 to 3/4 full. Dispose as infectious waste.

9.4 Syringes and Needles

Syringes and needles are dangerous instruments. Their use should be restricted to procedures for which there is no alternative. When needles and syringes must be used, the following procedures are recommended:

a) Wear gloves.
b) Use disposable safety-engineered needle-locking syringe units whenever possible.
c) Used disposable needles and syringes must be placed in appropriate puncture-resistant containers and discarded as infectious waste.

d) Fill the syringe carefully to minimize air bubbles. Expel the air, liquid and bubbles from the syringe vertically into a cotton pledget moistened with disinfectant.

9.5 Safe Use of Biological Safety Cabinets

a) Limit traffic in the area when the cabinet is in use.
b) Minimize the storage of materials inside and around the cabinet.
c) Before using, wipe the working surface with 70% alcohol or an appropriate disinfectant solution. Wipe off each item you need for your procedures and place them inside the cabinet.
d) Use a sheet with disinfectant and/or a sharps container inside the cabinet for pipette discards. Do not use vertical pipette discard canisters on the floor outside cabinet.
e) Clean up all spills inside the cabinet immediately.
f) If you use a piece of equipment which creates air turbulence inside the cabinet (such as a centrifuge or a blender) locate the equipment in the back 1/3 of the cabinet; stop other work while the equipment is operating.
g) When work is completed remove all materials and wipe all the interior surfaces with 70% alcohol or an appropriate disinfectant solution.

9.6 Infectious Waste

a) Used sharps must be segregated into sharps containers marked with the universal biohazard symbol. Sharps containers may be used until 2/3-3/4 full, at which time they must be decontaminated, preferably by autoclaving, and disposed of as infectious waste.
b) Fluids in volumes greater than 20 mL which are discarded as infectious waste must be segregated in appropriate containers (leak proof, break-resistant, tightly lidded and marked with the universal biohazard symbol). Fluids in volumes greater than 20 mL may be decontaminated (by autoclaving or exposure to an appropriate disinfectant), then flushed into the sanitary sewer system. The pouring of these wastes must be accompanied by large amounts of water. The empty fluid container may be autoclaved, then discarded with other infectious waste if it is disposable or autoclaved and washed if reusable.
c) Other infectious waste must be discarded directly into containers or plastic (polypropylene) autoclave bags which must be clearly identifiable and distinguishable from general waste. Autoclave bags must be distinctly colored red or orange, and marked with the universal biohazard symbol. These bags must not be used for any other materials or purpose.

10. Nano-Safety

These are basic rules that one should be aware when working with nanoparticles in a research laboratory. In fact, these rules are general and also apply to other chemical substances which are routinely used in different research contexts.

What makes nanoparticles particularly different is their small size and lack of studies reporting their interactions with biological systems.

One should handle these materials with additional care in order to avoid direct exposure. Although this seems obvious for well-known toxic substances, whether in bulk or in solution (*e.g.*, Cd containing materials), it should also apply to less toxic substances (*e.g.*, TiO_2).

When working with nanoparticles:

1. Always check the MSDS files of any compound that you are planning to use or to synthesise. Discuss with your supervisor if you have any questions related to these issues.
2. As a rule you should handle and synthesise nanoparticles using wet chemical methods. Although in this case the nanoparticles are confined in a solution you should wear adequate protective gloves and work in a clean bench.
3. Do not perform any activities involving production of dust or nanopowders in a free form. The only situation in which you have to handle powders is the characterization or processing of materials, following the respective synthesis. Typically you just need to isolate the product of the synthesis (filtering, centrifugation, magnetic separation), which is usually a small amount of sample that can be placed safely in a vial or sample holder. Finally, keep the samples in vials and store all samples inside a labelled box.
4. Place all the wastes containing nanoparticles in a recipient as solutions/suspensions containing dissolved metal species. These wastes will be treated and disposable using the established practices in the laboratory.

Final Note

The word nano is relatively recent, thus might originate some concern and afraid. However, the aforementioned rules apply to a number of chemicals that we normally use in the laboratory. Therefore these rules should remind us of our duty to read the safety manual of the Chemistry Department.

11. Gas Safety

11.1 Compressed Gas Cylinders: Hazards

Gas cylinders should **only be handled by those who have received specific training** to do so.

If damage, *e.g.*, due to improper use of the cylinders or the regulators, the high pressures inside the cylinders will make them behave like rockets. Pressure can also increase inside due to the increase in external temperature. For example, some cylinders can explode at temperatures around 50 ºC. In this context, have extra care where you store your gas cylinders inside the laboratories. Avoid at all costs the proximity with external sources of heat (*e.g.*, an oven for drying material).

Full size gas cylinders are very heavy and difficult to handle. Never do it alone and always use specific trolleys to carry them. Serious injuries arise from falling cylinders. If this happens, **do not try to catch it**. Storage of cylinders inside the laboratories requires a safety locking system which avoids their fall.

11.2 Cryogenic Gases

Liquefied gases (*e.g.*, liquid nitrogen) can cause severe cold burns when in direct contact with skin and soft tissues like the eyes.

Small amounts of a liquefied gas (*e.g.*, a few litres) can evaporate into large quantities of air, severely depleting the atmosphere from breathable oxygen. Air has an oxygen concentration of approximately 21% in volume, with the remaining being composed essentially of nitrogen (78%) and argon (1%). Atmospheres containing less than 19% of oxygen are considered depleted and it is already not safe to breathe. For concentrations around 12-14%, the respiration rate increases and the individual will feel dizzy. Below 11% of oxygen the individual will faint, suffer brain damage and, ultimately, will die by asphyxiation.

Please note: **this process is painless and the individual will not have any warning of danger**.

Basic guides to work with liquefied gases

- Oxygen level monitoring equipment is strongly advised in rooms where accidents involving the spillage of large amounts of liquefied gases may occur. In their absence ensure that the areas are well ventilated.
- Only use containers which have been specifically designed for these gases.
- Do not accompany cryogenic vessels in lifts. Open dewars are **forbidden** to enter the lifts.
- Always use protective clothing when transferring cryogens

11.3 Piped Gases

Nitrogen (N45 and N50) and ArK are supplied as piped gases in almost all laboratories of the two buildings. These gases are, in principle, permanently available but their use is controlled by a registration which is available at each safety valve in all laboratories.

Hydrogen (H_2) and oxygen (O_2) are distributed as piped gases for the two buildings of the Department of Chemistry. Their use is, essentially, for instrumentation and has specific rules which are described in the following pages. Only researchers who have been trained and received the approval of the Safety Committee are allowed to request the opening of the gases. A specific form which indicates the use of these gases is also available and its presence during an experiment is mandatory.

Rules for the Use of the Internal Distribution System of Hydrogen

Initial Considerations

- The internal distribution system of hydrogen (IDSH) of the Department of Chemistry and the Technological Laboratories of the University of Aveiro has specific points of utilization inside rooms 15.2.29, 29.1.05, 29.1.13, 29.2.10, 29.3.19 and 29.3.21.
- The IDSH is composed of two independent partial pipelines, one in building 15 (Chemistry) and the other in building 29 (Technological Laboratories), connected to the central cylinder gas storage house located in-between the two buildings.
- The access to the gas storage house is restricted to authorized staff. Authorization is conceded, canceled or renewed solely by the President of the Directing Board of the Department of Chemistry.
- When specific equipment is not being used, the safety shutoff valves in each point of utilization must be, without exceptions, closed.
- Rooms with points of utilization should have, without exception, a hydrogen leaking detector.
- The hours of opening and closing of the hydrogen pipeline (global or partial according the formal electronic requisition) should be registered and signed in a specific log book by the authorized member of staff.
- All Professors/Researchers which are authorized by the Safety Commission to open the partial pipelines of hydrogen should be trained for that purpose. Dr. Dulce Helena Teixeira will be responsible for the individual training.

Opening of the Hydrogen Pipeline during Working Days

- The opening of the hydrogen pipeline will be performed by authorized members of staff after formal requisition to the Stores by electronic mail (armazem.gases@dq.ua.pt) in the day prior to that of the utilization.
- The electronic message should contain the following information: identification of the pipeline to be opened (HYDROGEN), time of opening, predicted time of closing, user, equipment, building and room.
- The requisition for the opening of the hydrogen pipeline by e-mail is only allowed to:

Anabela Valente	Dmitry Evtugin	Mário Simões
Armando Silvestre	Dulce Helena Teixeira	Pedro Costa
Carlos Manuel Silva	Filipe Figueiredo	Sílvia Rocha
Carlos Pascoal Neto	Filipe Oliveira	Teresa Gomes
Celeste Azevedo	Manuel António Coimbra	Valdemer Esteves

Closing of the Hydrogen Pipeline during Working Days

a) Closing during normal working schedule (before 17:30 pm)

- The hydrogen pipeline will be closed at 17 hours and 30 minutes. The procedure will happen in three different locations: at the gas storage house, in the central shutoff valve of building 15 (Chemistry) and in the central shutoff valve of building 29 (Technological Laboratories).
- Only the following members of staff are allowed to close the hydrogen pipeline:

Ana Paula Fernandes	António Morais
Tiago Thorn	Dulce Helena Teixeira
Pedro Alves	

b) Closing after 17:30 pm

- In exceptional cases, the partial hydrogen pipelines could be closed after 17 hours and 30 minutes. In these cases, the shutoff of the partial hydrogen pipeline could only performed by authorized users.
- Potential authorized users:
  i) Professors/Researchers after formal request to the Safety Commission.
  ii) Ph.D. students and post-doctoral research associates after formal request by their supervisor to the Safety Commission and official granted authorization.
- This procedure should directed the following rules:
  - Authorized users to close the partial hydrogen pipelines should ask until 16:00 pm at the Stores of the Department of Chemistry the access keys to the main shutoff valves of their building.
  - The presence of another researcher in the building is mandatory, preferably in a nearby location to that of the instrument connected to the hydrogen pipeline, and with knowledge that the instrument is in use.
  - The authorized user is responsible for the safe closing of the partial pipeline of hydrogen at the shutoff valve of the building.
  - In the immediately following working day the key should be returned in person to the Stores. The delivery should be registered by the member of staff and signed by the authorized user.
  - If no formal request for the opening of the hydrogen pipeline is filed for the immediately following working day, the central shutoff at the gas storage house will be performed at 09:30 am by an authorized member of staff.

Use of the Hydrogen Pipeline Before 09:15 am during Working Days, at Weekends or at National Holidays

- The use of the hydrogen pipeline on working days before 09:15 am, at weekends or national holidays is of exceptional nature and will abide by the following rules:
  - The opening of the partial hydrogen pipeline is only allowed to Professors/Researchers who have filed a formal request to the Safety Commission. They should be responsible for opening in person and safely the partial hydrogen pipeline at the shutoff valve.
  - The authorization for the opening of the partial pipeline during working days prior to 09:15 am, at weekends or at national holidays is not eternal. The authorization will be valid only for the period determined by the Safety Commission.
  - The authorized Professor/Researcher should ask for the access keys to the safety shutoff valves of the partial hydrogen pipeline of their building on the day prior to the utilization.
  - The presence of another researcher in the same building is mandatory, preferably in a nearby location of the room with the instrument connected to the hydrogen pipeline, and having knowledge that the instrument is being used.
  - The closing of the partial hydrogen pipeline at the safety shutoff valve will be performed by the Professor/Researcher who asked for the keys or by a Ph.D./post-doctoral student if they are an authorized user by the Safety Commission.

Safety Notice

- The use of chromatographers or other instruments connected to the hydrogen pipeline will only be authorized after filling the SAFETY NOTICE. This notice should be

posted in a visible location next to the instrument or outside the room (if the door is closed).

- It is mandatory to have a daily registry of utilization of each instrument connected to the hydrogen pipeline.
- If the absence of the safety notice in a working instrument is detected, the Safety Commission reserves the right to close the instrument shutoff valve.

NOTICE	**In this case, the responsibility for the damages inflicted to the instrument or the research work in progress is solely of the users in charge of the work or of the utilization of the instrument**

- The safety notice should be filled in the safety briefcase of the room after the use of the instrument and the secure closing of the hydrogen pipeline.

Rules for the Use of the Internal Distribution System of Oxygen

Initial Considerations

- The internal distribution system of oxygen (IDSO) of the Technological Laboratories of the University of Aveiro has specific points of utilization inside rooms 29.1.05, 29.1.8, 29.1.13, 29.1.14, 29.1.17.1, 29.1.22, 29.1.23, 29.2.16 and 29.2.28.
- The access to the gas storage house is restricted to authorized staff. Authorization is conceded, canceled or renewed solely by the President of the Directing Board of the Department of Chemistry.
- When specific equipment is not being used, the safety shutoff valves in each point of utilization must be, without exceptions, closed.
- The hours of opening and closing of the oxygen pipeline should be registered and signed in a specific log book by the authorized member of staff.
- All Professors/Researchers which are authorized by the Safety Commission to open the oxygen pipeline should be trained for that purpose. Dr. Dulce Helena Teixeira will be responsible for the individual training.

Opening of the Oxygen Pipeline during Working Days

- The opening of the oxygen pipeline will be performed by authorized members of staff after formal requisition to the Stores by electronic mail (armazem.gases@dq.ua.pt) in the day prior to that of the utilization.
- The electronic message should contain the following information: identification of the pipeline to be opened (OXYGEN), time of opening, predicted time of closing, user, equipment, building and room.
- The requisition for the opening of the oxygen pipeline by e-mail is only allowed to:

Carlos Manuel Silva
Maria Eduarda Santos
Valdemar Esteves
Dmitry Evtugin
Maria Eduarda Pereira

Closing of the Oxygen Pipeline during Working Days

a) Closing during the normal working schedule (before 17:30 pm)

- The oxygen pipeline will be closed at 17 hours and 30 minutes. The procedure will happen in two different locations: at the gas storage house and in the central shutoff valve of building 29 (Technological Laboratories).
- Only the following members of staff are allowed to close the oxygen pipeline:

Ana Paula Fernandes
Tiago Thorn
Pedro Alves
António Morais
Dulce Helena Teixeira

b) Closing after 17:30 pm

- In exceptional cases, the oxygen pipeline could be closed after 17 hours and 30 minutes. In these cases, the shutoff of the oxygen pipeline could only performed by authorized users.
- Potential authorized users:
  iii) Professors/Researchers after formal request to the Safety Commission.
  iv) Ph.D. students and post-doctoral research associates after formal request by their supervisor to the Safety Commission and official granted authorization.
- This procedure should follow the following rules:
  - Authorized users to close the oxygen pipeline should ask at the Stores of the Department of Chemistry, until 16:00 pm, the access keys to the main shutoff valves of the Technological Laboratories.

- The presence of another researcher in the building is mandatory, preferably in a nearby location to that of the instrument connected to the oxygen pipeline, and with knowledge that the instrument is in use.
- The authorized user is responsible for the safe closing of the oxygen pipeline at the shutoff valve of the Technological Laboratories.
- In the immediately following working day the key should be returned in person to the Stores. The delivery should be registered by the member of staff and signed by the authorized user.
- If no formal request for the opening of the oxygen pipeline is filed for the immediately following working day, the central shutoff at the gas storage house will be performed at 09:30 am by the authorized member of staff.

Use of the Oxygen Pipeline Before 09:15 am during Working Days, at Weekends or at National Holidays

- The use of the oxygen pipeline on working days before 09:15 am, at weekends or national holidays is of exceptional nature and will abide by the following rules:
  - The opening of the oxygen pipeline is only allowed to Professors/Researchers who have filed a formal request to the Safety Commission. They should be those responsible for opening in safety the oxygen pipeline at the shutoff valve of the Technological Laboratories.
  - The authorization for the opening of the oxygen pipeline during working days prior to 09:15 am, at weekends or national holidays is not eternal. The authorization will be valid only for the period determined by the Safety Commission.
  - The authorized Professor/Researcher should ask for the access keys to the safety shutoff valve of the oxygen pipeline on the day prior to that of the utilization.
  - The presence of another researcher in the same building is mandatory, preferably in a nearby location to the room with the instrument connected to the oxygen pipeline, and having knowledge that the instrument is being used.
  - The closing of the oxygen pipeline at the safety shutoff valve will be performed by the Professor/Researcher who asked for the keys or by a Ph.D./post-doctoral student if they are an authorized user by the Safety Commission.

Safety Notice

- The use of instruments connected to the oxygen pipeline will only be authorized after filling the SAFETY NOTICE. This notice should be posted in a visible location next to the instrument or outside the room (if the door is closed).
- It is mandatory to have a daily registry of utilization for each instrument connected to the oxygen pipeline.
- If the absence of the safety notice in a working instrument is properly identified, the Safety Commission reserves the right to close the instrument shutoff valve.

NOTICE	**In this case, the responsibility for the damages inflicted to the instrument or the research work in progress is solely of the users in charge of the work or of the utilization of the instrument**

- The Safety notice should be filled in the safety briefcase of the room after the use of the instrument and the secure closing of the oxygen pipeline.

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Registo de Segurança: H_2 ou O_2

Safety Notice for the use of H_2 or O_2

Afixar em lugar bem visível *Post in a visible location*

Experiência ou Instrumento
Experiment or Instrument

Data *Date*

Gás em uso: *Gas in use*
Hidrogénio *Hydrogen* ☐
Oxigénio *Oxygen* ☐

	Hora *Hour*	**Data** *Date*
Início da experiência *Start of experiment*		
Fim da experiência *End of experiment*		
Fecho da linha de gás *Close of the gas pipeline*		

O Investigador *Researcher*

Telefones *Telephones*
D.Q. / L.T.
Outro *Other*

Autorizado/a pela Comissão de Segurança para fechar a linha de gás ☐
Authorized by the Security Commission to close the gas pipeline

O orientador responsável *Supervisor*

Telefones *Telephones*
D.Q. / L.T.
Outro *Other*

Responsável pela segurança:* *Head of Safety Commission:**

Este registo deve ser preenchido **todos os dias** de funcionamento dos aparelhos. O responsável pelo fecho da linha de gás em uso é o orientador. Em casos excepcionais e **previamente autorizados pela Comissão de Segurança**, o orientador poderá delegar essa responsabilidade no aluno.
*No caso de funcionamento durante os **fins-de-semana**, **feriados** e **fora do horário normal de trabalho** exige-se a assinatura do responsável pela segurança.

This form should be filled **every working day** of the instrument. The responsible for the closing of the gas pipeline is the supervisor. In exceptional situations **previously authorized by the Safety Commission** the supervisor may transfer that responsibility to the student.
*In the case of working during the **weekends, national holidays** or **outside normal working hours** the signature of the head of the Safety Commission is mandatory.

12. Laboratory Waste Disposal

The Department Chemistry has implemented correct disposal procedures for the elimination of residues in order to provide a healthy environment for students, staff, visitors to the Department and the surrounding community, and also to abide by the laws and regulations of the Portuguese Government.

As a rule, **it is not allowed to intentionally eliminate chemical residues or dangerous substances directly to the Environment.**

This restriction includes the elimination of residues by any method such as normal sewage disposal, using the rubbish bins or evaporation inside the fume cupboards.

In order to fulfill these objectives it is crucial to promote good laboratory practices (both in research and teaching activities), which lead preferentially to small amounts of chemical residues. The implementation of good practices for the prevention of environmental pollution is further expected to develop in each researcher the social consciousness for the correct management of chemical waste.

At the end of this section you can find an example of the form which needs to be handed at the Chemistry stores for the elimination of residues. The electronic form can be downloaded online from the safety pages of the Department of Chemistry.

12.1 Procedure for the Elimination of Residues

1. Identify the category to which the chemical residues belong.
2. Store chemical residues in appropriate vessels. These should allow a correct seal of its contents, be of small internal volume and adequate to the chemical residue to be disposed. Solvents should be kept inside adequate plastic containers with an internal volume smaller than 5 L. Metallic containers should be avoided.
3. ALL recipients with chemical residues should be LABELLED (initial date of storage, contents and laboratory – see labels in section 7.3). The label from the previous use of the container should be completely removed or, at least, completely erased.
4. Halogenated solvents should be segregated from those non-halogenated. The remaining liquid residues should also be separated from the latter two types of solvents. Solvents should be kept inside adequate, properly labeled, plastic containers.
5. The Department of Chemistry recycles the following solvents: acetone, chloroform, dichloromethane, petroleum ether, ethanol, diethyl ether and toluene. These solvents, provided that they have the adequate conditions to be recycled, should be kept inside adequate labeled containers. They should be delivered to the distillation room for the recycling procedure.
6. There are chemical residues which, due to their high reactivity of toxicity, must not be eliminated alongside solvents. These residues should be separated from other incompatible products and stored. It is advisable that the following non-recyclable compounds should be segregated for adequate elimination. Please study your own case in order to proceed with the best and safer way to store your chemical waste. The given categories have been designated from A to K. **Attention**: even though some compounds could belong to the same category, their mutual reactivity must be taken into consideration for additional separations of chemical waste.

Container A: Organic non-halogenated solvents and solutions of organic non-halogenated compounds;
Container B: Organic halogenated solvents and solutions of organic halogenated compounds;

Container C: Organic solid waste;
Container D: Aqueous solutions neutralized to a pH between 6 and 8;
Container E: Inorganic toxic residues and salts of heavy metals and their respective solutions;
Container F: Flammable toxic compounds;
Container G: Mercury and residues of mercury salts;
Container H: Metal residues. Each metal should be disposed individually.
Container I: Inorganic solid waste;
Container K: Selective disposal of glass, metal and plastic.

7. These products should be stored following the guidelines for the storage of chemical products, including the aforementioned segregation rules.
8. Due to the current confined space for storage of residues in the Department of Chemistry, these should be kept, if possible, inside each laboratory. Solvents are excluded and could be directly delivered at the Chemistry stores. The directing board of the Department of Chemistry will provide a way for the safe and correct elimination of the chemical residues with a periodicity of at least twice per year (at the end of each academic semester). If justifiable, other or additional dates for the elimination procedure will be created.
9. The delivery of products for destruction should always be accompanied by the adequate form. The chemical nature of each residue must be identified. An example of the form is given in the following page and the electronic version is available online.
10. Everyone is morally obliged to use the smallest possible amount of dangerous substances and also to produce small quantities of chemical waste.

The procedures suggested for the elimination of biological samples and residues have been described in section 9.6.

12.2 Selective Removal of Glass

Not every disposed glass can be recycled. All labware is made of non-recyclable glass and should be segregated into appropriate containers. Only chemical flasks purchased from commercial sources, and after being carefully washed, can be disposed using the green container (called "vidrão").

12.3 Removal of Mercury

Mercury is a highly toxic substance. Once inhaled, mercury vapors deposit in the lungs, being ultimately absorbed and transported in the blood to various organs in the human body. Its toxicity occurs essentially at the central nervous system, kidneys and liver.

Please note: it is not necessary to spill a large amount of mercury to overrun the safety admissible limits in the air. Thus, it is important to avoid, at all costs, mercury spillage, specially from broken thermometers.

In the case of an accidental mercury spillage (*e.g.*, broke thermometer), please proceed as described below:

i) Try to reduce the spillage to a minimum. Avoid floor and/or benches contamination.
ii) Collect the possible maximum amount of spilled mercury using a Pasteur pipette.
iii) Contact immediately Dr. Dulce Helena (Extension No. 23587). With an appropriate Kit she will proceed with the decontamination of the affected area(s) and will provide a safe and correct way to dispose the residues.

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Serviço de Recolha de Resíduos

Chemical Waste Disposal Service

A preencher pelo fiel do Armazém **Data**

Entrega N.º

Contentor N.º

	Data *Date*	
Armazenamento *Beginning of storage*		**Laboratório** *Laboratory*
Entrega no Armazém *Delivery at the Stores*		

Componente principal *Main component* **Quantidade** *Quantity*

Outros componentes *Other components*

O orientador responsável *Supervisor*

Telefones *Telephones*

D.Q. / L.T. Outro *Other*

Responsável pela segurança:* *Head of Safety Commission:**

Este registo deve ser preenchido para **todos os resíduos** a eliminar.
*Quando os resíduos a eliminar pertençam às classes 1, 4, 5 ou 6 exige-se a assinatura do responsável pela segurança.

This form should be filled for **all chemical waste** to eliminate.
*If the chemical waste to eliminate belong to categories 1, 4, 5 or 6 the signature of the head of the Safety Commission is mandatory.

13. Unattended Operations

When laboratory operations are performed which will be unattended by laboratory personnel (continuous operations, overnight reactions, lunch time, etc.), the following rules apply:

- Only work belonging to categories 1 and 2 can be performed unattended, after permission from your supervisor(s).
- All unattended operations must be conducted in the fume cupboard. A form (an example is provided in the following page; the electronic version is available online at the web site of the Department of Chemistry) must be signed by you and your supervisor(s) and placed in a visible location near the experiment.
- Scientific equipment which needs to be in permanent use needs to be reported to the Safety Committee and receive a prior approval. The form (example given in the following pages) is available online at the site of the Department of Chemistry.
- Only work of category 1 can be done outside the fume cupboard.
- Floods are avoidable. Please consult the Laboratory Safety Coordinator or your supervisor(s) if you need to leave an experiment overnight with a water refrigerating system.

14. References

All the information present in this booklet is available in the internet.

Please consult the Department of Chemistry wed page under "**Segurança**" for a list of links. It is specially recommended the Chemical Hygiene Plan of the University of California, Irvine, School of Biological Sciences (http://www.ehs.uci.edu/programs/ih/Universalchp/chp.html), or the Department of Chemistry Lab Safety Manual of Duke University (http://www.chem.duke.edu/safety/).

For further details on standard safety procedures for the use of biological substances we recommend:

a) Laboratory Biosafety Manual of the World Health Organization (3rd edition, 2004) found at: http://www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf)
b) The Biological Safety Manual of the University of Pennsylvania, found at: http://www.ehrs.upenn.edu/programs/bio/bio_manual.html

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Registo de Segurança

Unattended Experiment Safety Notice

Afixar em lugar bem visível *Post in a visible location*

Experiência ou Instrumento
Experiment or Instrument

Data *Date*

Fim da experiência
End of experiment

Hora *Hour*

Data *Date*

Detalhes experimentais *Experimental details*

Instruções em caso de acidente
Instructions in case of accident

O Investigador
Researcher

Telefones *Telephones*
D.Q. / L.T.
Outro *Other*

O orientador responsável
Supervisor

Telefones *Telephones*
D.Q. / L.T.
Outro *Other*

Validade do presente registo:
Valid through:

Responsável pela segurança:*
*Head of Safety Commission:**

Este registo deve ser preenchido para **todas as experiências**. *Nas classificadas de categoria 3 exige-se a assinatura do responsável pela segurança.

*This form should be filled for **all experiments**. *For those classified as category 3 the signature of the head of safety is necessary.*

Requisição para Utilização de Equipamento Científico em Regime Contínuo

Form for the Continuous Use of Scientific Equipment

I. Docente / Investigador Responsável *Supervisor* **Contacto** *Contact*

II. Equipamento *Equipment*

Designação genérica *Generic designation*	
Marca *Brand*	
Modelo *Model*	
Local de utilização *Location*	

III. Procedimentos em caso de acidente
Procedures in case of accident

IV. Procedimentos em caso de falta de água ou corrente eléctrica
Procedures in case of water or electricity failure

IV. Investigadores a contactar em caso de emergência
Researchers to contact in case of emergency

		Contactos *Contacts*
1.		
2.		
3.		