



MINISTERIO
DE EMPLEO
Y SEGURIDAD SOCIAL

SECRETARÍA DE ESTADO
DE LA SEGURIDAD SOCIAL

DIRECCIÓN GENERAL
DE ORDENACIÓN DE
LA SEGURIDAD SOCIAL

Plan General de Actividades Preventivas de la Seguridad Social 2015



Guide to Health and Safety in LABORATORIES



FREMAM

*Mutua Colaboradora con la
Seguridad Social nº 61*

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MAIN RISKS





General principles of safety and health in laboratories

- The Laboratory Design (lay-out, facilities, operating procedures, etc.) will be adequate for maintaining a good prevention standard.
- There will be emergency facilities or elements such as showers, eye washes, fire extinguishers, etc. in addition to personal protection equipment (also known as PPE).
- The laboratory and its corridors, exits, passageways, equipment and facilities, will be in a perfect state of tidiness and cleanliness, and regular maintenance established for these areas.
- Waste, stains and traces of hazardous substances will be rapidly disposed of.
- It is forbidden to carry out works other than those authorised by the persons directly responsible, and to use appliances and facilities without knowing how they operate first.
- Staff will wash their hands before and after entering the laboratory.



General principles of safety and health in laboratories

- Work clothes will be fastened at all times, with no long or hanging sleeves. Long hair will be pinned up.
- It is prohibited to eat, drink and smoke in the laboratory.
- Staff who is wearing contact lenses will wear safety goggles.
- Always check the good condition of products and materials and their labels before using them.
- All preparations will be properly labelled, and it is forbidden to reuse empty containers without removing the original label.
- When you are lighting Bunsen burners, it is advisable to use piezoelectric lighters, and reduce the use of bare flames to a minimum, once lit.
- Whenever possible, work in glass safety cabinets.
- After performing the operation or task in the laboratory, store the materials and reagents, clean the workplace and ensure all appliances, and water and gas conducts are disconnected.





Handling Chemicals

Chemicals as risk factors:

Dangerous chemicals are chemical elements and compounds thereof presented in their natural state or produced in industry, that could cause direct or indirect harm to people, property and/or the environment.

These chemicals substances are classified as follows, depending on how dangerous they are:

- a) **Explosive**.- Substances and preparations that could explode due to the effect of a flame or heat, or which are highly sensitive to impact and contact.
- b) **Combustible**.- Substances and preparations which, when you are entering into contact with others, especially with flammable substances, cause a highly exothermic reaction.
- c) **Flammable**.- Substances and preparations in which the ignition point is low. Depending on how flammable they are, these can be divided into three groups:
 - Extremely Flammable
 - Easily Flammable
 - Flammable
- d) **Toxic**.- Substances and preparations which when inhaled, ingested or penetrating the skin, may alter the health of a person.

Depending on their toxicity they are divided into three categories:

- Very Toxic
 - Toxic
 - Harmful
- e) **Corrosive**.- Substances and preparations which have an with live tissue can destroy it.
 - f) **Irritants**.- Non-corrosive substances and preparations have an immediate, prolonged or repeated contact with the skin or mucous membrane, can cause an inflammatory reaction.
 - g) **Dangerous for the environment**.- Substances and preparations which, when are in contact with the environment, entail an immediate or future danger for one or more components thereof.
 - h) **Carcinogenic**.- Substances and preparations which, when are inhaled or if they penetrate the skin, can cause cancer or increase its frequency.
 - i) **Teratogenic**.- Substances and preparations which, when are inhaled, ingested or if they penetrate the skin, can cause alterations to the foetus during its development in the womb.
 - j) **Mutagenic**.- Substances and preparations which when are inhaled, ingested or if they penetrate the skin, can cause hereditary genetic defects or increase their frequency.
 - k) **Allergenic**.- Substances and preparations which, when are inhaled or if they penetrate the skin can cause a reaction in the immune system, in such a way that subsequent exposure to that substance or preparation can give rise to a series of characteristic negative effects.





Handling chemicals

Identification of hazardous substances and preparations:




Any chemical used in the workplace must bear information on the risks involved when you are using the substance or preparation.

Label

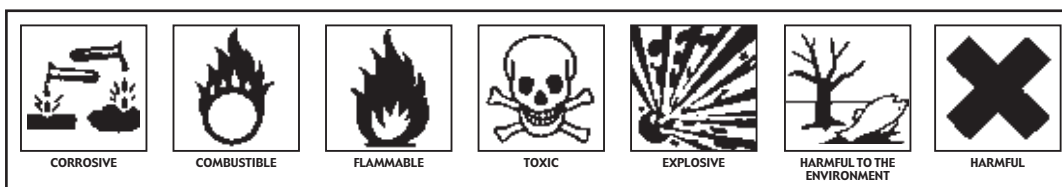
It is the first information that identifies the product at the time it is used. This label must be clearly visible and written in the official language of the State. It will contain the following:

- Name of the substance or preparation.
- Name, address and telephone number of the manufacturer or importer.



| | |
|---|--|
| NAME AND ADDRESS OF THE MANUFACTURER AND DISTRIBUTOR | |
| NAME OF THE SUBSTANCE CAS NUMBER % | |
| R PHRASES (Specific Risks) | S PHRASES (Precautions) |
|   |  |

- Symbols, pictograms and indications of the hazard, including the main risks (Figure 1).



(Figure 1)

- R phrases that allow certain risks to be enlarged on and identified by describing them.
- S phrases that establish prevention measures in handling and using the chemicals, by way of mentioning several precautions.

Safety Data Sheet

This sheet must be provided with the first delivery of the chemical, and is formed by 16 sections that include the following information:

- | | |
|---|---|
| 01. Identification of the substance or preparation and the company or laboratory. | 08. Control over exposure/ personal protection. |
| 02. Composition / information on the components. | 09. Physical and chemical properties. |
| 03. Identification of hazards. | 10. Stability and reactivity. |
| 04. First aid. | 11. Toxicological information. |
| 05. Fire prevention methods. | 12. Ecological information. |
| 06. Measures to be taken in the case of accidental spills. | 13. Considerations on disposing of it. |
| 07. Handling and storage. | 14. Information on transporting it. |
| | 15. Regulatory information. |
| | 16. Other information. |





Handling chemicals

General recommendations:

- The reactivity or reaction of the products must be known.
- Always use the smallest possible quantity of reagents.
- Open containers filled with chemicals slowly and carefully.
- When you are pouring a liquid from the container into a vessel, this must be done carefully to prevent splashing.
- When you are handling toxic or harmful substances, avoid allowing them to come into contact with the skin, inhaling the vapours and ingestion.
 - Use scoops or spatulas for collecting solid substances.
 - Use safety pipettes for collecting liquids.
- Transfers them as follows:
 - In small quantities or in special areas.
 - Transfer flammable substances far from heat sources.
 - Wear the appropriate personal protection equipment for each substance handled, and in particular, toxic, irritant and corrosive substances.
 - Use funnels, dispensers or siphons.



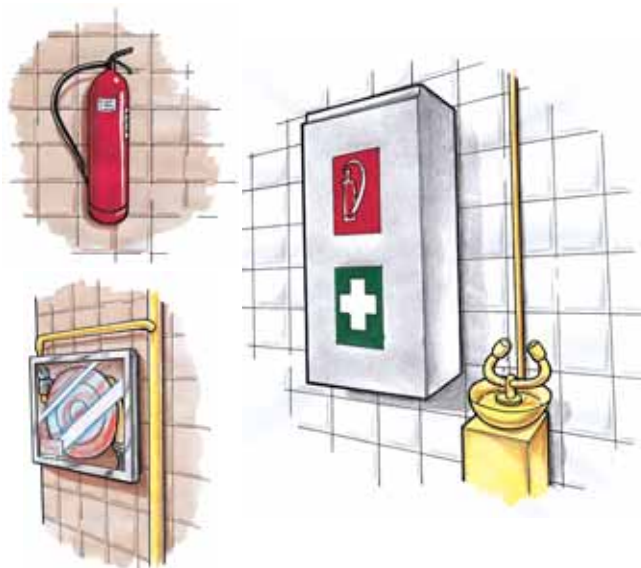
- Waste-disposal will be carried out based on the following recommendations:
 - Neutralise solutions before pouring them down the drain.
 - Do not store empty bottles that are not closed.
 - Cloth or paper impregnated with chemical substances or preparations will not be thrown into waste-paper bins.
 - Hire the services of an authorised company for disposing of hazardous waste such as flammable substances, heavy metals, etc.





Handling chemicals

- When you are working in the laboratory, wear the appropriate personal equipment (safety goggles, gloves, breathing equipment, etc.), and guarantee they are in a perfect state of repair.
- All the staff should know how the fire prevention equipment works, how to apply first aid and the mechanisms in place for requesting help from outside the laboratory.



Storing chemicals

- All workplaces where chemicals are handled will have a storeroom (preferable an external one) that is clearly marked.
- All products will be properly labelled and recorded.
- Any products without labels will be analysed to identify and determine its characteristics, or destroyed.
- Chemicals with similar characteristics will be grouped together, separating the incompatible ones and isolating or confining those with special characteristics (very toxic, carcinogenic, explosive, pestilent, etc.).
- The laboratory will have safety cabinets with at least RF-15 fire resistance, so that a larger number of flammable products can be stored.





Storing chemicals

- Aggressive products will be stored in special cabinets, and never at a height of more than 165 centimetres.
- Refrigerators will be anti-deflagrant with increased safety or for storing highly volatile flammable products.
- Chemicals will be stored in different materials, depending on their characteristics:
 - Substances which attack glass: Containers made of synthetic or metallic materials.
 - Substances that are broken down under the light: Opaque or dark glass containers.
 - Alkali materials: With a protective solvent layer that has a high boiling point.
 - White phosphorus: Under a layer of water.
 - Quantities of mercury in excess of 3 kg: In steel containers with threaded screws.



Handling Microorganisms

To be able to define the basic safety and health guidelines for handling microorganisms, the following concepts must first be defined:

- **Microorganism.**- Any microbiological entity, which may or may not be a cell, that is able to reproduce or transfer genetic material.
- **Cell Culture.**- The result of the “in vitro” growth of cells obtained from multicellular organisms.
- **Biological Agents.**- Microorganisms, including genetically-modified ones, cell cultures and human endoparasites that could give rise to an infection, allergy or toxicity.

They include the following types:

- **Bacteria.**- Simple multicellular organisms that multiply by simple division. Examples: Brucella, Salmonella serotypes, etc.
- **Virus.**- Non-cellular agents of an inferior order to bacteria, that are unable to grow or reproduce outside a live cell. Examples: Hepatitis B, AIDS, Rabies, etc.
- **Fungi.**- They have a vegetative structure known as mycelio. Examples: Aspergillus fumigatus, Cryptococcus neoformans, etc.
- **Parasites.**- Higher organisms associated with plants and animals. Examples: Leishmania, Echinococcus granulosus, etc.





Handling Microorganisms

- **Rickettsia**- Coccoid or bacillary-shaped microorganisms. They are smaller than bacteria and depend on other organisms. They are associated with vector arthropods.

When you are handling biological samples, even if they are non-infectious or toxic, and above all when they are unknown, bear in mind the following safety and hygienic guidelines:

- The first aspect to consider is the design of the laboratory used for this purpose. The walls, floors, ceilings and working surfaces will comply with the following characteristics:
 - They will be smooth.
 - Easy to clean.
 - Waterproof.
 - Resistant to acids, alkalis, solvents and disinfectants.
- Access will be restricted to the facilities in the event that any activity is being carried out.
- The laboratory equipment will be in a perfect state of tidiness and cleanliness.
- Eating, drinking and smoking in the laboratory is forbidden.
- All staff will wear the appropriate clothing (gowns, uniforms, etc.), safety goggles and gloves as a matter of course. In the case of handling infectious agents, they will also wear use protection.
- Each person will be responsible for his/her own personal hygiene, and wash before and after remaining in the laboratory with soap and water.





Handling Microorganisms

- As far as possible use Class I, II and III Biological Safety Cabins.
- The laboratory equipment will be handled taking into account the following recommendations:
 - Pipettes will be handled with mechanical aspiration devices and never using the mouth.
 - Infectious materials will be carefully placed in the centrifuge machine, in closed recipients (containers or tubes).
 - If any of the recipients breaks inside the machine, let it stand 30 minutes before stopping.
 - Remove the infected broken glass wearing cut-resistant gloves.
- All the material will be disinfected or sterilised correctly, following specific procedures.
- A safety warehouse facility will be in place for biological agents.
- All products will be labelled and stored in a safe place after finishing work in the laboratory.



Handling Glassware

- Before using glassware, check its condition and if it is broken, do not use it.
- If the material has suffered a violent blow, do not use it, even if you cannot see any important anomaly.
- Glass will be heated by interposing a metal mesh between the flame and the material.
- When you are assembling glassware elements, take the following precautions:
 - Ensure that the materials used are in tension.
 - Use supports and clamps.
 - Use silicone grease in all fastening points and plastic caps (if possible) to prevent blockage.





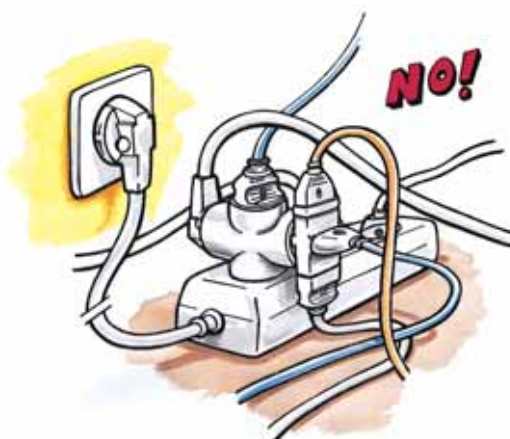
Handling Glassware

- Glass balloons will be inserted into baths slowly and gradually and dried with compressed air at a low pressure.
- When you are unblocking glassware, wear the appropriate personal safety equipment, and perform the operation under a funnel with a protective screen.
- When you are handling assemblies made of glass, you must adopt a series of precautions as are described below.
 - They must be cut, holding them with a cloth near the mark where the cut is going to be made.
 - After being cut, the tips will be moulded by heating.
 - When you are inserting them into the hole of a cap, the cap will be wetted with water for lubrication purposes.
- Handling of pipettes:
 - It is strictly forbidden to pipette using the mouth.
 - For suctioning liquids through the pipette, use rubber “pears”.
 - Wear personal protection equipment such as gloves that are resistant to the substance used and safety goggles, if possible.



Handling Electrical Equipment

- Each laboratory will have a general electric panel, with the following components and features:
 - The appropriate differential circuit breaker.
 - An efficient ground plug.
 - An automatic voltage switch or magnetothermic circuit.
 - The distribution will have protection on the shunt head.
- Do not make constant use of lengtheners and multi-connectors.
- All equipments which are used for working with flammable substances will be fireproof.
- In practice laboratories or laboratories with a high degree of humidity, work under low voltage (24 V is recommended) and using waterproof sockets with caps, etc.





Refrigerators

The Refrigerators which are used in the laboratories will comply with the following specifications:

- They will have no electrical installation inside them.
- Refrigerators used to store flammable substances will be homologated for that purpose.
- Do not store containers that are open or not properly closed.
- Control the inner temperature often.



Appliances producing flames

- Equipment which are producing flames will have a safety system to permit the gas supply to be cut off in an emergency.
- Flammable liquids will be heated at temperatures that are lower than their self-ignition point.
- Always work under an extractor funnel.



Heating devices

Hot baths:

- Do not fill the baths to the brim.
- Use supports to keep the bath stable.
- The glass used will be special glass for withstanding high temperatures.
- If you are using thermal insulation devices, they will not contain asbestos.
- Whenever possible, work under a localised extractor system.
- Always use a temperature control system.



Ovens:

- When you are working with flammable vapours, use increased safety ovens or an anti-deflagrant facility.
- Heating volatile substances involves the use of a localised extraction system and filters or a condensation system for retaining them.
- Use a temperature control system.





Gas facilities

- Gas cylinders will be chained to a support.
- Wear safety goggles.
- The guidelines of action in the case of a leak and the mouth of cylinder catching fire will be included in the Emergency Plan.



Centrifuging equipments

- The load will be distributed symmetrically.
- The equipment will have a safety system to prevent it from being operated with the lid open or not properly closed.
- The safety system will also prevent the lid from opening while in movement.



Autoclaves

- The appliance will have a manometer.
- Increases in pressure and decompression will be done gradually.



Analytical Instruments

Gas chromatograph:

- All equipment whose function is to emit a heat sources will be placed in well-ventilated rooms.
- The circuit will be closed and the flow divider output of the capillary injector and non-destructive detectors connected to the exterior.
- Wear personal protection equipment if necessary.



High resolution liquid chromatograph:

- Operations involving the transfer of liquids will be carried out wearing the appropriate gloves.
- Glassware used in vacuum operations will be sufficient resistant.

Atomic absorption spectrophotometer:

- Use a localised extraction device over the flame and general ventilation in the facility.
- Acid digestions will be performed in a cabinet.
- Wear the appropriate personal protection equipment (gloves, goggles, etc.).
- Handle gases such as acetylene (among others) following the recommendations given in the section on gases.
- Avoid visual contact with the flame or lamps used.



UV-Visible and Infrared Spectrophotometer, Fluorimeter, etc.:

- Wear safety goggles in the presence of UV and infrared radiation.
- Avoid the radiation coming into contact with the skin.
- In the event that Ozone is formed (a toxic gas that can be detected by smell), wear the appropriate breathing equipment (with an active carbon filter) and warn the laboratory director.

LASER Ray facilities:

- The zone will be clearly marked.
- Establish safe operating procedures.

Ionising radiation facilities:

- The area affected will be clearly marked and with an access control.
- Use individual and environmental dosimetry.
- Follow-up on annual dose limits.
- Medical check-ups
- Use of the appropriate protection equipment.





How to proceed in the event of an Emergency

Fire

- Raise the alarm immediately.
- The laboratory will be equipped with portable fire extinguishers that are appropriate for all fire classes and easily accessible.
- All the laboratory staff will be familiar with how this equipment works and practise with it regularly.
- For small fires, use blankets (not water), and if your clothes catch fire, use the safety shower.
- If the laboratory must be evacuated, do it calmly, closing all the doors.
- Pay special attention to all highly flammable compounds, among which the most important are the following:

- | | |
|---|--|
| <ul style="list-style-type: none">• Acetaldehyde• Acetone• Acetonitril• Amyl acetate• Benzene• Carbon disulphide• Chlorobenzene• Cyclohexane• Cyclohexene• Dioxane• Ethanol• Ether• Ethyl acetate• Peroxides | <ul style="list-style-type: none">• Hexane• Methanol• Methylenechloride• Pentane• Petroleum ether• Propanol• Propylene oxide• Piridine• Toluene• Vinyl acetate• Xylene• Metallic hydrides• Alkali metals• Yellow phosphorus |
|---|--|

Thermal burns:

- First of all:
 - Wash the affected area with water to cool it down.
 - DO NOT remove any clothing that can be adhered to the skin.
 - Do not break the blisters.
 - Cover the burned area with clean clothing.
- Do not apply ointment grease or disinfectant to the affected area.
- Do not give the patient anything to eat or drink.
- One person at least will stay with the victim.
- Always seek medical advice, no matter how serious the burn is.





How to proceed in the event of an Emergency

Splashing:

- Wash with water for 10-15 minutes using the safety shower if necessary.
- If the eyes are affected, wash them in the eye wash for 15-20 minutes.
- Remove all clothing affected by the product.
- DO NOT try to neutralise the product.
- Take the patient to a doctor together with the product label or safety data sheet.



Ingestion:

- Obtain information about the ingested product (label or safety data sheet) and take it with the patient to a doctor as soon as possible.
- Neutralise the toxic substance or prevent it from being absorbed by the body, depending on the type of substance:
 - Acid: Drink a bicarbonate solution.
 - Base: Take acid drinks (coca cola).
- DO NOT provoke vomiting, unless expressly instructed to.
- In the event of doubt, consult the toxicological information service.

Spills:

- Open all the windows.
- Turn on the cabinets with the screens fully open.
- Close all appliances which produce flames.
- If the spill is large, evacuate the laboratory and notify the intervention staff who should be wearing the adequate protective equipment.
- Do not allow anyone to enter the evacuated premises until it has been confirmed that the environmental concentration of the contaminant poses no risk (direct measuring devices with sensors can be used or specific calorimetric tubes).
- Spilled substances will be absorbed or eliminated depending on the type of substance:
 - **Mercury:** Absorb with Calcium Polysulphate, sulphur or amalgams, both marketed and non-marketed. If accumulated in grooves, with Fixing Lacquer or aspirate using a Pasteur Pipette.
 - **Flammable liquids:** Absorb with Active Carbon or other marketed absorbents. DO NOT use sawdust.
 - **Acids:** Neutralise with marketed products for absorption and neutralisation them. If none are available use Sodium Bicarbonate.
 - **Bases:** Neutralise with marketed products for absorption and neutralisation. If none are available, use Slightly Acid pH Water and then wash the affected area with water and a detergent.
 - **Other non-corrosive liquids that are not toxic or flammable:** Absorb with sawdust.





How to proceed in the event of an Emergency

Gas Leaks:

- If the gas leak has occurred in a permanent facility, close the valves of the cylinders connected to it and warn the laboratory director so that he can put the adequate emergency measures into practice (evacuation, warning the fire brigade, isolating the area, etc.).
- If the gas leak occurs in a cylinder and the gas is not lit, proceed as follows:
 - Approach the cylinder in the same direction as the wind.
 - Close the valve if possible.
 - If the gas is inert or not oxygen, notify the fire brigade immediately.
 - Use the appropriate protection equipment for moving the cylinder to an open space, far from people and buildings, mark off the affected areas and prevent access to them.
 - Once outside, control the cylinder until it has been completely emptied.
 - Notify the cylinder supplier once the danger has passed.
- If the gas leak occurs in a cylinder and the gas is lit, proceed as follows:
 - Close the valve if possible.
 - Use a fire extinguisher to put the fire out, preferably a powder one
 - Once the fire is out, remember there is a gas leak on the premises (especially in a confined area) and proceed as indicated above.
 - If you decide not to put out the flame, due to the danger of the gas, warn the fire brigade immediately.

Electrocution:

- Immediately cut off the power in the appliance causing the electrocution. Do not go near the victim until you have done this.
- Remove the victim once you have ensured the power is off.
- If it is necessary, perform cardiorespiratory resuscitation (always by qualified staff).
- Do not give the patient anything to eat or drink to anything to activate the respiration.





How to proceed in the event of an Emergency

Dizziness or loss of consciousness due to a persistent toxic leaks:

- Before approaching the area where the victim is, check the concentration of contaminant in the atmosphere and the concentration of oxygen present.
- If there is a risk of intoxication, use the adequate breathing equipment for the contaminant (if there is sub-oxygenation, use autonomous breathing equipment to move the victim and ventilate the affected area.
- Another person will be outside the affected area to raise the alarm in the event of the rescuer losing consciousness.
- After moving the victim to a safe place, proceed as follows:
 - Lie him on his left side (safety position).
 - Loosen all clothing that could constrict him.
 - Check whether he is conscious and breathing.
 - Take his pulse.
 - If it is necessary, perform cardiorespiratory resuscitation (always by qualified staff).
 - Do not give the victim anything to eat or drink or any product to activate respiration.



Elimination and Recycling of Waste By Substance Groups

| SUBSTANCE | DISPOSAL OF SPILLS | PPE | STANDARD PRODUCT | INCOMPATIBILITIES |
|---|---|---|---|--|
| INORGANIC ACIDS | <ul style="list-style-type: none"> - Cover the contaminated area with sodium bicarbonate or a similar mixture. - Add water and mix to form a suspension. - Collect the substance and pour it down the drain with plenty of water. - Wash the area with a sodium carbonate solution. | <ul style="list-style-type: none"> - Rubber gloves - Breathing equipment - Laboratory apron | <ul style="list-style-type: none"> - Acetic Acid - Sulphuric Acid - Nitric Acid - Phosphoric Acid - Biphosphates - Bisulphates - Etc. | <ul style="list-style-type: none"> - Bases - Amines - Metals in general |
| ORGANIC ACIDS | <ul style="list-style-type: none"> - Cover the contaminated area with sodium bicarbonate or a similar mixture (sodium carbonate). - Add water. - Collect the substance and neutralise it with OHNH₄ 6M or HCl 6M. - Wash the area with a sodium carbonate solution. | <ul style="list-style-type: none"> - Rubber gloves - Face shield - Laboratory apron - Have breathing protector at hand. | <ul style="list-style-type: none"> - Acetic Acid - Butyric Acid - Phenylacrylic Acid - Naphtalensulphonic Acid - Succinic Acid - Sulphamic Acid - Toluensulphonic Acid | <ul style="list-style-type: none"> - Bases - Amines |
| HYDROCARBONS, ALCOHOLS, KETONES, ESTERS | <ul style="list-style-type: none"> - Remove all ignition sources and flammable products from the affected area. - Absorb on paper, evaporate in a sink with a funnel and then burn the paper. | <ul style="list-style-type: none"> - Protective gloves - Face shield - Laboratory apron - Mask with multifilter | <ul style="list-style-type: none"> - Acetone - Ethyl alcohol - Ethyl acetate | <ul style="list-style-type: none"> - Heat sources |





Elimination and Recycling of Waste By Substance Groups

| SUBSTANCE | DISPOSAL OF SPILLS | PPE | STANDARD PRODUCT | INCOMPATIBILITIES |
|--|--|---|--|--|
| ALIPHATIC AMINES | <ul style="list-style-type: none"> - Cover with sodium bisulphate or a similar mixture. - Add pulverised water and pour the mixture down the drain with water. | <ul style="list-style-type: none"> - Butylated rubber gloves - Face shield - Mask with multifilter | <ul style="list-style-type: none"> - Diethylamine - Triethanolamine | <ul style="list-style-type: none"> - Acid-based products - Halogen-based products - Metals in general |
| ALKALIS, ALKALINOTE-RREOUS METALS, ALKYDS, METAL ALKOXIDES | <ul style="list-style-type: none"> - Cover the contaminated area with an excessive quantity of dry sodium carbonate. - Slowly add butylic alcohol. - Leave the mixture for at least 24 hours. - Dilute the mixture and pour it down the drain with plenty of water. | <ul style="list-style-type: none"> - Rubber gloves - Large face shield - Laboratory apron | <ul style="list-style-type: none"> - Sodium - Lithium - Magnesium - Hydrides | <ul style="list-style-type: none"> - Water - Humidity - Acids |
| ALDEHYDES, OXIDANT COMPOUNDS | <ul style="list-style-type: none"> - Remove all ignition sources and flammable products from the affected area. - Absorb with paper, evaporate in a laboratory cabinet and then burn. - For large quantities, cover with sodium bisulphate and mix with a small quantity of water. - Collect the mixture and pour it down the drain with plenty of water, after a period of no less than one hour. | <ul style="list-style-type: none"> - Protective gloves - Breathing equipment - Laboratory apron | <ul style="list-style-type: none"> - Benzaldehyde - Formaldehyde | <ul style="list-style-type: none"> - Combustible substances - Reducing substances - Organic materials - Carbon, sulphur |
| MERCURY | <ul style="list-style-type: none"> - Remove all gold, silver and copper. - Collect small droplets with a suction pump and an aspiration cylinder with a long tube. - Inaccessible droplets will be covered with calcium polysulphide and excess sulphur. - Keep in a sealed container. | <ul style="list-style-type: none"> - Rubber gloves - Laboratory apron - Breathing protector | <ul style="list-style-type: none"> - Metal mercury - Mercury compounds | <ul style="list-style-type: none"> - Gold, silver, copper - Ammonium - Gases - Acetylenes - Fulminic Acid - Tobacco and food |

| SUBSTANCE | DISPOSAL OF SPILLS | PPE | STANDARD PRODUCT | INCOMPATIBILITIES |
|---------------------------------|--|---|---|--|
| LEAD, CADMIUM, ARSENIC SELENIUM | <ul style="list-style-type: none"> - Dissolve in hydrochloric acid to form an insoluble salt. - Dilute the solution. - Saturate in a cabinet with Sulphuric Acid. - The solid that forms is washed and disposed of in a special container for toxic substances. | <ul style="list-style-type: none"> - Rubber gloves - Safety goggles | <ul style="list-style-type: none"> - Heavy metal compounds. | <ul style="list-style-type: none"> - Tobacco - Food |
| ORGANIC COMPOUNDS HALOGEN | <ul style="list-style-type: none"> - Remove all ignition sources and flammable products from the affected area. - Absorb on paper. - Place on paper on a glass plate in a cabinet and leave to evaporate. - Burn the paper, if possible in a cabinet. | <ul style="list-style-type: none"> - Rubber gloves - Breathing protector with multifilter - Laboratory apron | <ul style="list-style-type: none"> - Chloroform - Dichloromethane - Carbon tetrachloride | <ul style="list-style-type: none"> - Bases. |
| AROMATIC AMINES | <ul style="list-style-type: none"> - Wash the skin with a solution of soap and rinse with water afterwards. - For small spills, absorb on paper towels and sweep the solid particles onto paper. - Place the contaminants on an iron plate inside a cabinet and leave to evaporate. - Add wrinkled paper and burn. | <ul style="list-style-type: none"> - Leather gloves - Large face shield - Laboratory apron | <ul style="list-style-type: none"> - Aniline - p-toluidine - N-methylaniline | <ul style="list-style-type: none"> - Nitric Acid - Hydrogen peroxide |
| ALKALIS AND AMMONIUM | <ul style="list-style-type: none"> - Collect and dilute (in the case of solids) - Neutralise the solid or dissolution with HCl 6 M in an appropriate container. | <ul style="list-style-type: none"> - Rubber gloves - Mask with ammonium filter - Laboratory apron | <ul style="list-style-type: none"> - Ammonium | <ul style="list-style-type: none"> - Mercury - Chlorine - Calcium hypochlorite - Acids (for alkalis) |





Elimination and Recycling of Waste By Substance Groups

| SUBSTANCE | DISPOSAL OF SPILLS | PPE | STANDARD PRODUCT | INCOMPATIBILITIES |
|----------------------------------|---|--|--|---|
| INORGANIC SALTS | <ul style="list-style-type: none"> - Collect (if solid) and dissolve with water. - Cover the contaminated area (if dissolution) with sodium carbonate, mix and collect in a container with water. - Neutralise with HCl 6 M. - Pour down the drain with plenty of water. | <ul style="list-style-type: none"> - Rubber gloves - Laboratory apron - Safety goggles | <ul style="list-style-type: none"> - Potassium hydroxide. - Potassium carbonate. | <ul style="list-style-type: none"> - Acids - Metals - Halogen-based products |
| MERCAPTANES AND ORGANIC SULPHURS | <ul style="list-style-type: none"> - Remove all ignition sources and flammable products from the affected area. - Cover and mix the contaminated zone with an aqueous dissolution of calcium hypochlorite. - Collect after several hours and neutralise with HCl 6M - Pour down the drain with plenty of water. | <ul style="list-style-type: none"> - Rubber gloves - Autonomous breathing equipment - Laboratory apron | <ul style="list-style-type: none"> - Mercaptobenzothiazol - Thyophenol - Ethyl sulphide | <ul style="list-style-type: none"> - Acids - Acid salts - Dichromates - Permanganates - Tobacco and food |
| CYANIDES | <ul style="list-style-type: none"> - Evacuate the area and isolate it. Remove all ignition sources and flammable products from the area. - Absorb the liquid on paper. - Place the paper on a glass plate inside a cabinet and leave to evaporate. - Burn the paper, if possible in a cabinet. | <ul style="list-style-type: none"> - Long rubber gloves - Autonomous breathing equipment - Laboratory apron or gown | <ul style="list-style-type: none"> - Miscellaneous cyanides | <ul style="list-style-type: none"> - Acids |
| NITRILS | <ul style="list-style-type: none"> - Evacuate the area and isolate it. - Add sodium hydroxide and a hypochlorite dissolution. - After one hour, pour down the drain with plenty of water. - Wash the place of the spill with a hypochlorite dissolution. | <ul style="list-style-type: none"> - Long rubber gloves - Autonomous breathing equipment - Laboratory apron or gown | <ul style="list-style-type: none"> - Acetonitril - Isopropyl cyanide | <ul style="list-style-type: none"> - Acids |

| SUBSTANCE | DISPOSAL OF SPILLS | PPE | STANDARD PRODUCT | INCOMPATIBILITIES |
|---------------------------|---|---|--|---|
| NITRO-COMPOUNDS | <ul style="list-style-type: none"> - Remove from the affected area all ignition sources and flammable products. - In the case of liquids absorb on paper and incinerate in a cabinet, in small quantities. - In the case of solids, cover and mix with sand and burn in a cabinet in small quantities. | <ul style="list-style-type: none"> - Rubber gloves - Large face shield - Laboratory apron | <ul style="list-style-type: none"> - Nitromethane. - 2.4.6 Trinitrophenol - 2.4.6 Trinitrotoluene | <ul style="list-style-type: none"> - Combustible materials - Strong acids - Strong oxidants - Alkalis - Amines |
| ETHERS | <ul style="list-style-type: none"> - Remove all ignition sources and flammable products from the affected area. - Evaporate in small quantities in a cabinet with a little ferrous sulphate, thereby preventing the formation of combustible mixtures. The formation of peroxides can be prevented by adding sodium thread, iron or other reducing agents. | <ul style="list-style-type: none"> - Rubber gloves - Face shield - Laboratory apron - Mask with multifilter | <ul style="list-style-type: none"> - Ethyl ether - Petroleum ether - Tetrahydrofurane | <ul style="list-style-type: none"> - Heat sources - Halogen-based products |
| FLUORIDES | <ul style="list-style-type: none"> - Mix with calcium carbonate to form a calcium fluoride precipitate. - Wash and dispose of the precipitate in special containers for toxic substances. | <ul style="list-style-type: none"> - Protective gloves - Face shield - Laboratory apron | <ul style="list-style-type: none"> - Miscellaneous fluorides | <ul style="list-style-type: none"> - Metals - Halogen-based products |
| PHOSPHORUS AND PHOSPHIDES | <ul style="list-style-type: none"> - Dissolve the material in a cabinet under a nitrogen atmosphere, using a cold mixture of calcium hypochlorite and sodium hydroxide, stirring continuously. - Dilute with water. - Pour down the drain with plenty of water. | <ul style="list-style-type: none"> - Protective gloves - Face shield - Laboratory apron | <ul style="list-style-type: none"> - White phosphorus - Red phosphorus | <ul style="list-style-type: none"> - Air - Oxygen - Alkalis - Reducing agents - Water |





Workers' Obligations Regarding Occupational Risk Prevention



Article 29 of the Occupational Risk Prevention Act (Ley de Prevención de Riesgos Laborales) makes it incumbent on workers to take reasonable care for his or her own health and safety and for the health and safety of anyone else who may be affected by his or her acts or omissions at the workplace.

In due accordance with the training and the employer's instructions, workers are in particular bound to:

- Make proper use of machines, appliances, tools, hazardous substances, transportation equipment and, in general, any other method used to carry out their activity.
- Use the protection resources and equipment provided by their employers and maintain them correctly, and if damaged, request them to be replaced.
- Use existing safety devices properly and never put them out of order.
- Immediately inform their supervisor of any situation they deem may entail a risk to workers' health and safety of workers.
- Cooperate with the employers so that they can guarantee safe working conditions that involve no risk to the health and safety of workers.
- Any breach of the risk-prevention obligations referred to above will be deemed to be an occupational infringement for the purposes of the provisions laid down in article 58.1 of the Statute of Workers' Rights (Estatuto de los Trabajadores).



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SAFETY AND HEALTH GUIDE
FOR LABORATORIES

I have received the Occupational Safety and Health Guide which includes the risks and basic preventive measures and a summary of the obligations of workers set forth in Article 29 of the Occupational Risk Prevention Act.

I.D. Number:

Date:

Name and signature of the worker:





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