# Practical work number 01
# Chemistry laboratory: Initiation, safety rules and materials

**Introduction**

**To the Student:** A significant amount of your training in chemistry will take place in the laboratory. The following instructions should be read carefully before you attend the first laboratory session. These instructions will help you make efficient use of your time while in the laboratory and also promote laboratory safety.

**Objectives**

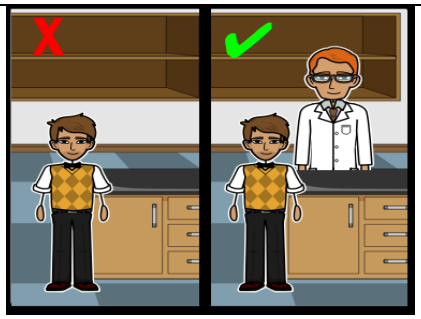
- Know the safety rules in the laboratory
- Identify the equipment used in the laboratory
- Know the different danger pictograms

**Pre-lab preparation**

Before coming to the laboratory, you must read carefully the practical work. The questions have been chosen to draw your attention to specific techniques and precautions that you should be aware of before you start the experiment. The experiments are designed to allow you to collect the data in **3 hours**, make sure you arrive on time, since your instructor will provide additional instructions for experiments as needed.

**Laboratory safety**

Prevention is the first basic safety step. Preventing accidents involves having a good knowledge of the work to be done, respecting safety signs, having good behavior in the laboratory, exercising effective personal protection, labeling, storing and disposing of chemicals correctly. The following table show the most of them:

| Safety rules | Instructions to follow |
|---|---|
|  Do not perform unauthorized experiments or work in a laboratory alone | Teacher presence required |
|  All personal belongings should be placed in the bookcases as you enter the laboratory | workspaces must be free |

*wear lab coats at all times. Your legs must be completely covered below the knee by your lab coat.
*Approved eye protection must be worn at all times in the laboratory.
*Wearing gloves is required


* Long hair and loose clothing must be confined while in a laboratory

*The lab coat must be cotton

*Eye protection must be splash proof chemical goggles.

*If you do get a chemical in your eye rinse immediately with large quantities of water using the eye-wash stations.


*Know the location and proper use of fire extinguishers, fire blankets, safety showers, eye wash devices, and first aid kits.

Smother the fire with a damp towel on a person: lay the person on the ground and cover them with the fire blanket

Eating, smoking, chewing and drinking are not allowed in a chemistry laboratory.

Thoroughly wash your hands after leaving the laboratory

<table>
<tr>
<td> 
Mouth suction is never used to fill a pipette.</td>
<td>rinse mouth<br>Do not give drink<br>Do not induce vomiting</td>
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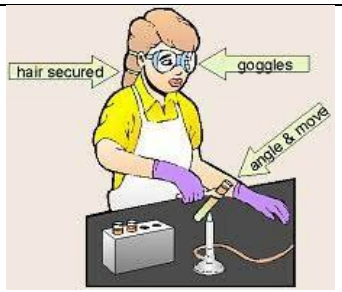
<td> 
Never direct the open end of test tube toward yourself or anyone else</td>
<td> 
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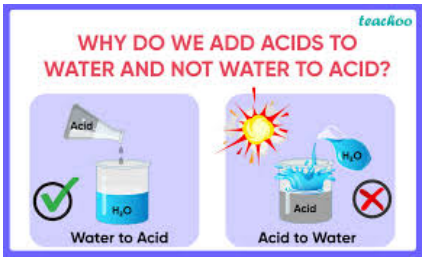
Never pour water into concentrated acid</td>
<td> 

If an acid is to be diluted, pour acid slowly into the water with constant stirring.</td>
</tr>
<tr>
<td> 
Liquid and solid waste containers must be properly used at all times ,and must be disposed of appropriately.</td>
<td>To avoid contamination of water and soil by the chemicals used<br><br>Some used chemicals can be flushed down the sink drain with water.</td>
</tr>
<tr>
<td> 
Never place chemicals directly on the balance pan.</td>
<td>*Always use a proper weighing container when using a balance to weigh a chemical.<br>*Never return unused chemicals to their original container.<br>* Securely replace lids, caps, and stoppers after removing reagents from containers.<br>*Always wipe spatulas clean before and after inserting into reagent bottles.</td>
</tr>
</table>

| | |
|---|---|
|  Use the fume hoods when toxic or irritating vapors are involved | Get out and breathe fresh air |
|   | **In any emergency, to get the lab supervisor attention is to SCREAM!** |

**General laboratory procedures**

The following procedures will help you to use your time efficiently and will help to minimize the waste of chemicals and other supplies. Other techniques will be described to you as needed in later experiments.

| **General laboratory procedures** |
|---|
|  Scrub inside and out with a brush, detergent, and tap water. |
|  Rinse away all suds with tap water. Rinse the inside of the glassware two or three times with minimal amounts of distilled water. (Distilled water is expensive and should be used sparingly.) If dry glassware is needed immediately, rinse the equipment twice with small amounts of acetone. The residual acetone in the equipment will vaporize quickly and leave no residue. |
| |

Shake out as much rinse water as possible and dry the outside with a towel.

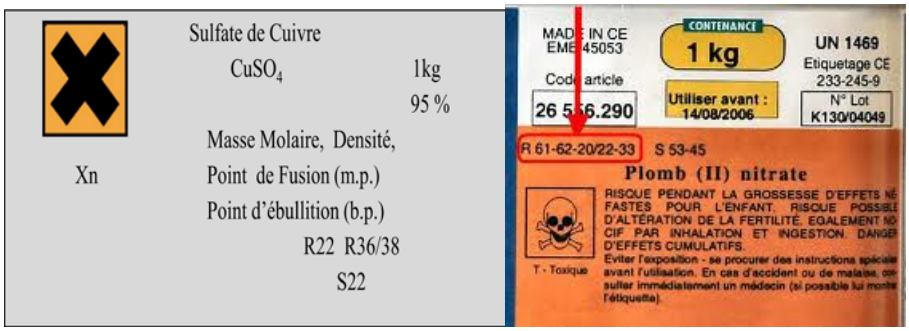
Make sure your work area is clean and dry.
Clean up any spill immediately.
Never place anything that is not directly required for the experiment on laboratory desks; other items may interfere with the experiment

- Before leaving the laboratory, make sure your work area is clean and dry. Ensure that all gas, water, vacuum, and air valves are completely turned off.
- Your instructor is available for any assistance you may need. Never hesitate to ask questions especially if there is any question concerning proper operating procedure.
- Be sure that you understand every instruction before proceeding.

**Chemical hazard information**

The label affixed to the containers of marketed products has the role of informing the user about the dangerous properties. It must inclue :

- The name of the substance as well as its formula
- The dangers symbols (pictograms)
- One or more risk phrases
- One or more safety tips
- Some physicochemical properties and other indications.




**Product Risk Phrases, Safety Phrases and Storage Phrases**

There are three types of phrases on a product label:

- **Risk Phrases or H in English "Hazard"** : R1, R2, R68 etc…ex: R1 : Explosive when dry
- **Safety Phrases:** S1, S2, … S64,….
- **Product storage and handling phrases** : S25 : Avoid contact with eyes; S49: Keep only in the original container.


**Symbols used on labels (pictograms)**

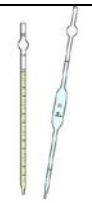
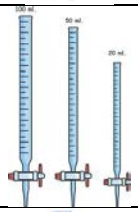
The handling of chemical species is not always safe for users but also for nature. The manufacturers therefore indicate on each bottle of chemical product drawings which are called pictograms to indicate the different dangers.

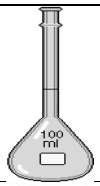
| ***Symbol*** | ***Meaning*** | ***Risks*** | ***Precautionary advice*** |
|---|---|---|---|
|  | **Flame over Circle** | Oxidizers | These chemicals give off oxygen and can make a fire spread. |
|  | **Flame** | Flammable • Pyrophoric • Self-heating • Emits Flammable Gas • Self-reactive • Organic peroxides | These chemicals burn or can release gases that burn. |
|  | **Exclamation mark** | Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer | Cause health problems. Usually less toxic than chemicals labeled with the health hazard or skull and cross-bone pictograms.<br>Also used for chemicals that can destroy the ozone layer. |
|  | **Skull and Cross-bone** | Acute Toxicity (fatal or toxic) | Poisons that quickly cause sickness or death. A toxin may attack one or more parts of the body, such as the liver, kidneys, nerves, lungs, skin, eyes, bone. |

| | | | |
|---|---|---|---|
|  | **Exploding Bomb** | Explosive , self-reactive , organic peroxide | These chemicals can explode. |
|  | **Corrosion** | Skin Corrosion/Burns • Eye Damage • Corrosive to Metals | These chemicals cause permanent damage to skin or eyes. These chemicals destroy metals. |
|  | **Environment** | Aquatic toxicity | These chemicals are dangerous if they get into rivers, lakes or oceans. |
|  | **Gas Cylinder** | Gases under pressure | Gases and liquids under pressure Can explode. This pictogram is used for both pressurized gases and liquefied gases such as liquid nitrogen. |
|  | **Health Hazard** | Carcinogen . Mutagenicity .Reproductive Toxicity. Respiratory Sensitizer. Target Organ Toxicity. Aspiration Toxicity | Cause serious health problems. Some problems show up immediately, but some may show up much later. |

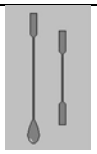
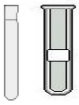
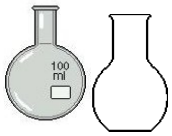
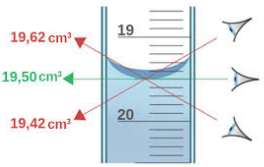
**Usual glassware and utensils used in Practical Chemistry**

Laboratory equipment is generally used either to perform a manipulation or experiment or to perform measurements and collect data. The volume of the glassware used must be adapted to the handling:

| Glassware | Utility and precision |
|---|---|
|  | Pipette for very precise volume measurement<br>Graduate pipette for various volume measurement |
|  | Burette for precise volume measurement |
|  | Graduated cylinder for precise volume measurement |

| | |
|---|---|
|  | Volumetric flask very precise measurement |
|  | Beaker, for inaccurate measurement , and container for transferring |
|  | Erlenmeyer, for inaccurate measurement and chemical reaction (dosage, oxidation-reduction) |

All chemistry laboratories mainly share common laboratory equipment, glassware and characterization devices. This includes:

| **Equipment and glassware** | **Utility** |
|---|---|
|  Hot plate stirrer: for heating, stirring and mixing reagents |  The balance: to weigh reagents |
|  Wash bottle: may contain distilled water or other solvent |  Spatula: for solid powder samples |
|  Suction device (pear) to suck up the solutions |  Thermometer : taking reaction temperatures |
|  Test tube container for chemical tests |  Florence flask for synthesis reaction |
|  Bunsen burner  Tripod  Watch glass  Mortar |  correct reading |