

# CHEMISTRY LABORATORY


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# CHEMISTRY LABORATORY SAFETY PROCEDURES

Chemical experimentations are not always safe. For this reason all experiments are carried out in a special room – the chemistry laboratory. In the chemistry laboratory there are workplaces with containers of chemicals and reagents, laboratory glassware, heating, cooling, mixing devices, etc. – every thing you need to perform chemical experiments. If toxic fumes, vapours or dust are emitted experiments must be undertaken in a laboratory chemical hood – a camera with good ventilation to suck gases and dust. A fire extinguisher and a first aid equipment should always be in the laboratory. Goggles and an apron are obligatory. Protective gloves are also often used. This personal protection is needed because some substances are explosive, highly inflammable, corrosive, etc.

Before entering the laboratory students (if they are minors – their parents) declare in writing that they are acquainted with the laboratory safety procedures and will follow them.

## CHEMISTRY LABORATORY SAFETY PROCEDURES

- Students wear the appropriate personal protective equipment (protective gloves, laboratory aprons or coats, chemical splash goggles, etc.). Hair also should be secured.
- Experimentaions are performed only under the supervision of the teacher. His instructions should by followed strictly.
- Laboratory equipment, chemicals and reagents should only be used as described in the experimentations instructions.
- Foods and beverages are not permitted in the laboratory.
- Flammable substances should be kept away from fire. It is forbidden to check the flammability of any substance unless it is mentioned in the instructions.
- Students should protect themselves from heat sources and flame. Heaters must be turned of immediately after being used.
- Empty vessels should never be heated. When heating solutions in test tubes the open end of the test tube must point away from the experimenter or any other person. This is obligatory also if a reaction is going on in the test tube as harmful substances can be evolved or the reaction mixture can explode.
- When diluting an acid it is always added to the water slowly. Never add water to an acid.

- Glassware should always be used very carefully as it is fragile and can be broken easily. Broken glass is very dangerous. The pieces of broken glass should not be collected with hands.
- If some of the reaction products are harmful vapours, experiments should be performed in a laboratory chemical hood.
- Goggles, laboratory apron and protective gloves are obligatory when working with acids, bases and all corrosives substances.
- Other rules assuring the effective work in the laboratory should also be respected: reactants should not be contaminated; workplace should always be cleaned after finishing the experimentations; wasted materials should be disposed of properly; chemicals and reagents should be stored on their appropriate places; chemicals and reagents without labels should be disposed of; to avoid chemicals and reagents contamination it is always necessary to keep all containers closed and chemicals or reagents that have been taken out from the containers should not be returned back. If these safety rules and procedures are violated, emergency situations may arise.
- In case of accident in the laboratory, everybody has to keep calm. The teacher should be informed immediately.

There are safety symbols to indicate the hazardous chemicals and the necessary personal protection. Here are some of them:

| **OBLIGATORY:** | | |
|---|---|---|
| Goggles (safety glasses) |  | *Protective glasses should be used.* |
| Laboratory apron |  | *Protective clothes should be used.* |
| **USED AS INDICATED:** | | |
| Rubber gloves |  | *Hands protection* |
| Heated object |  | *Heat resistant gloves should be used.* |
| Power off |  | *The used electric device must be turned of after finishing the experiments.* |

## TO INDICATE HAZARDOUS PROPERTIES OF SUBSTANCES:

| | | |
|---|---|---|
| Corrosive substance |  | *Direct contact with eyes, skin and clothes should be avoided. To not respire. The use of protective gloves is obligatory.* |
| Harmful to the environment substance |  | |
| Explosive |  | |
| Poison |  | |
| Flammable substance |  | |
| Radioactive substance |  | |
| Harmful, irritating substance |  | |
| Substance that evolves suffocating smoke or vapour. |  | |

## OTHER SYMBOLS ARE ALSO USED IN THE LABORATORY:

| | | |
|---|---|---|
| Hands must be washed. |  | |
| Waste container |  | *Chemical waste should be disposed of properly.* |
| Low level hazard |  | |
| First aid kit |  | |

# LABORATORY GLASSWARE

Laboratory glassware is made of high quality glass. It is used for heating, mixing, reacting, measuring of volume, or to prepare solutions.

Reactions are often carried out in test tubes – cylindrical tubes with a small diameter and a round bottom. Special racks are used to hold them. The volume of the test tubes is most often in the range of 5 $cm^3$ to 25 $cm^3$. The volume of the liquid in the test tube should not exceed the half of the whole tube volume. Special test tubes holders are used to hold test tubes during the experiments (this is obligatory if the solution in the test tube is heated) or three of the fingers are used. The bottom of the test tube should never be heated The test tube should be little by little rotated to heat its wall. Attention must always be paid to never point the open end of the test tube at yourself or at another person. Different types of test tubes are shown in **fig. 1**.



**Fig. 1.** Test tubes

Different types of beakers are shown in **fig. 2**. Their volume ranges between 10 $cm^3$ and 2000 $cm^3$. Big volume beakers are used to prepare solutions and for other preparation purposes. 10 $cm^3$ to 300 $cm^3$ beakers are usually used. They have different shapes. They are especially useful if they are graduated (there are marks on the beakers outside corresponding to the indicated volume). Beakers may be heated on a hot plate with wire gauze or over a burner, attached to a ring stand.

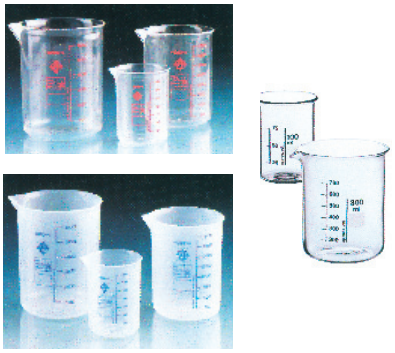


**Fig. 2.** Beakers

Different flasks are shown in **fig. 3**. They are laboratory glass vessels of different shapes and sizes used for various purposes.

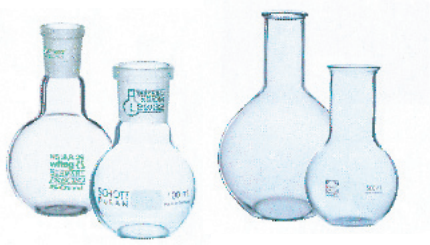


**Fig. 3.** Flasks

Volumetric glassware is shown in **fig. 4** – different types of graduated cylinders, pipettes, burets and volumetric flasks. The volume of the graduated cylinders (always on a stand) may vary from 5 $cm^3$ up to 2000 $cm^3$. They should not be heated. Measurements are not very precise.

Burets, pipettes and volumetric flasks (have marks for the entire volume) are used for precise volumetric measurements. Burets and pipette should not be heated. Burets are graduated glass tubes with a stopcock at the bottom. Their volume ranges from 1 $cm^3$ to 50 $cm^3$.

This brief overview does not cover all types of laboratory glassware.

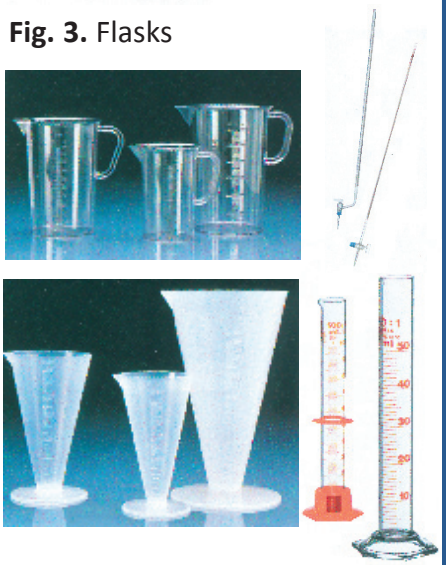


**Fig. 4.** Volumetric glassware

# WORKING IN THE LABORATORY

Chemical experimentations always start with the careful reading of the safety and methodological instructions for the experiments and end with the writing of the lab report. Every point of the experimentations should be understood and all instructions should be followed. All experimental data, observations, effects, etc. should be noted in the lab diary (can be a part of your chemistry notebook) in details.

Experimental data should never be noted on a single sheet of paper. The experimental data and all the notes in lab diary are used in the report. It summarizes all experimental data and observations. A final conclusion is always drawn.

The report includes the main experimental results. It is a personal lab document and the student's name is always noted. Here is a lab report template:

## REPORT

Name and surname . . . . . class . . . . . date . . . . . .

Title . . . . . .

Objective . . . . . .

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Materials. . . . . .

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Procedures, data and results . . . . . .

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Conclusions . . . . . .

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Discussion. . . . . .

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Other comments (if should be noted) . . . . . .

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