TP N°01 Introduction to Chemistry Lab Work

I. 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.

II. Pre-lab preparation

Carefully read the experiment to be performed before you come to the laboratory. Your instructor might require you to complete the Pre-Lab Review Sheet found before the Data Sheet of each experiment and turn it inbefore you begin your lab work. Even if this is not a requirement, you are still advised to complete the Review Sheet. The questions have been chosento 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 or less. Students unableto do this have usually failed to prepare properly for the laboratory. Make sure you arrive on time, since your instructor will provide additional instructions for experiments as needed.

III. Laboratory Safety

The chemistry laboratory can be a place of discovery and learning. However, by the very nature of laboratory work, it can be a place of danger if proper common-sense precautions aren't taken. While every effort has been made to eliminate the use of explosive, highly toxic, and carcinogenic substances from the experiments which you will perform, there is a certain unavoidable hazard associated with the use of a variety of chemicals and glassware. You are expected to learn and adhere to the following general safety guidelines to ensure a safe laboratory environment for both yourself and the people you may be working near. Additional safety precautions will be announced in class prior to experiments where a potential danger exists. Students who fail to follow all safety rules may be asked to leave the lab or suffer grading penalties.

IV. Laboratory Safety Rules

1. Do not perform unauthorized experiments or work in a laboratory alone.
2. Approved eye protection must be worn at all times in the laboratory. Eye protection must be splash proof chemical goggles and be approved by your instructor. If you do get a chemical in your eye rinse immediately with large quantities of water using the eye-wash stations.
3. Long hair and loose clothing must be confined while in a laboratory.
4. All students must wear lab coats at all times. Your legs must be completely covered below the knee by your lab coat.
5. Closed shoes with socks must be worn at all times – open-toed shoes, backless shoes, sling backs, clogs, and sandals are not permitted.
6. Know the location and proper use of fire extinguishers, fire blankets, safety showers, eye wash devices, and first aid kits.
7. Before obtaining any chemicals carefully read the label on the reagent bottles.
8. Eating, smoking, chewing and drinking are not allowed in a chemistry laboratory.
9. Thoroughly wash your hands after leaving the laboratory.
10. Use the fume hoods when toxic or irritating vapors are involved.
11. Mouth suction is never used to fill a pipette.
12. Never force glass tubing through cork or rubber stoppers without proper lubrication.
13. Never direct the open end of test tube toward yourself or anyone else.
14. Never pour water into concentrated acid.
15. Learn the proper procedure for igniting and operating a laboratory burner. Always extinguish the flame when the burner is not being used. Make sure that all flammable reagents are well removed before lighting the burner.
16. Liquid and solid waste containers must be properly used at all times.
17. Never place chemicals directly on the balance pan. Always use a proper weighing container when using a balance to weigh a chemical. Never pour chemicals directly over the balance.
18. Never return unused chemicals to their original container (unless directed to do so by the instructor).
19. Securely replace lids, caps, and stoppers after removing reagents from containers.
20. Always wipe spatulas clean before and after inserting into reagent bottles.
21. Report any accident and/or injury, however minor, to your instructor immediately.
22. Never place anything that is not directly required for the experiment on laboratory desks;

other items may interfere with the experiment.

23. All personal belongings should be placed in the bookcases as you enter the laboratory.

24. Clean up any spill immediately.

25. 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.

26. 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.

27. In any emergency, to get the lab supervisor attention is to SCREAM!

28. If an acid is to be diluted, pour acid slowly into the water with constant stirring. Never add water to acid.

29. Students should use their own calculator. Mobile phones cannot be used as calculator.

30. Be familiar with the following terms and their effects.

V. General laboratory procedures

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

1. Cleaning glassware: 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.) Shake out as much rinse water as possible and dry the outside with a towel. 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.

2. Disposal of used materials: Used chemicals and other materials must be disposed of appropriately. Some used chemicals can be flushed down the sink drain with water.

3. Most used chemicals will be collected in labeled containers located in the lab. Your instructor or other qualified individuals will then properly dispose of the collected materials (never return excess chemical to the original container).

VI. Chemical hazard information

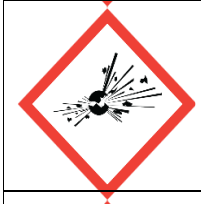
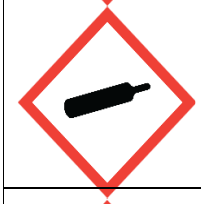
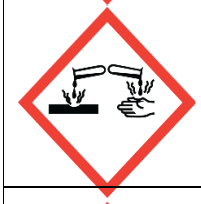
The label affixed to the containers of marketed products has the role of informing the user aboutthe dangerous properties. It must include:

- 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.

VII. 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.

Pictograms are symbols used to warn you about chemical hazards.

Pictogram Symbol	Pictogram Name	Hazards	General Meaning
	Flame	• Flammable • Pyrophoric • Self-heating • Emits Flammable Gas • Self-reactive • Organic peroxides	These chemicals burn or can release gases that burn.
	Flame over Circle	• Oxidizers	These chemicals give off oxygen and can make a fire spread.
	Exploding Bomb	• Explosive • Self-reactive • Organic peroxide	These chemicals can explode.
	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.
	Corrosion	• Skin Corrosion/Burns • Eye Damage • Corrosive to Metals	These chemicals cause permanent damage to skin or eyes. These chemicals destroy metals.
	Health Hazard	• Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	These chemicals cause serious health problems. Some problems show up immediately, but some may show up much later.
	Skull and Cross-bone	• Acute Toxicity (fatal or toxic)	These chemicals are 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, or bone.
	Exclamation Mark	• Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer	These chemicals cause health problems. Usually less toxic than chemicals labeled with the *Health Hazard* or *Skull and Cross-bone* pictograms.This pictogram is also used for chemicals that can destroy the ozone layer.
	Environment	• Aquatic Toxicity	These chemicals are dangerous if they get into rivers, lakes or oceans.

VIII. Product Risk Phrases, Safety Phrases and Storage Phrases

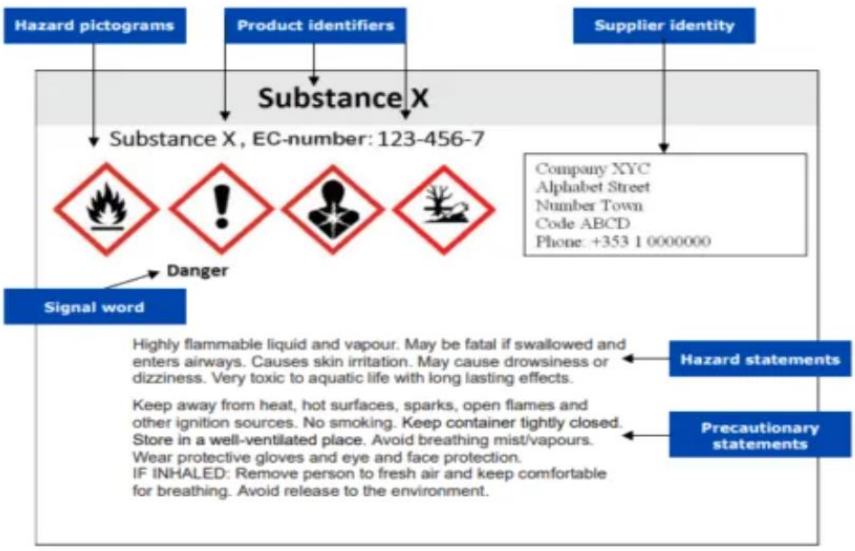
There are three types of phrases on a product label:

R1, R2, … R68,……etc: (or H in English "Hazard")

Risk Phrases, ex: R1 : Explosive when dry

S1, S2, … S64,…. etc:

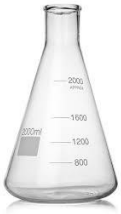
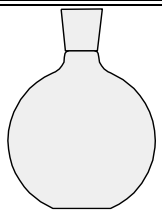
Safety Phrases, Product Storage and Handling Phrases, ex: S25 : Avoid contact with eyes; S49: Keep only in the original container.

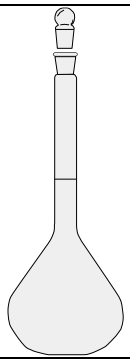
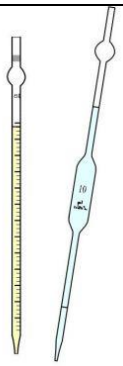
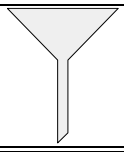
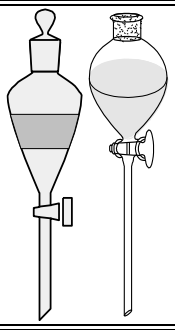
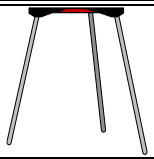
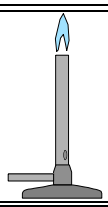


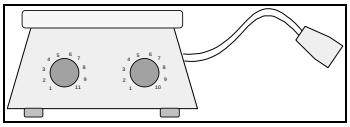
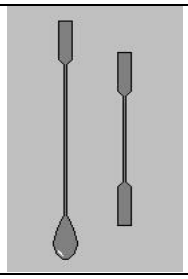
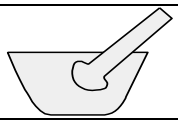
IX. Usual glassware and utensils used in Practical Chemistry

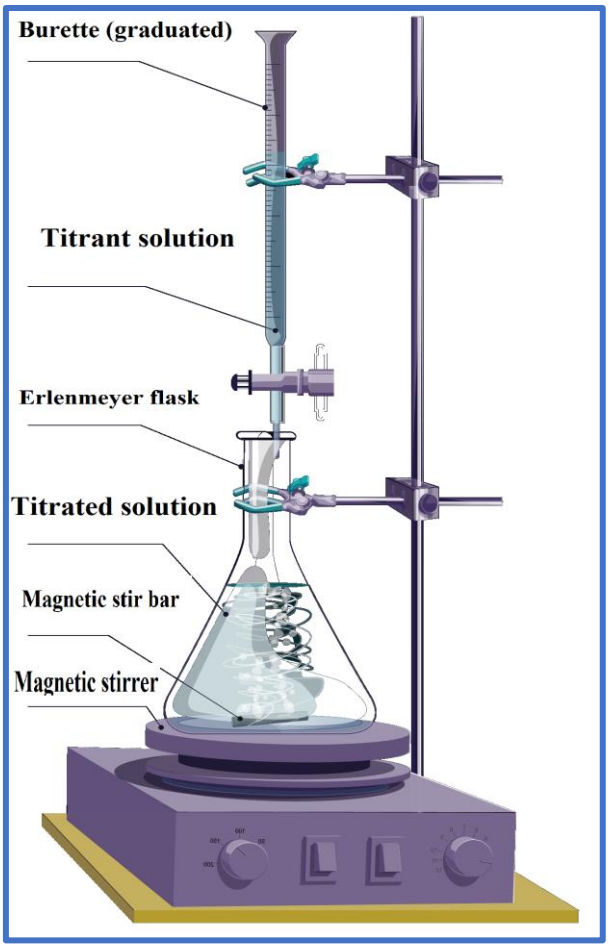
- Laboratory equipment is generally used either to perform a manipulation or experiment or to perform measurements and collect data. The volume of the glassware used must be adapted to the handling:
- Volumetric flask or pipette for very precise measurement;
- Graduated cylinder or burette for precise measurement;
- Beaker, Erlenmeyer…for inaccurate measurement.
- All chemistry laboratories mainly share common laboratory equipment, glassware and characterization devices. This includes:
- Devices such as the stirrer, the balance, etc.;
- General purpose glassware such as beaker, test tubes and Erlenmeyer flask;
- Volumetric glassware such as pipettes (graduated, gauged) and the burette;
- Accessories such as wash bottle, funnel, etc.

X. LABORATORY EQUIPMENTS

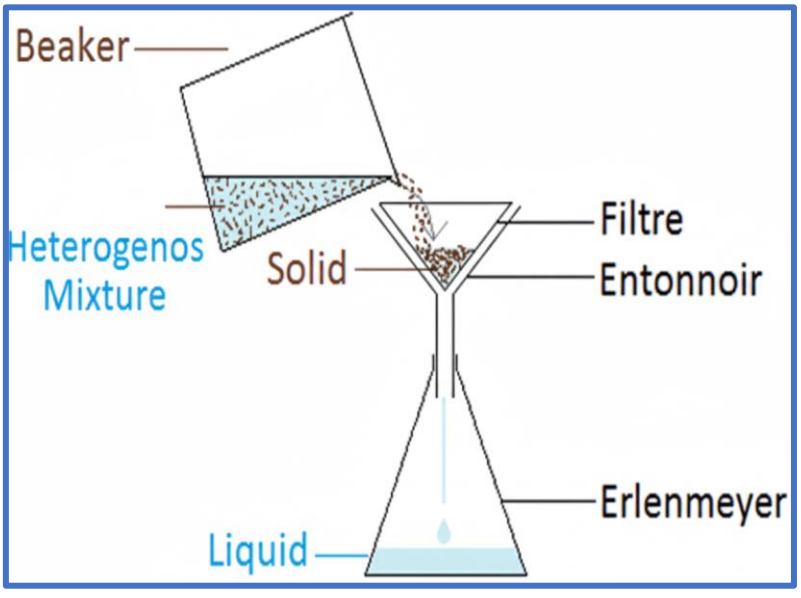
Instrument		Description / Usage principal
Beaker		Used to mix, heat, and measure approximate volumes of liquids.
Erlenmeyer flask		Used to mix solutions; its narrow neck helps prevent splashes.
Florence flask		Used for boiling liquids; designed to evenly heat substances.
Graduated cylinder		Used to measure the volume of liquids accurately.
Burette		Used to deliver precise volumes of liquid in titrations.

Instrument		Description / Usage principal
Volumetric flask		Used to prepare solutions of precise volumes and concentrations.
Pipette		Used to transfer a measured volume of liquid accurately.
Funnel		Used to pour liquids into containers with small openings or for filtration.
Separatory funnel		Used to separate immiscible liquids (e.g., oil and water).
Tripod		Used to support containers (like beakers or flasks) during heating.
Test tube		Used to hold, mix, or heat small quantities of liquid or solid chemicals.
Bunsen burner		Used for heating, sterilization, and combustion in laboratory experiments.

Instrument		Description / Usage principal
Balance		Used to measure the mass of substances accurately.
Hot plate stirrer		Used to heat and stir solutions with magnetic stirring.
Thermometer		Used to measure the temperature of substances accurately.
Wash bottle		Used to rinse glassware or to dispense small quantities of distilled water.
Spatula		Used to transfer small quantities of solid chemicals.
Mortar (and pestle)		Used to crush and grind solid substances into fine powder.
Watch glass		Used to evaporate liquids, hold small samples, or cover beakers.
Suction device (pear)		Used to create suction, often connected to filtration systems or vacuum operations.



Chemical Titration Experiment Setup



Filtration of a solid and a liquid