Introduction

Hypothesis become theories and theories attain rank of laws after withstanding rigorous experimental tests. Feasibility of a process is confirmed in the laboratory. Qualitative and quantitative analyses give complete chemical picture of the substance. It is with these considerations in mind we proceed to learn what is there in a chemistry laboratory.

Chemistry Laboratory

A chemistry laboratory is a workshop for chemists. Here students learn the techniques of the preparation, identification and estimation of chemical substances. Before starting experiment, a student must know from where to get the apparatus required for the given experiment and the placement of the chemicals to be used. A student must know the proper use of each equipment and the precautions to be observed while working in the laboratory. A chemistry laboratory is provided with the following fittings with which the student must become familiar.

1. Demonstration Table

Before starting experiment, the teacher gives instructions and demonstrates the concerned experiment on demonstration table. In chemistry laboratory, no seats are made available to the students, so students stand around demonstration table and note the instructions from teacher.

2. Students' Working Table

A number of wooden or concrete tables are provided for working. Each seat is provided with :
(a) Reagent shelves. Reagents or chemicals to be used are placed on the reagent shelf. These

are the reagents which are commonly used. For example, all dilute and concentrated acids such as H_2S0_4, HCl, HNO_3, etc. and bases like NaOH, NH_4OH, etc.
(b) Sinks and water taps. A sink and a water tap is fitted between every two reagent shelves. On either side of the sink, usually two taps are fitted for supply of water.
(c) Gas taps. These taps are fitted on the seats for supply of petrol gas to the burners. Sometimes kerosene is used for producing gas in place of petrol.

3. Side Shelves

Mostly there are two big shelves fitted on the walls of the laboratory. Reagents and chemicals, which are less frequently used, are placed in these shelves. Sometimes solid chemicals are placed in a separate shelf.

4. Fume Cup-board

There is at least one fume cup-board in the comer of the laboratory. All experiments giving out poisonous gases Or vapours are performed in this cup-board.

5. Balance Room

It is a small room attached to each laboratory. Here, a number of balances are kept for weighing the substances. .

6. Exhaust Fans

Two exhaust fans are provided at the two corners of the laboratory for the removal of the poisonous gases and vapours from the laboratory.

Common Laboratory Apparatus

The apparatus which is commonly used by XIth class student is described below :

1. Beakers. Beakers of different sizes such as 150 ml, 200 ml made of soft glass or corning glass. Beakers are used for taking various liquids.

2. Test Tubes. Test tubes of different sizes are available. Small test tubes used for salt analysis known as centrifuging tubes and boiling tubes are also available.

3. Conical Flask. It is used in volumetric analysis for carrying out titration.

4. Funnel. It is used for filtration or for pouring solutions.

5. Measuring Flask. It is used in quantitative analysis when we have to prepare a solution with a particular volume. There are flasks of 50 ml, 100 ml and 250 ml capacity. There is a mark on the stem of the flask upto which the liquid is taken to complete the volume.

6. Glass-Rod. It is used for stirring purposes. It is also used as an aid for transferring the liquid into the funnel.

7. China Dish. It is a small vessel made of porcelain. It is used in crystallisation, for concentrating a solution.

8. Wire Gauze. It is placed above the flame of the burner so that the glass vessel being heated does not touch the flame directly and hence is prevented from breaking.

9. Tripod Stand. It is used for supporting a china dish or a beaker so that it can be heated from below.

Other apparatus with which a student must familiarize are test tube holder, test tube brush, crucible tongs, spatula, watch glass, clamp stand, burette, pipette, water bath, sand bath and centrifugal machine.

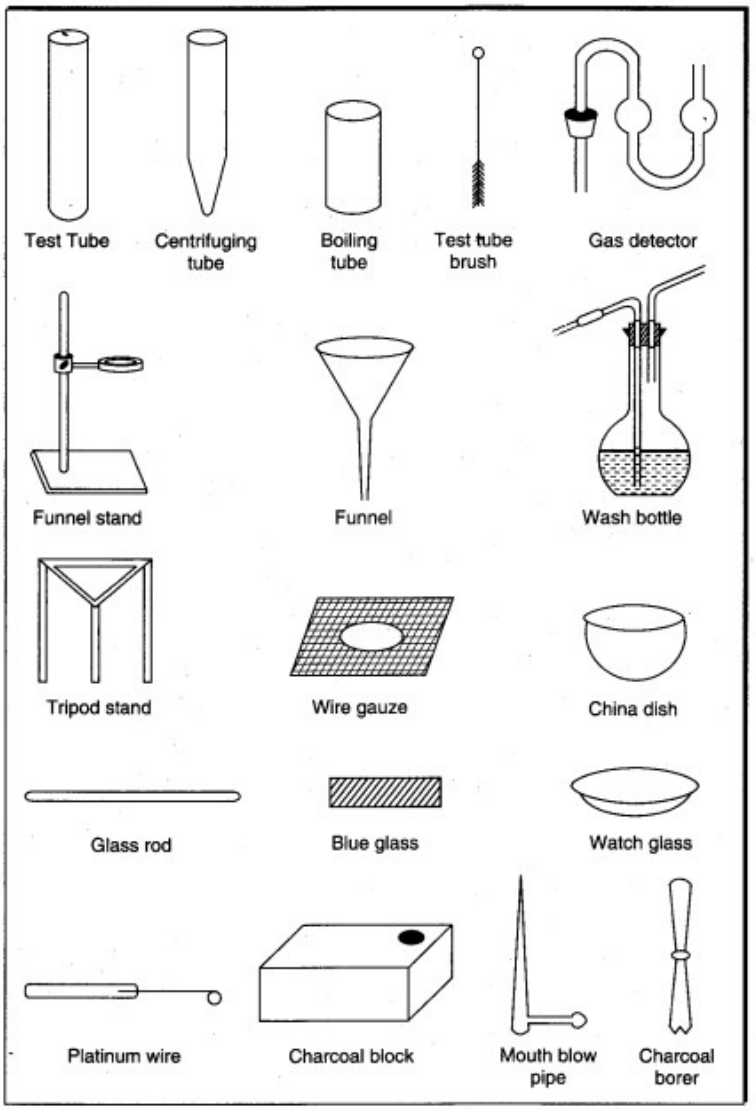

Fig. 1.1. Apparatus used in chemistry laboratory.

Instructions To Work In Laboratory

To work in the laboratory, a student must follow the following rules :

1. A student must have a practical note-book, rough note-book for instructions, a pen or pencil, a laboratory coat and other equipment such as a platinum wire, fractional weights as required.
2. Always come prepared for the experiment. This will help in understanding the experiment better.
3. Always listen to the teacher's instructions carefully and note down the important points and precautions to be followed. .
4. After the instructions, collect the apparatus from the laboratory assistant in queue.
5. Thoroughly clean the apparatus to be used.
6. Do only the experiments assigned, unallotted experiments should not be done.
7. Do your experiment honestly without caring for the final result. Record the observa¬tions on a rough note-book instead of writing on the pieces of paper.
8. Plan your work so that it is finished in the stipulated time.
9. Be economical with the reagents. Only small quantities of the reagents are to be used.
10. Handle the glass apparatus very carefully. In case of any breakage, report it to your teacher at once.
11. Dispose of all waste liquids in the sink and allow water to run for sometime by opening the

water tap.
12. Keep your seat clean. If an acid or other corrosive chemical is spilled, wash it off with water.
13. Clean your apparatus after the experiment and return it to the laboratory assistant.
14. In case of any injury or accident or breakage of the apparatus, report it to the teacher immediately.
15. Wash your hands with soap after the experiment.

Some Important Precautions

To avoid unnecessary risk or injury during laboratory work, the students are advised to observe the following precautions :
1. Do not touch any chemical with hand as some of them may be corrosive.
2. Never taste a chemical. It may be poisonous.
3. Do not place the chemical on the palm of your hand.
4. Do not keep the reagent bottles open.
5. Do not roam here and there in the laboratory without work.
6. Do not put any object into the reagent bottle.
7. Do not bring inflammable liquids such as alcohol, ether near the flame.
8. Do not take the reagent from the shelf to your seat.
9. Do not disturb the arrangement of reagents placed on the shelf.
10. Do not use cracked glass apparatus such as beakers for heating purposes.
11. Do not keep water tap running when not required.
12. Do not throw solid waste materials like filter paper pieces, test-tube pieces, etc. in the sink. Throw them in the waste box only.
13. Do not heat beakers or china dish directly on flame. Always make use of wire gauge.

Practical Note-Book

All the experiments that are conducted in the laboratory are recorded in a practical note-book. It is compilation of whole work done by the student, so it must be well maintained, protected from mechanical and chemical damage. For keeping up-to-date record of experiments following points should be kept in mind :

1. The name of the experiment should be entered along with the date of carrying out that experiment.
2. Requirements should be mentioned next to the title given.
3. Theory and principle of the experiment should be given in precise manner.
4. This should be followed by procedure in which experiment is to be conducted. Then a summary of precautions to be taken care are mentioned. Finally mention the general calculations for the experiment.

If we make a table of the points to be written on left hand and right hand side of the notebook, it will look somewhat like the one given below :

Left hand side	*Right hand side*
Date Diagram Chemical equation Observations Calculations	Date Name of experiment Theory Procedure General calculations Precautions

Keep following points in consideration regarding your practical note-book :

1. Do not tear pages from note-book.
2. Do not over write if a mistake has been committed in recording, put a line over it and write the correct word or figure again.
3. Number the pages of your note-book.
4. Complete the index, indicating the experiment, its serial number, page number on which it is written.
5. Keep your note-book neat and tidy and covered with brown paper.

First Aid Emergency Treatment In The Laboratory

A chemistry laboratory encompasses different types of chemicals, apparatus. Any lack of attention on the part of student may cause accident. Accidents may occur by chance also. In any case prompt action should be taken to give first aid to the victim and then should be hospitalised if the need be. The probable accidents and their first aid emergency treatment are given below :

Type of accident	*First aid emergency treatment*
1. Burns :	
(*i*) Burn by dry heat (*i.e.*, flame, hot object etc.)	(*i*) Apply burnol or sarson (mustard) oil.
(*ii*) Burns causing blisters. **Caution.** Heat burns should never be washed.	(*ii*) Apply burnol at once.
(*iii*) Acid burns	(*iii*) Wash freely with water, then with 1% acetic acid and again with water. Dry the skin and apply burnol.
(*iv*) Bromine burns	(*iv*) Wash liberally with 2% NH_3 solution and then rub glycerine. Wipe off glycerine after some time and apply burnol.
2. Cuts :	
(*i*) Minor cuts	(*i*) Allow to bleed for a few seconds. Remove the glass piece if any. Apply a little methylated spirit and cover with a piece of cotton. Alternatively apply $FeCl_3$ solution to stop bleeding.
(*ii*) Serious cuts	(*ii*) Apply pressure above the cut to stop bleeding. Call the doctor.
3. Eye Accidents :	
(*i*) Acid in eye	(*i*) Wash thoroughly with water, then with 1% sodium bicarbonate solution and then with water again.
(*ii*) Alkali in eye	(*ii*) Wash thoroughly with water and then with 1% boric acid solution.
4. Poisons :	
(*i*) Poisons not swallowed	(*i*) Spit out immediately. Wash mouth with water.
(*ii*) Acid swallowed	(*ii*) Drink lot of water. Drink lime water. No emetic should be taken.
(*iii*) Caustic alkalies swallowed	(*iii*) Drink lot of water. Drink a glass of lemon or orange juice. No emetic should be taken.
(*iv*) Inhalation of gases like Cl_2, SO_2, Br_2 etc causing suffocation.	(*iv*) Loosen the clothes at the neck. Go in the open air. Inhale dilute vapours of ammonia or gargle with sodium bicarbonate solution.
5. Fire :	
(*i*) Clothes catch fire	(*i*) Do not run. Wrap with a blanket. Lie down on the floor and roll.
(*ii*) Beaker containing inflammable liquid catches fire	(*ii*) Cover the beaker with duster or damp cloth.