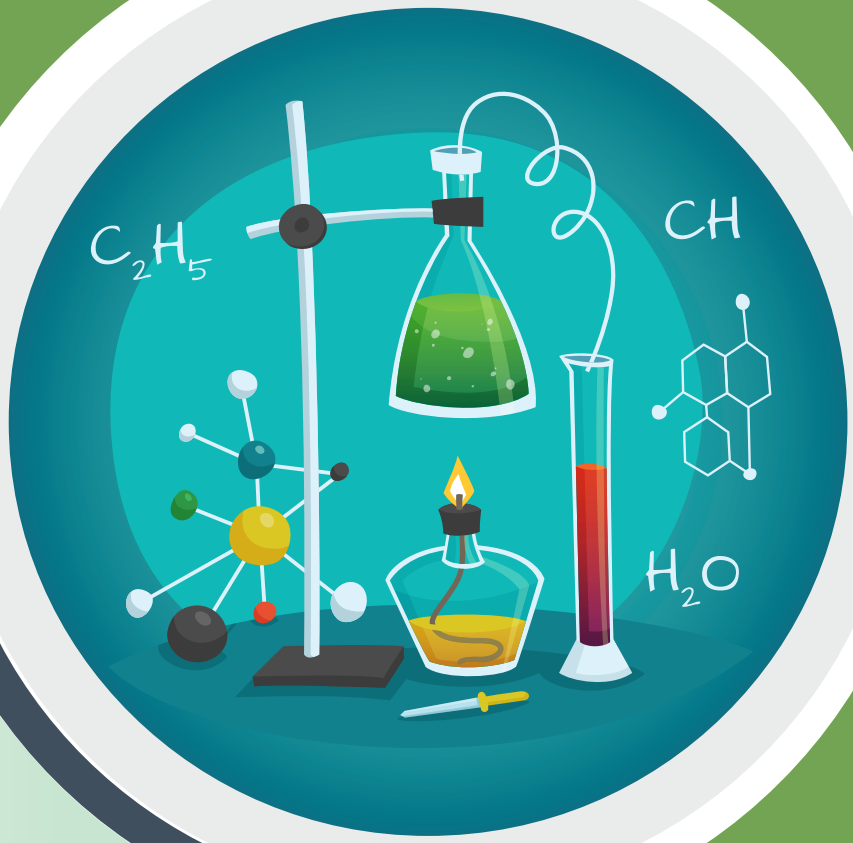
NOOTAN



ISC

Chemistry

Lab Manual

Class XII

Free NOOTAN Practical Notebook with this Book

Nageen Prakashan

NOOTAN

ISC

CHEMISTRY

LAB MANUAL

Class XII

R. K. SHARMA
M.Sc., B.Ed.

PERSONAL MEMORANDA

Name .....

School .....

Class..... **Roll No**..... **Section**..... **Year**.....

Published by :

Nageen Prakashan Pvt. Ltd.

310, Western Kutchery Road, Meerut-250 002, U.P. (INDIA)

- **Published by**
  Nageen Prakashan Pvt. Ltd.

- **Registered Office**
  Nageen Prakashan Pvt. Ltd.
  310, Western Kutchery Road,
  Meerut-250 002, U.P. (INDIA)
  Ph. : +91-121-2792600 (10 lines),
  Fax : +91-121-2643153

- **Branch Office**
  Nageen Prakashan Pvt. Ltd.
  (Nageen International)
  6, Ground Floor, Plot No. 48,
  Hasanpur, I.P. Extension, Patparganj,
  (Near CBSE Office)
  New Delhi-110 092
  Ph. : +91-11-42548855

- **Corporate Office**
  Nageen Prakashan Pvt. Ltd.
  (NPPL Press Unit)
  Vill. Salarpur, P.O. Rajpura
  Mawana Road,
  Meerut-250 001, U.P. (INDIA)
  Ph. : +91-121-2793400

E-mail : info@nageenprakashan.com
nageenprakashan@yahoo.com
Visit us : www.nageenprakashan.com

- **Latest Edition**

- This edition can be exported from India only by the publisher.

- **Price :** ₹ **220.00 (In India)**
  $ **10.00 (Outside India)**

- **Laser Typesetting by :**
  Nageen Prakashan Pvt. Ltd.
  DTP Division
  Vill. Salarpur, P.O. Rajpura,
  Mawana Road,
  Meerut-250 001, U.P. (INDIA)
  dtp@nageenprakashan.com

- **Cover Designed by :**
  Nageen Prakashan Pvt. Ltd.
  Design Unit
  Vill. Salarpur, P.O. Rajpura,
  Mawana Road,
  Meerut-250 001, U.P. (INDIA)
  design@nageenprakashan.com

- **Printed at :**
  NPPL Press Unit
  Vill. Salarpur, P.O. Rajpura,
  Mawana Road,
  Meerut-250 001, U.P. (INDIA)
  press@nageenprakashan.com

52019

Preface

Science without experiments is incomplete. The complete knowledge of science can only be achieved from experimentation.

Experiments not only help to understand the basic principles of a particular topic but also inculcates the scientific attitude in the students. The experiments make the subject interesting. There remains no longer any need for memorization of various chemical facts and principles. Researches in chemistry are the basis of great inventions and discoveries. The present edition of ISC Chemistry Lab Manual for Class XII has the following features :

- The experiments have been described in the simple and easy language.
- The matter is according to the latest ISC syllabus.
- Brief theory about the experiment has been discussed along with the experiment.
- Specimen format of the salt analysis are written according to ISC council's pattern.
- Experiments and the questions based upon the experiments on volumetric analysis are according to the Board pattern.
- The identification of various organic compounds involves all the important chemical tests with their correct observations.
- The essential graphs related to rate of reaction have been plotted.
- Previous years board question papers have been added to understand its pattern.

With the above mentioned features, it is hoped that the present Lab Manual for class XII will help the students to perform the experiments correctly and record their observations, calculations and results accurately to score high marks in their board examination. Suggestions from the learned teachers for the further improvement of the present edition shall be appreciated. These will be duly acknowledged and incorporated in the next edition.

I am thankful to Mr. Mohit Jain of Nageen Prakashan Pvt. Ltd., Meerut for his support and cooperation during the publication of this Lab Manual. I give sincere thanks to Almighty God, colleagues and family members for their moral support.

R. K. Sharma

SYLLABUS

PRACTICAL WORK — 15 Marks

Candidates are required to complete the following experiments

1. Titrations

Oxidation-reduction titrations : potassium manganate (VII)/ammonium iron (I) sulphate; potassium manganate (VII)/oxalic acid.

The candidate may be required to determine the percentage purity of a compound and the number of molecules of water of crystallization in hydrated salts. In such experiments sufficient working details including recognition of the end point will be given.

Candidates will be required to calculate :

- Molarity
- Concentration in grams L^{-1}/molecular mass
- Number of molecules of water of crystallization/ percentage purity.

NOTE : Molarity must be calculated upto 4 decimal places at least,in order to avoid error.

OBSERVATION TABLE

S. No.	(A)	(B)	(B–A)
	Initial burette reading (ml)	Final burette reading (ml)	Difference (ml)
1			
2			
3			

- Concordant reading is to be used for titre value. Concordant reading is two consecutive values which are exactly the same. Average will not be accepted as titre value.
- The table is to be completed in ink only. Pencil is not to be used.
- Overwriting will not be accepted in the tabular column.

Observations :

- Pipette size (should be same for all the candidates at the centre).
- Titre value (concordant value).

2. Study of the rate of reaction

The candidates will be required, having been given full instructions, to carry out an experiment on the rate of reaction, *e.g.*, reaction between sodium thiosulphate and hydrochloric acid (using different concentrations for either), magnesium and dil. sulphuric acid/dil. hydrochloric acid (using different concentrations).

1. *Graph of volume vs. time and its interpretation.*
2. *Relationship between concentration and rate, volume and rate and time and rate.*

3. Identification of the following compounds and functional groups based on observations

- Alcoholic group - glycerol
- Aldehyde group - formaldehyde
- Ketonic group - acetone
- Carboxylic group - benzoic acid
- Amino group - aniline

* Please Note : Carbylamine and acrolein tests should not be performed.

The student should learn to differentiate between colours, solution, ring and precipitate.

4. Characteristic tests of carbohydrates and proteins

- Carbohydrates - glucose
- Proteins - powdered milk

Identification should be of 'Carbohydrate' and 'Protein' not of individual substances.

5. Experiments related to pH change using pH paper or universal indicator

- Determination of pH of some solutions obtained from fruit juice, solutions of known and varied concentrations of acids, bases and salts.
- Comparison of pH of the solutions of strong and weak acids of the same concentration.

Use of universal indicator/pH paper must be taught to the students.

6. Electrochemistry

Setting up a simple voltaic cell.

Variation of cell potential in $Zn/Zn^{2+}//Cu^{2+}/Cu$ with change in concentration of electrolyte ($CuSO_4$, $ZnSO_4$) at room temperature.

7. Qualitative analysis

Qualitative analysis : identification of single salt containing one anion and one cation :

Anions : CO_3^{2-}, NO_2^-, S^{2-}, SO_3^{2-}, SO_4^{2-}, NO_3^-, CH_3COO^-, Cl^-, Br^-, I^-, $C_2O_4^{2-}$, PO_4^{3-}.

Cations : NH_4^+, Pb^{2+}, Cu^{2+}, Al^{3+}, Fe^{3+}, Zn^{2+}, Mn^{2+}, Ni^{2+}, Co^{2+},Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}.

NOTE : Chromyl chloride test not to be performed. For wet test of anions, sodium carbonate extract must be used (except for carbonate).

(Insoluble salts such as lead sulphate, barium sulphate, calcium sulphate, strontium sulphate will not be given).

Anions : Dilute acid group — CO_3^{2-}, NO_2^-, S^{2-}, SO_3^{2-}
Concentrated Acid Group— NO_3^-, Cl^-, Br^-, I^-, CH_3COO^-, Special Group—- SO_4^{2-}, PO_4^{3-}, $C_2O_4^{-2}$.

Cations : Group Zero : NH_4^+
Group I : Pb^{2+}

Group II : Cu^{2+}, Pb^{2+}
Group III : Al^{3+}, Fe^{3+}
Group IV : Zn^{2+}, Mn^{2+}, Ni^{2+},Co^{+2}
Group V : Ba^{2+}, Sr^{2+}, Ca^{2+}
Group VI : Mg^{2+}

NOTE :

- Formal analytical procedure is required for Qualitative Analysis.
- Specific solvent for O.S. to be used;
- Before adding Group III reagents to the filtrate of Group II, H_2S must be removed followed by boiling with conc. Nitric acid.
- The right order for buffer (NH_4Cl and NH_4OH) must be used.
- The flame test with the precipitate obtained in Group V for Ba^{2+}, Sr^{2+}, Ca^{2+} will also be accepted as a confirmatory test.

For wet test of anions, sodium carbonate extract must be used (except for carbonate).

PATTERN OF CHEMISTRY PRACTICAL PAPER

Questions in the practical paper will be set as follows :

Question 1	Volumetric Analysis	**7 Marks**
Question 2	Any one or a combination of the following experiments : • Study of the rate of reaction • Identification of the organic compounds and functional groups based on observations. • Characteristic tests of carbohydrates and proteins. • Experiments related to pH determination using pH paper or universal indicator. • Electrochemistry	**4 Marks**
Question 3	Qualitative Analysis (Single Salt)	**4 Marks**

PROJECT WORK AND PRACTICAL FILE — 15 Marks

Project Work — 10 Marks

The project work is to be assessed by a Visiting Examiner appointed locally and approved by the Council.

The candidate is to creatively execute one project/ assignment on an aspect of Chemistry. Teachers may assign or students may select a topic of their choice. Following is only a suggestive list of projects.

Suggested Evaluation Criteria for Project Work

- Introduction/purpose
- Contents
- Analysis/material aid (graph, data, structure, pie charts, histograms, diagrams, etc.)
- Presentation
- Bibliography

Suggested Assignments

1. Amino acids : Peptides structure and classification, proteins structure and their role in the growth of living beings.
2. Nucleic Acid : DNA and RNA – their structure. Unique nature. Importance in evolution and their characteristic features.
3. Carbohydrates and their metabolism, Blood - haemoglobin and respiration.
4. Vitamins and hormones.
5. Simple idea of chemical evolution.
6. Natural polymers (any five) structure, characteristics, uses. Synthetic polymers (any five) - method of preparation, structure, characteristics and uses.
7. Types of Dyes - methods of preparation, characteristics and uses.
8. Chemicals in medicines, antiseptics, antibiotics, antacids, etc. and their uses.
9. Preparation of soap, nail polish, boot polish, varnish, nail polish remover, shampoo and perfumes.
10. Chemicals and chemical processes in forensic studies.
11. Insecticides, pesticides and chemical fertilisers.
12. Ancient Indian medicines and medicinal plants.
13. Organic Chemistry in Nutrition, Food Science and Biotechnology.
14. Effect of Green House Gases.
15. How Plastics have changed the world, both socially and economically.

Practical File

5 Marks

The Visiting Examiner is required to assess students on the basis of the Chemistry Practical file maintained by them during the academic year.

NOTE : According to the recommendation of International Union of Pure and Applied Chemistry (IUPAC), the groups are numbered from 1 to 18 replacing the older notation of groups IA ..... VIIA, VIII, IB, ..., VIIB and 0.

However, for the examination both notations will be accepted.

Old notation	New notation	Old notation	New notation
IA	1	IB	11
IIA	2	IIB	12
IIIB	3	IIIA	13
IVB	4	IVA	14
VB	5	VA	15
VIB	6	VIA	16
VIIB	7	VIIA	17
VIII	8 9 10	0	18

CONTENTS

INDEX

S.No.	Experiment	Date	Page	Remarks

INDEX

S.No.	Experiment	Date	Page	Remarks

Titration (Volumetric Analysis)

1

Tritimeric or volumetric analysis is a quantitative analysis which involves the measurement of volumes of reacting substances. In this process, one solution from burette is added to the known volume of the other solution till the end point with the help of an indicator. Titrations are classified as follows :

1. Acid-base titration
2. Redox titration
3. Iodometric titration
4. Iodimetric titration
5. Precipitation titration
6. Complexometric titration

IMPORTANT TERMS IN VOLUMETRIC ANALYSIS

1. Titration

The process of complete reaction of a known volume of a solution of one substance with the solution of another substance is called titration. The solution whose strength is already known is called titrant (standard solution) and the solution whose strength has to be determined is called titre. Titrant is generally taken in titration flask.

2. End Point

The point at which the chemical reaction is complete is called end point. It is also known as titre value.

3. Indicator

A chemical substance which indicates the end point in a titration is called indicator.

Apparatus Used in Volumetric Analysis

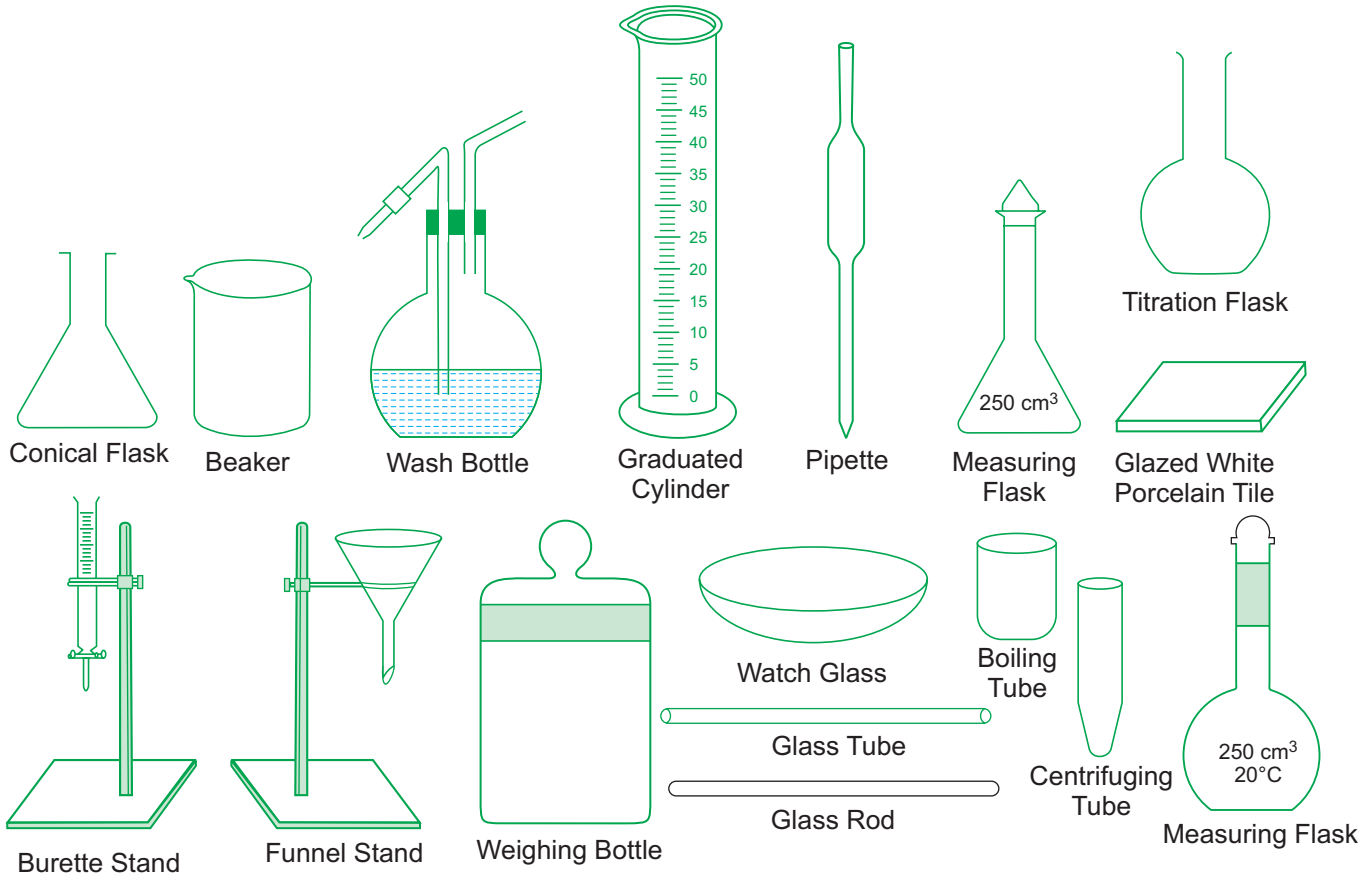


Fig.1.1. Apparatus used in volumetric analysis.

1. Burette

It is a long cylindrical glass tube of uniform bore. It is graduated from zero to fifty in millilitres. Each division is further subdivided into ten equal parts. Therefore, the least count of burette is 0.1 ml.

Uses of Burette

1. The burette which has to be used should not leak.
2. The burette is thoroughly washed with distilled water or with chromic acid (mixture of conc. H_2SO_4 and $K_2Cr_2O_7$).
3. Pour little solution which has to be taken in burette in titration and rotate the solution into it. This is called rinsing.
4. Clamp the burette after padding with paper in a burette stand in vertical position. Pour the solution into it with the help of funnel as shown in fig. 1.2. The funnel is slightly kept above the burette for the escape of air. Funnel is removed after filling the burette. Air bubbles are removed by opening the stop cock so that the outgoing solution removes the bubbles through the nozzle.
5. Every liquid has at its top a curved surface called meniscus. While taking a reading on the burette, read the mark that concides with the lower curve of the meniscus in the colourless solution and the upper curve in case of coloured solutions.

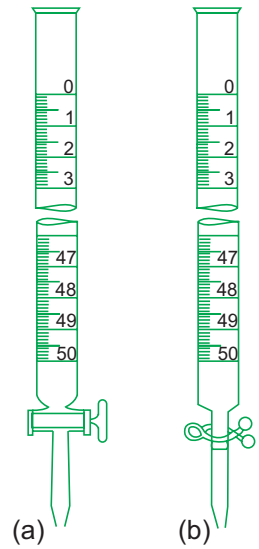


Fig.1.2. Burettes.

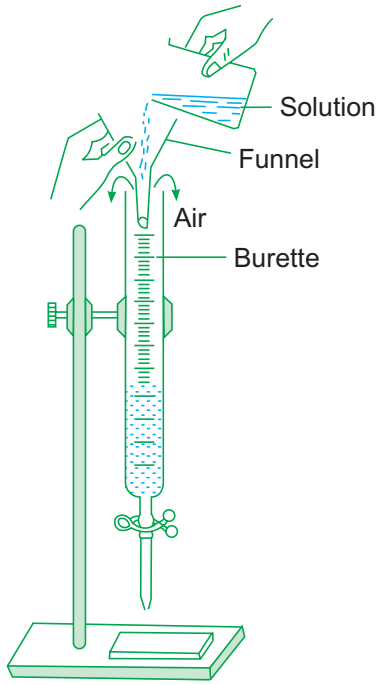


Fig.1.3. Filling the burette.

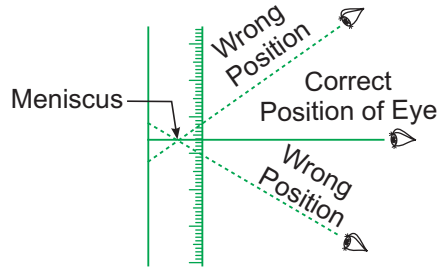


Fig.1.4. How to take burette reading.

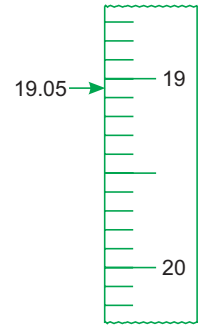


Fig.1.5

2. Pipette

It is a long narrow tube provided with a bulb in the middle and a narrow end at the lower position. It has an etched mark on the stem above the bulb. This mark indicates the capacity of the pipette. The capacity of the pipette in cm^3 at a particular temperature is marked on the pipette.

Uses of Pipette

1. It is first washed with distilled water and then rinsed with about 5 cm^3 of solution as shown in fig. 1.6.
2. Suck the solution through nozzle by dipping it inside the solution. When the level of solution is just above the etched mark, remove it from the mouth quickly and close the upper end of the pipette with the forefinger of your right hand as shown in fig. 1.7. Now release the pressure of your finger slightly, so that the liquid begins to fall down till the lower meniscus of the solution touches the etched mark. Now close the pipette tightly and transfer the solution into titration flask by removing your finger.

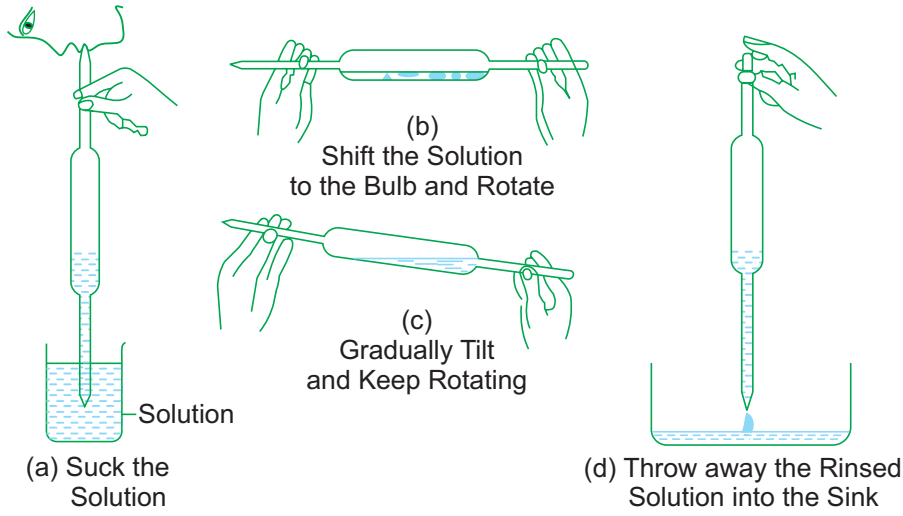


Fig.1.6. Rinsing of a pipette.

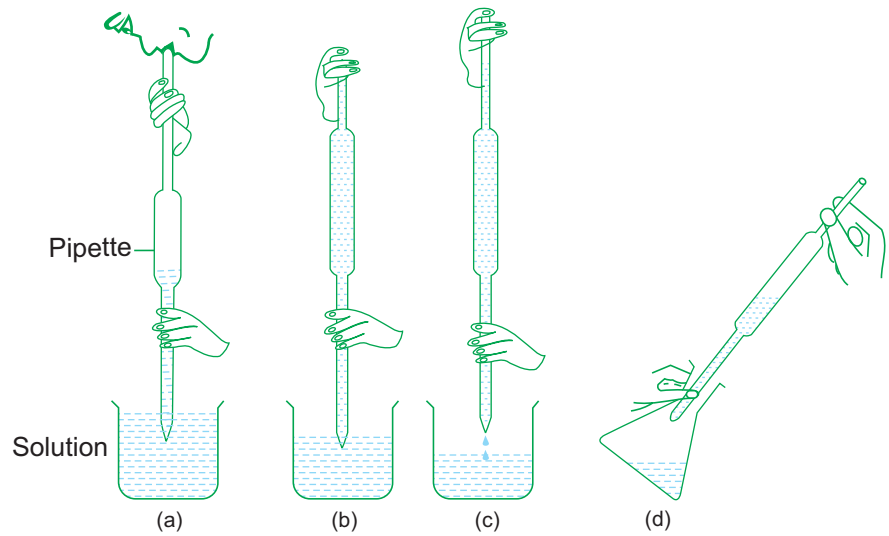


Fig.1.7. Measuring and transferring a solution with a pipette.

Method of Titration

The solution from the burette is added into the titration flask drop wise by opening the stop cock with left hand and shaking the solution of titration flask continuously with the help of right hand as shown in fig. 1.8.

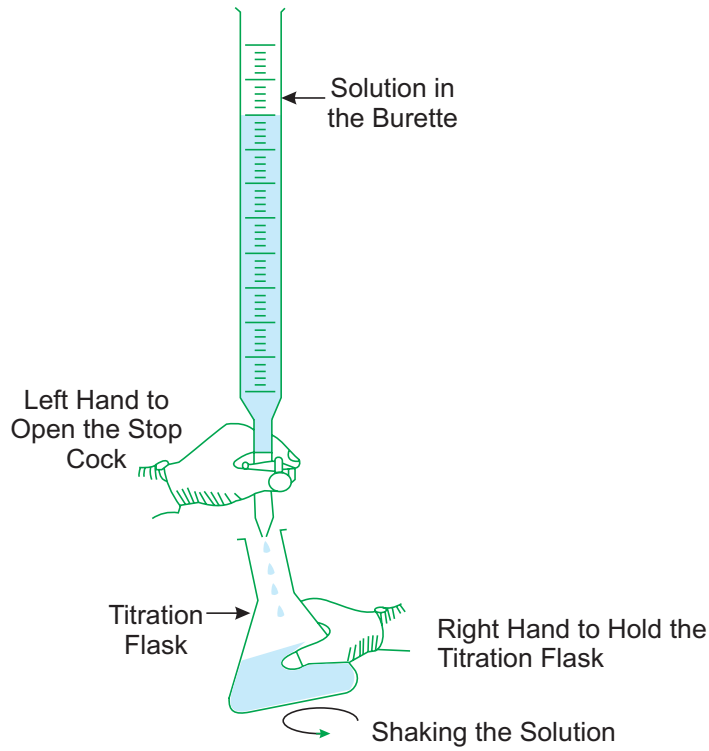


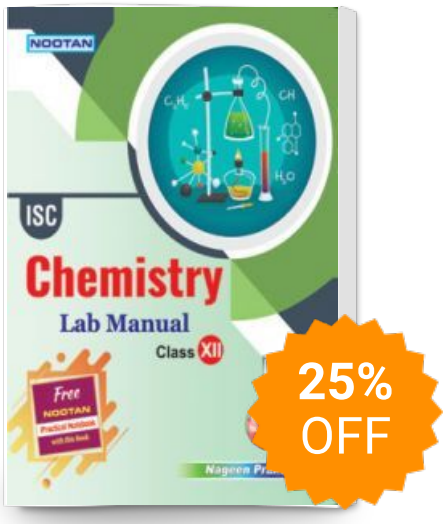
Fig.1.8. Method of titration.

Terms Used in Titration

The following terms are frequently used in titration.

1. Standard solution : A solution of known concentration is called standard solution.

ISC Chemistry Lab Manual For Class - XII



Publisher : Nageen Prakashan ISBN : 9789388931519 Author : R. K. Sharma