

Department of Chemistry

Semester –V

B.Sc	Semester–V(SkillEnhancementCourse-Elective)	Credits:4
Course: 6B	AnalyticalMethodsInChemistry-1	Hrs/Wk:4

Learning Outcomes:

Students after successful completion of the course will be able to:

1. Identify the importance of solvent extraction and ion exchange method.
2. Acquire knowledge on the basic principles of volumetric analysis and gravimetric analysis.
3. Demonstrate the usage of common laboratory apparatus used in quantitative analysis.
4. Understand the theories of different types of titrations.
5. Gain knowledge on different types of errors and their minimization methods.

Unit-1:Quantitativeanalysis-1

8hours

1. A brief introduction to analytical methods in chemistry
2. Principles of volumetric analysis, concentration terms- Molarity, Molality, Normality, v/v, w/v, ppm and ppb, preparing solutions- Standard solution, primary standards and secondary standards.
3. Description and use of common laboratory apparatus- volumetric flask, burette, pipette, beakers, measuring cylinders.

Unit-2:Quantitativeanalysis-2

12hours

1. Principles of volumetric analysis: Theories of acid-base (including study of acid-base titration curves), redox, complex metric, iodometric and precipitation titrations-choice of indicators for the saturations.
2. Principles of gravimetric analysis: precipitation, coagulation, peptization, coprecipitation, postprecipitation, digestion, filtration, and washing of precipitate, drying and ignition.

Unit-3:Treatmentofanalyticaldata

8hours

Types of errors-Relative and absolute, significant figures and its importance, accuracy - methods of expressing accuracy, errors- Determinate and indeterminate and minimization of errors, precision-methods of expressing precision, standard deviation and confidence interval.

Unit-4:separationtechniques

12hours

1. Solvent Extraction: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism. Application-Determination of Iron (III).
2. Ion Exchange method: Introduction, action of ion exchange resins, applications.

UNIT-5:Analysisofwater

10hours

Determination of dissolved solids, total hardness of water, turbidity, alkalinity, Dissolved oxygen, COD, determination of chloride using Mohr's method.

References

1. Fundamentals of Analytical Chemistry by F. James Holler, Stanley R. Crouch, Donald M. West and Douglas A. Skoog, Ninth edition, Cengage.
2. Analytical Chemistry by Gary D. Christian, Purnendu K. Das Gupta and Kevin A. Schug, Seventh edition, Wiley.
3. Quantitative analysis by R. A. Day Jr. and A. L. Underwood, Sixth edition, Pearson.
4. Textbook of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
5. Textbook of Environmental Chemistry and Pollution Control by S. S. Dara and D. D. Mishra, Revised edition, S Chand & Co Ltd.

Practical -6B

Learning Outcomes:

On successful completion of this practical course, students shall be able to:

1. Estimate Iron(II) using standard Potassium dichromate solution
2. Learn the procedure for the estimation of total hardness of water
3. Demonstrate the determination of chloride using Mohr's method
4. Acquire skills in the operation and calibration of pH meter
5. Perform the strong acid vs strong base titration using pH meter

a) Practical (Laboratory) Syllabus: (30hrs)

(Max. 50 Marks)

1. Estimation of Iron(II) using standard Potassium dichromate solution (using DPA indicator)
2. Estimation of total hardness of water using EDTA
3. Determination of chloride ion by Mohr's method
4. Study the effect on pH of addition of HCl/NaOH to solutions of acetic acid, sodium acetate and their mixtures.
5. Preparation of buffer solutions of different pH (i) Sodium acetate-acetic acid, (ii) Ammonium chloride- ammonium hydroxide.
6. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base.
7. Determination of dissociation constant of a weak acid.

b) Lab References:

1. Textbook of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.