

ADVANCE CHEMISTRY- V (ANALYTICAL CHEMISTRY)

CREDIT HOURS: 3

Course Objectives: The main objectives of this course are to introduce the students to the basics principles, instrumental aspects and applications of separation and spectrophotometric analytical methods

1. Introduction / Assessment of Analytical Data

Introduction and scope of Analytical Chemistry: Analytical problems and their solutions; The nature of analytical methods; trends in analytical methods; Different units of concentration and their conversion; Definition and basic concepts: nature and origin of errors, Classification of errors; Accuracy and Precision; Limits of detection, Confidence limits; Deviation, Standard deviation, Application of statistical tests; Rounding off analytical data; Quality control charts; Computation of analytical data. Significance of sampling, weighing and measuring in Analytical chemistry.

2. Basic Chromatography Techniques

Classifications of Chromatographic Techniques, Paper and Thin Layer Chromatographic Techniques; their instrumentation, applications and limitations, Column Adsorption Chromatography.

3. Introduction to Spectroscopy / Spectrophotometry

Introduction to Molecular spectroscopy, absorption in UV and Visible range; Basic principle of Spectrophotometry; Beer-Lambert's law; Deviations; Instrumentation and application.

4. Ion Exchange Chromatography:

Cation Exchange resin, Anion Exchange resin, Cross-linkage, Effect of pH-separation of Amino Acids, Separation of metal ions on Anions Exchange Columns, Applications of ion Exchange Chromatography.

5. Solvent Extraction:

Basic principle of solvent extraction, The Distribution Coefficient, The Distribution Ratio, The Percent Extracted Solvent Extraction of Metals, Analytical Separations, Multiple Batch Extractions, Countercurrent Distribution, Solid-Phase Extraction, Solvent Extraction by Flow Injection Analysis.

6. Electrophoresis:

Capillary Zone Electrophoresis, Application of traditional Electrophoresis Gel Chromatography.

7. Flame Emission:

Basic principle of atomic spectroscopy; Use of atomic spectra for detection and determination of elements; flame as a source of atomization and excitation; Instrumentation involved in FES; applications and limitations.

8. Atomic Absorption Spectroscopy:

Basic Principle of AAS; Flameless AA spectroscopy including graphite furnace and hydride generation.

Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

RECOMMENDED BOOKS:

1. Analytical Chemistry by J.D. Dick, McGraw Hill, 1973, N.Y. also available in International students edition McGraw Hill, Mogakusha, 1973.
2. Instrumental Methods by W.Ewing, Mc Graw Hill Book Co. N.Y. (Third/Fourth Edition) also available in International students edition.
3. Chromatography by R.K Sharma , Gogel publishing home meerret
4. Introduction to chromatography by Nasir-ud-din, Published by author
5. Paper chromatography by Dr.Friedrich Cramer, London Macmillan and Co Ltd
6. Thin- layer chromatography by Marini, Elsevier publisher
7. Modern analytical chemistry by David Harvey, Roohani-art press, Islamabad
8. Principle and Practice of analytical chemistry by Fillfield, Blackwell Science Ltd
9. Spectroscopy by Browing, Mcgram Hill London
10. Fundamentals of Chromatography by H.G. Cassidy, Inter Science Publisher, London, N.Y.
11. Fundamentals of Analytical Chemistry by Douglas Skoog and Donald M. W. West, Holt Reinchart and Inc, London.

ADVANCE CHEMISTRY LAB- V (ANALYTICAL CHEMISTRY)

CREDIT HOURS: 1

1. Calibration

Calibration of glassware (pipette, burette and flask) used for volumetric analysis. Use of analytical balance and calculation of standard deviation. Calibration of pH meter and determination of pH of various acidic and basic solution.

Calibration of conductometer and determination of conductance of tap water, distilled water, conductivity water and canal water.

Calculation of dissociation constants of various acids.

Calculation of variance, mean, median, coefficient of variance of the data.

2. Basic Chromatography

Separation of ink components by paper chromatography.

Separation of amino acids by thin layer chromatography.

Separation of dyes by column chromatography.

Separation of mixtures by circular paper chromatography.

3. Flame Emission / Spectrophotometry:

Determination of Sodium in tap water by using Flame Photometer.

Determination of Potassium in tap water by using Flame Photometer.

Find out the calcium in chalk sample by flame photometry.

Determination of Ba by flame photometry.

Estimation of purity of various compounds on the base of flame emission Spectrophotometry.

Indirect determination of various compounds by flame photometric techniques.

Determination of λ_{max} of $KMnO_4$ and $K_2Cr_2O_7$ by using spectrophotometer.

Verification of Beer and Lambert Law.

Ultraviolet spectrophotometric determination of Aspirin, Phenacetin and Caffeine in APC tablet using Solvent Extraction.

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RECOMMENDED BOOKS:

1. Vogel's text book of quantitative inorganic analysis by J. Bassett. The English language book Society and Longman.
2. Introduction to chromatography by Nasir-ud-din, Published by author.
3. Paper chromatography by Dr.Friedrich Cramer, London Macmillan and Co Ltd.
4. Thin- layer chromatography by Marini, Elsevier publisher.