Subject Code : P8CHE6

ANALYTICAL CHEMISTRY:

UNIT 1

Instrumental methods of Analysis:

Principles and Applications of Extended X-ray absorption fine structure (EXAFS) – Surface extended X-ray absorption (SEXAFS) – Atomic Absorption Spectroscopy (AAS) - Flame Emission Spectroscopy (FES) .Turbidimetry – Theory and Applications.

UNIT II

Data and Error Analysis :

Various types of Error – Accuracy, precision, significant figures – Frequency distributions, the binomial distribution, the Poisson distribution and normal distribution – Describing data, population and sample, mean, variance, standard deviation, way of quoting uncertainty, robust estimators, repeatability and reproducibility of measurements – Hypothesis testing, levels of confidence and significance, test for an outlier, testing variances, means t-Test, Paired t-Test – Analysis of variance (ANOVA) – Correlation and Regression – Curve fitting , Fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals – General polynomial equation fitting , linearizing transformations, exponential function fit – r and its abuse – multiple linear regression analysis, elementary aspects.

UNIT III

Chromatography:

Solvent extraction – principles of ion exchange, paper, thin layer and column Chromatography techniques – Columns, adsorbents, methods, Rf values, McReynold's constants and their uses – HPTLC, HPLC techniques – Adsorbents, columns, detection methods, estimations, preparative column – GC-MS techniques: methods, principles and uses.

UNIT IV

Thermo analytical methods:

Principles and applications of Thermogravimetry Analysis (TGA) – Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC). Thermometric titrations.

UNIT V

Electroanalytical techniques and Fluorescence spectroscopy:

Electrochemical sensors, ion sensitive electrodes, glass – membrane electrodes, solid liquid membrane electrodes – ion-selective field effect transistors (ISFETs) – Sensors for the analysis of gases in solution – Amperometric gas sensors – Amperometric titrations: Principles- Apparatus –techniques – applications.

Basic aspects of synchronous fluorescence spectroscopy – Spectral hole burning – flow cytometry – Instrumentation on fluorescence ratio – Fluorimeters (quantization).

References:

1. D.B.Hibbert and J.J. Gooding, Data Analysis for chemistry, Oxford University Press, 2006
2. J.Topping , Errors of Observation and their treatment, Fourth Edn., Chapman Hall, London, 1984
3. R. Stock and C. B. F. Rice, Chromatographic Methods, Chapman and Hall, New York.
4. V.K.Srivastava & K.K. Srivastava, Introduction to Chromatography, S. Chand & Co., New Delhi, 2nd ed,1981.
5. Willard, Merrit, Dean and Settle, Instrumental methods of Analysis CBS Publishers and Distributors, 6th ed., 1986.
6. Skoog, D. A., West, D. M., Holler, F. J., Fundamentals of Analytical Chemistry, 7th edition, Harcourt College Publishers, Singapore. (Pages 523 - 665).
7. A.Sharma, S.G. Schulman, Introduction to Fluoresceence Spectroscopy, Wiley-Interscience. New York,1999
8. C.N.Banwell and E.M.McCash, Fundamentals of Molecular spectroscopy, 4th ed., Tata McGraw-Hill, New Delhi, 1994.
9. Vogel, A. I., Text book of Quantitative Inorganic Analysis, ELBS.
10. Daniel C Harris, Quantitative Chemical Analysis, 4th ed., W. H. Freeman and Company, New York, 1995.
11. 11.S.C.Gupta, Fundamentals of Statistics,6th ed., Himalaya Publ. House, Delhi, 2006.