

**Major Based Elective I : Analytical Chemistry**

**UNIT 1: INTRODUCTION TO ANALYTICAL CHEMISTRY**

Types of analytical methods : Importance of analytical methods in qualitative and quantitative analysis : chemical and instrumental methods - advantages and limitations of chemical and instrumental methods.

**Laboratory Hygiene and safety** : Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous chemicals.

Simple first aid procedures for accidents involving acids, alkalis, bromine, burns and cut by glass. Threshold vapour concentration - safe limits. Waste disposal and fee me disposal.

Evaluation of analytical data : Idea of significant figures - its importance. Accuracy - methods of expressing accuracy . error analysis –types of errors- minimizing errors. precision-methods of expressing precision - mean, median, mean deviation, standard deviation and confidence limit. Method of least squares - problems involving straight line graphs.

**UNIT 2: QUANTITATIVE ANALYSIS :**

Estimations of commercial samples - determination of percentage purity of samples – pyrolusite, Iron ore, washing soda and Bleaching power - estimation of glucose and phenol.

gravimetric analysis - principle - theories of precipitation - solubility product and precipitation –conditions of precipitations-types of precipitants-specific and selective precipitants- organic and inorganic precipitants - types of precipitation - purity of precipitates – co precipitation - post precipitation - precipitation from homogeneous solution - use of sequestering agents

**UNIT 3: THERMO AND ELECTRO ANALYTICAL TECHNIQUES**

**Thermo analytical methods** : Principle of thermo gravimetry, differential thermal analysis, differential scanning calorimetry - Instrumentation for TGA, DTA and DSC - Characteristics of TGA and DTA curves - factors affecting TGA and DTA curves. applications - TGA of calcium oxalate monohydrate DTA of calcium acetate monohydrate - determination of purity of pharmaceuticals by DSC.

Electro analytical techniques - electro gravimetry -theory of electro gravimetric analysis - determination of copper (by constant current procedure) - electrolytic separation of metals : Principle - separation of copper and nickel, coulometry : principle of coulometric analysis - coulometry at controlled potential - apparatus and technique - separation of nickel and cobalt.

**UNIT 4: SPECTRO ANALYTICAL TECHNIQUES**

Colorimetry and spectrophotometry - Beer – Lambert's law - principle of colorimetric analysis - visual colorimetry - standard series method - balancing method -estimation of  $\text{Ni}^{+2}$  and  $\text{Fe}^{+3}$  colorimetrically - photoelectric photometer method - spectro photometric determination of chromium and manganese in alloy steel. infra red spectroscopy (Instrumentation only)-block diagram- source-monochromator-cell-detectors

and recorders-sampling techniques-NMR spectroscopy(instrumentation only)

### **UNIT 5: CHROMATOGRAPHY TECHNIQUES**

Column chromatography - principle, types of adsorbents, preparation of the column, elution, recovery of substances and applications. thin layer chromatography - principle, choice of adsorbent and solvent, preparation of chromatoplates, Rf-values, factors affecting the Rf-values, Significance of Rf-values. Paper chromatography - principle, solvents used, development of chromatogram, ascending, descending and radial paper chromatography. paper electrophoresis - separation of amino acids and other applications. Ion - exchange chromatography - principle - types of resins -requirements of a good resin -action of resins - experimental techniques - separation of Na-K, Ca-Mg, Co-Ni and chloride - bromide mixture. analysis of milk and apple juice - gas chromatography - principle - experimental techniques - instrumentation and applications. High Pressure Liquid Chromatography (HPLC)-principle -experimental techniques - instrumentation and advantages.

#### **Book for Reference :**

1. Douglas A. Skoog and Donald M. West, F.J. Holler, Fundamentals of Analytical Chemistry, 7th edition, Harcourt College Publishers.
2. Mendham J., Denney R.C., Barnes J.D., Thomas M., Vogel's Text book of Quantitative Chemical analysis 6th edition Pearson education.
3. Sharma, B.K., Instrumental Methods of Chemical Analysis, Coel Publishing House, Merrut, (1997)
4. Gopalan. R., Subramaniam P.S. and Rengarajan K., Elements of Analytical Chemistry, Sultan Chand and Sons.
5. Usharani S., Analytical Chemistry, Macmillian.