

GOVERNMENT COLLEGE (A), RAJAHMUNDRY.
B.Sc. SECOND YEAR CHEMISTRY SEMESTER –IV
FROM 2018-19 ONWARDS
SPECTROSCOPY & PHYSICAL CHEMISTRY
60 hrs (4 h / w)

Course Code: CHE104

SPECTROSCOPY (30 h)

UNIT-I:

Spectrophotometry

6h

General features of absorption - Beer-Lambert's law and its limitations, transmittance, absorbance, and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert's law for quantitative analysis of 1. Chromium in $K_2Cr_2O_7$ 2. Manganese in Manganous sulphate.

Proton magnetic resonance spectroscopy (1H -NMR)

10 h

Principles of nuclear magnetic resonance. Continuous Wave (CW)-NMR and Fourier Transform (FT)-NMR techniques, effect of spin population on NMR signal strength, chemical shift, chemical shift affecting factors. Chemical shift equivalent and non-equivalent protons. Integration. Splitting of NMR signals (spin-spin coupling), coupling constants. Sample NMR spectra of - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

UNIT-II

Electronic spectroscopy

6h

Interaction of electromagnetic radiation with molecules and types of molecular spectra, energy levels of molecular orbitals (σ, π, n). Selection rules for electronic spectra. Types of electronic transitions in molecules. Concept of chromophore and auxochrome. Bathochromic shift, hypsochromic shift, hyperchromic shift, hypochromic shift. Effect of conjugation on λ_{max} .

Infrared spectroscopy

8h

Different Regions in Infrared radiations. Modes of vibrations in linear and non-

linear molecules. Characteristic absorption bands of various functional groups. Interpretation of IR spectra- Alkanes, Aromatic, Alcohols, carbonyls, and amines with one example to each.

PHYSICAL CHEMISTRY (30 h)

UNIT-III

Electrochemistry

10h

Specific conductance, equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorf's method. Application of conductivity measurements- conductometric titrations.

Electrochemical cells

4h

Single electrode potential, sign convention, Reversible and irreversible cells. Reference electrode, Standard Hydrogen electrode, calomel electrode, Indicator electrode, metal – metal ion electrode, Inert electrode. Nernst Equation. Determination of EMF of cell, Applications of EMF measurements - Potentiometric titrations.

UNIT-IV

Dilute solutions

8h

Colligative properties. Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis, osmotic pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties- Van't Hoff factor.

UNIT-V

Phase rule

8h

Concept of phase, components, degrees of freedom. Thermodynamic Derivation of Gibbs phase rule. Phase equilibrium of one component system - water system. Phase equilibrium of two- component system, solid-liquid equilibrium. Simple eutectic diagram of Pb-Ag system, simple eutectic diagram, desilverisation of lead., NaCl-Water system, Freezing mixtures.

