

**M.Sc. SEMESTER-III**  
**Physical Chemistry**  
**CHNN-602(P)**  
**Paper-II**

**Unit 1:** **25% (15 Hours)**

**Reversible Cells:** reaction in Reversible cells, Free Energy and heat changes in reversible cells, Amalgam cells, Activity coefficients from cells with transference, Quinine- hydroquinone system, Two stage oxidation reduction.

**Liquid Junction :** Liquid junction potentials of same electrolytes, General equation of liquid junction potential, Types of boundary, free diffusion junction , flowing junction , constrained diffusion junction

**Electrolytic Conduction:** Mechanism of electrolytic conductance (Debye Huckel Onsager Conductance equation) validity of DHO equation (Aqueous & non aqueous solution), Deviation of DHO Equation, Debye Falkenhagen effect and Wien effect,

**Migration of ions:** Transference number (True, apparent & Abnormal), Transference numbers in mixture, Factors effecting transference numbers, Methods for determining transference numbers.

**Unit 2:** **25% (15 Hours)**

**Acids and Bases:** Types of solvents, Dissociation constant, determination of dissociation constants of mono and poly basic acids by E.M.F. methods, colorimetric methods and conductimetric methods,

Effect of solvent on dissociation constant, Determination of ionic product of water by conductometric method and E.M.F. method.

Amphoteric electrolytes: properties of Dipolar ions, E.M.F methods for determination of dissociation constant of amino acids, proportion of dipolar ions, isoelectric point.

Neutralization curves for ampholytes, activity coefficient of ampholytes.

**Unit 3:** **25% (15 Hours)**

**Over voltage:** Theories of Hydrogen Overvoltage (Bubble formation, Combination of atoms as slow process, ion Discharge as the process, proton

transfer as the slow process), Factors effecting overvoltage, oxygen overvoltage, hydrogen overvoltage.

Polarisation: Electrolytic polarisation, Dissolution and decomposition potentials, metal deposition, concentration polarisation, Decomposition voltage in aqueous solution, Metal dissolution.

**Reversible Oxidation and Reduction:** Reversible Oxidation and Reduction process, nonreversible process, Factor effecting electrolytic reduction and electrolytic oxidation, Application of electrolytic oxidation and reduction.

**Electro Organic Synthesis:** complete cell design designer electrodes, polymerization of anions, Oxidation of Fatty acids, Brown-walker Electro synthesis.

**Unit 4:**

**25% (15 Hours)**

Electrophoresis and electro chromatography: principle, types, instrumentation and applications, capillary electrophoresis: Basic, Principle, instrumentation & Application.

Coulometry and amperometry: Basic, instrumentation & Application.

Polarography: Principle, wave equations, instrumentation & Application.

Voltametry (Cyclic Voltametry, Andodic stripping).

**Books:**

1. Modern Electrochemistry, J OM Bockeris/A.K.N. Reddy, Vol.1 and 2, third edition, plenum press,1977
2. Modern Electrochemistry, J OM Bockeris/A.K.N. Reddy, Vol.1,2 and 3, second edition, Springer,2008.
3. An introduction to electrochemistry, Samuel Glasstone, 10<sup>th</sup> edition, D. van Nostrand company, INC.1962
4. Erving's Analytical instrumentation hand book, edited by Jack cazes, Third edition, instrumental method of chemical analysis, Galen W. Ewing, Fourth edition, Mac Graw hill 1975.