# MJD Govt. College Taranagar (Churu)

**Department of Chemistry**

**B.Sc.-II (Syllabus)**

## PHYSICAL CHEMISTRY

**PAPER-III**

## Unit-I

**Thermodynamics-I :** Definition of thermodynamics terms : system, surroundings etc. Types
of systems, intensive and extensive properties. State and path functions and their differentials.
Thermodynamic process. Concept of heat and work.
First Law of Thermodynamics:statement, definition and internal energy and enthalpy. Heat
capacity, heat capacities at constant volume and pressure and their relationship. Joule's lawjoule-
Thomson coefficient and inversion temperature. Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.
Thermochemistry:Standard state, standard enthaply of formation-Hess's'Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume.
Enthalpy of neutrilization. Bond dissociation energy and its calculation from thermo-chemical
data, temperature dependence of enthalpy, Kirchhoffs equation.

## Unit-II

**Photochemistry**
Interaction of radiation with matter, difference between thermal and photochemical processes,
laws of photochemistry: Grothus- Drapper law, Stark-Einstein law, Jablonski diagram depicting
various processes occurring inthe excited state, qualitative description of fluroscence, phorescence, non-radiative processes (internal conversion, inter system crossing), quantum
yield, photosestitized reactions-energy transfer processes (simple examples)

## Unit-III

**(a) Chemical Equilibrium :**
Equilibrium constant and free energy. Thermodynamic derivation of law of mass action, Le
Chatelier's principle.

Reaction isotherm and reaction isochore-Clapeyron equation and Clausisus-Clapeyron equation, applications.

**(b) Phase Equilibrium:**

Statement and meaning of the terms-phase, component and degree of freedom, derivation of
Gibbs phase rule, phase equilibria of one component system-water, CO2 and S systems.
Phase equilibria of two component system-solid-liquid equilibria .simple eutectic-Bi-Cd, Pb-Ag
systems, desilverisation of lead.
Solid solutions-compound formation with congruent melting point (Mg-Zn) and incongruent
melting point, (NaCI-H2O), (FeCl3-H2O) and (CuSO4-H2O) system. Freezing mixtures, acetone-dry ice.
Liquid-liquid mixtures-Ideal liquid mixtures, Raoult's and Henrys law. Non-ideal systemazeotropes-
HCl-H20 and ethanol-water systms.
Partially miscible liquids-Phenol-water, trimethylamine, nicotine-water systems. Lower and
upper consulate temperature. Effect of impurity on consulate temperature
Immiscible liquids, steam distillation.
Nernst distribution law-thermodynamic derivation, applications.

## Unit - IV

**Electrochemistry-l**

Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and
equivalent conductance, measurement of equivalent conductance, variation of equivalent and
specific conductance with dilution.
Migration of ions and Kohlrahusch law, Arrehenius theory of electrolyte dissociation and its
limitations, weak and strong electrolytes, Ostwald's dilution law its uses and limitations.
Debye-Huckel-Onsagar's equation for strong electrolytes (elementary treatment only).
Transport number- Definition and determination by Httorf method and moving boundary method.
Applications of conductivity measurements : Determination of degree of dissociation, determination of Ka of acids, determination of solubility product of a sparingly soluble salt,
conductometric titrations.

# Unit-V

**Electrochemistry-II**

Types of reversible electrodes-gas-metal ion, metal-insoluble salt anion and redox electrodes.

Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential,

standard hydrogen electrode reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance.

Electrolytic and Galvanic cells-reversible and irreversible cells, con-ventional representation of

electrochemical cells.

EMF of a cell and its measurements. Computation of cell EMF. Calculation of thermodynamic

quantities of cell reactions (rG, rH and K) polarization, over potential and hydrogen over voltage.

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric

titrations.

Definition of pH and pKa determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods.

Buffers-mechanisrn of buffer action, Henderson-Hazel equation. Hydrolysis of salts.

Corrosion-Types, theories and methods of combating it.