PHYSICAL CHEMISTRY

Course Code: 15BC1105

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Course Outcomes:

At the end of the course the student shall be able to

CO 1 Understand principles and applications of distribution law.

CO 2 Analyze of reaction rates and mechanisms.

CO 3 Understand principle and different types of catalysis.

CO 4 Apply laws and concepts of thermodynamics to chemical process.

CO 5 Apply of phase rule to different heterogeneous systems.

UNIT I: (10 Lectures)

DISTRIBUTION LAW

Statement-Nernst Distribution law, Explanation and limitations of law, Modification of Distribution law when association or dissociation of the solute occurs, Determination of Equilibrium constant from Distribution coefficient, Extraction of a solute from solution with an immiscible solvent, Applications of Distribution law, partition chromatography.

UNIT II: (12 Lectures)

CHEMICAL KINETICS

Basic Terms, Methods of determining order of reaction, Theories of reaction rates- Arrhenius, Collision and Absolute reaction rate theories, Influence of ionic strength on the rates of reaction, Simultaneous reactions- Consecutive reactions, Parallel reactions, Reversible or opposing reactions, Chain reactions- Hydrogen and chlorine & Hydrogen and bromine, Fast reactions-stopped flow and relaxation techniques.

UNIT III: (10 Lectures)

CATALYSIS:

Definition-Types- Homogeneous and heterogeneous catalysis, Characteristics of catalytic reactions, Promoters, Catalytic poisoning, Retardation, Autocatalysis, Activation energy and catalysis, Mechanism of Catalysis ,Acid-base catalysis- Protolytic and Prototropic mechanism, Enzyme catalysis-Mechanism of enzyme catalysis-Characteristics of enzyme catalysis.

UNIT IV: (12 Lectures)

THERMODYNAMICS

Thermodynamics terms and Basic concepts, Thermodynamic processes- Reversible and irreversible process, pressure-volume work, Internal energy, First Law of thermodynamics, Enthalpy, Molar Heat Capacities ,Isothermal and Adiabatic expansion of an ideal gas

Spontaneous process- Entropy- Second Law of thermodynamics, Carnot Cycle- Derivation of entropy from Carnot cycle – Physical significance of entropy, Free energy, Gibbs Helmholtz Equation,Clausius-Clapeyron Equation, Van't hoffs isotherm and isochore,Third law of thermodynamics.

UNIT V: (16 Lectures)

PHASE RULE AND COLLOIDS:

PHASE RULE:

Definition and explanation of terms, Thermodynamic derivation of Phase rule, One component system- Water system and Sulphur system, Two component systems –Eutectic point-Lead-silver system-Applications of phase rule

COLLOIDS:

Definition of colloids, Classification of colloids, Solids in liquids (Sols)-Kinetic, optical and electrical properties, Stability of colloids, Protective action, Hardy-Schultz Law, Gold Number, Liquids in liquids (emulsions)- Types of emulsions, Preparation, Emulsifier,

Liquid in Solids (gel), Classification, Preparation and properties-General applications of colloids

TEXT BOOKS:

1. Puri, Sharma and Pathania, *"Physical Chemistry"*, 42nd Edition Vishal Publishing Company, 2008.
2. Arun Bahl, BS Bahl & Tuli, *"Essentials of Physical Chemistry"*, 16th Edition, S.Chand Publications.

REFERENCE BOOKS:

1. Glasston & Lewis, *"Physical Chemistry"*, 2nd Edition, McMillan Publishers, 1973.
2. Gurudeep Raj, *"Advanced Physical Chemistry"*, Goel Publishing House, 33rd Edition (2007).
3. Atkins, *"Physical Chemistry"*, 9th Edition, W.H. Freeman Publishers, 2010.