Course Contents for Subjects with Code: CHEM

This document only contains details of courses having code **CHEM**.

Code	Subject Title	Cr. Hrs	Semester
CHEM-101	Chemistry-I (Physical Chemistry)	3	I

Year	Discipline
1	Botany, Zoology, Chemistry-I, II

STATES OF MATTER

A. Gases:
Law of equipartition of energy, Collision diameter, collision number, collision frequency and mean free path; Viscosities of gases, measurements, effect of temperature and pressure on viscosities of gasses; Critical phenomenon of gases and experimental determination of Pc, Vc and Tc; Concept of molecular velocities of gasses according to Maxwell's distribution law and comparison of various velocities.

B. Liquids:
The properties of liquids like surface tension, viscosity, refractive index and dipole moment; Parachor, reheochor and molar refraction as additive and constitutive properties; Measurement of refractive index and dipole moment; Magnetic susceptibility and its measurement by Gouys balance.

C. Solids:
Symmetry operations and Bravis lattices; Concept of X-Ray diffraction, Bragg's equation and crystal structure analysis; Powder method of crystal structure analysis; X-ray crystallography of sodium chloride crystal; Heat capacities of solids.

CHEMICAL THERMODYNAMICS:

Heat capacity as Cp and Vc; Difference in Cp and Cv and ration of Cp and Cv towards atomicity; Temperature dependence of heat capacities; Quantitative effect of temperature over enthalpy change and internal energy change; Types of thermodynamical processes; Isothermal reversible expansion of ideal gases; Adiabatic process of ideal gasses; Second law of thermodynamics, Carnot cycle, efficiency of heat engine and concept of entropy; Thermodynamics scale of temperature entropy for phase transition, spontaneity and reversibility; Entropy change in reversible and irreversible processes; Temperature dependence of entropy, Variation of entropy with pressure and volume; Concept of free energy; Derivation of Gibbs and Helmholtz equation; standard free energy of formation; Partial molar quantities, Chemical potential, variation of chemical potential with pressure and temperature fugacity; Thermodynamic of equilibrium, Reaction isohore; Calusius-Clapeyron equation; Molecular basis of entropy and probability.

CHEMICAL KINETICS:

Derivation of kinetic expression of zero order, first order, second order (with same and different concentration) and third order reactions (with same concentrations) with suitable examples; Equation for half life periods and determination of rate constants; Methods of measurements of order of reactions giving examples with different techniques; Derivation of Arrhenius equation and measurements of Arrhenius parameters, Measurement of slopes of Arrhenius plots for some important reactions Bimolecular collision theory of reaction rates and its failures; Collision theory of uni-molecular, gas phase reactions (Lindeman mechanism); Introduction transition state theory of reaction rates.

SOLUTION:

Thermodynamics derivation of colligates properties as lowering of vapor pressure, elevation of boiling point, depression of freezing point; Relationship between lowering of vapor pressure with ΔTb and ΔTf; Osmotic pressure an their determination; Concept of semi

permeable membrane, Isotonic solution, theory of osmotic pressure, relationship between vapor pressure and osmotic pressure, Abnormal colligative properties describing association and disassociation of solutes; Fractional distillation and idea of azotropes in detail; Concept of colloids; Classification of Colloids; their properties with reference to dialysis, electro dialysis, sedimentation, precipitation, ultra filtrations, Suspensions and gels; Tyndal cone effect; Macromolecules and micelles.

SURFACE CHEMISTRY:

Introduction to adsorption; Difference between physical and chemical adsorption; Adsorption of gases by solids; Different types of adsorption isotherms with special reference to Langmuir adsorption isotherm and its applications; Freundlich adsorption isotherm giving some important applications; Brief introduction to catalysis; Theories of Catalysis; Activation energy for catalyzed reactions; Kinetics of enzyme catalysis; Theories of catalysis; Activation energy for catalyzed reactions; Kinetics of enzyme catalysis.

Recommended Books:

1. Adamson A. W. "Understanding Physical Chemistry" 3rd Ed., Benjamin Cummings Publishing Company Inc.
2. Akhtar M.N.& Ghulam Nabi, "Textbook of Physical Chemistry", ilmi Kutab Khana, Lahore.
3. Bhatti H.N. and K.Hussain, "Principles of Physical Chemistry"; Carwan Book House, Lahore.
4. Maron S.H. & B. Jerome, "Fundamentals of Physical Chemistry", Macruthan Publishing Co., Inc. New York. (Also published by National Book Foundation).
5. Atikins P.W.& M.J.Clugston, "Principles of Physical Chemistry" Pitman Publishing Company (1988).
6. Moore W.J. "Physical Chemistry", 5th Ed. Longmans Publishers.
7. Jones M. "Elements of Physical Chemistry" Addison-Sesky Publishing Company.
8. G.M.Barrow, International six Edition "Physical Chemistry".
9. IRA. N. Levine fourth edition "Physical Chemistry"
10. Alberty and Danials, "Physical Chemistry"
11. Castallon, "Physical Chemistry"
12. Laidler & Meiser "Physical Chemistry"
13. Friemental "Chemistry in Action"