CHEMISTRY
(Major)
(1st Semester)
Course No.: **CHM-DSC-102**
(Physical Chemistry -I)
States of Matter and Solution
Contact Hours: 45; Credits: 03
Full Marks = 100[End Semester Exam (70) Internal Assessment (30)]
Pass Marks = 40 [End Semester Exam (28) Internal Assessment(12)]

Unit 1: Gaseous State I

Postulates of Kinetic theory of Gases and derivation of the kinetic gas equation; collision frequency; collision diameter; mean free path and viscosity of gases, including their temperature and pressure dependence, relation between mean free path and coefficient of viscosity; variation of viscosity with temperature and pressure. Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartitions of energy and degrees of freedom.

Unit 2: Gaseous State II

Behaviour of real gases: Deviations from ideal gas behaviour, compressibility factor, Z, and its variation with pressure for different gases. Causes of deviation from ideal behaviour. Vander Waals equation of state, its derivation and application in explaining real gas behaviour. PV isotherm of Carbon dioxide, critical state, relation between critical constants and van der Waals constants, law of corresponding states, liquefaction of gas, inversion temperature.

Unit 3: Liquid State

Physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity, and their determination. Effect of addition of various solutes on surface tension and viscosity. Interficial tension, Surface active agent, Explanation of cleansing action of detergents. Temperature variation of viscosity of liquids and comparison with that of gases.

Unit 4: Solid State

Types of crystal, space lattice, unit cell, seven crystal systems, fourteen Bravais lattices, law of constancy of interfacial angles, law of rational indices, Miller indices, and; X-ray diffraction, Bragg's law. Defects in crystals, Colour center, Energy band theory of Conductor, Semiconductors and insulators, Glasses, liquid crystal and their phases (Nematic, Smectic A and Smectic C)

Unit 5: Solutions

Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapour pressure-composition and temperature-composition curves of ideal and non-ideal solutions. Distillation of solutions. Azeotropes. Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Immiscibility of liquids-Principle of steam distillation. Nernst distribution law and its applications, solvent extraction

Reference Books

- Puri, Sharma, Pathania; Principles of Physical Chemistry, Vishal Publishing Co. 45th edition (2011)
- Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry Ed., Oxford University Press 13
- (2006).
- Ball, D. W. Physical Chemistry Thomson Press, India (2007).
- Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).
- Mortimer, R. G. Physical Chemistry 3rd Ed. Elsevier: NOIDA, UP (2009).