

## Physical Chemistry-I (M = 35)

### Unit 1 (M = 15)

#### *Gaseous state*

Maxwell's distribution law of molecular speeds (without derivation), most probable, average and root mean square speed of gas molecules, principle of equipartition of energy (without derivation). Mean free path and collision frequencies. Heat capacity of gases (molecular basis); viscosity of gases.

Real gases, compressibility factor, deviation from ideality, van der Waals equation of state, critical phenomena, continuity of states, critical constants.

#### *Liquid state*

Physical properties of liquids and their measurements: surface tension and viscosity.

### Unit 2 (M = 20)

#### *Thermodynamics*

Definition of thermodynamic terms: Intensive and extensive variables, isolated, closed and open systems. Cyclic, reversible and irreversible processes. Thermodynamic functions and their differentials. Zeroth law of thermodynamics, concept of heat (q) and work (w).

First law of thermodynamics, internal energy (U) and enthalpy (H); relation between  $C_p$  and  $C_v$ , calculation of  $w$ ,  $q$ ,  $\Delta U$  and  $\Delta H$  for expansion of ideal gas under isothermal and adiabatic conditions for reversible and irreversible processes including free expansion. Joule-Thomson Coefficient and inversion temperature. Kirchhoff's equation, relation between  $\Delta H$  and  $\Delta U$  of a reaction.

Spontaneous processes, heat engine, Carnot cycle and its efficiency, Second law of thermodynamics, Entropy (S) as a state function, molecular interpretation of entropy, entropy changes in simple transformations. Free energy: Gibbs function (G) and Helmholtz function (A), Gibbs-Helmholtz equation, criteria for thermodynamic equilibrium and spontaneity of a process.

## Physical Practical-I (M = 15)

Determination of solubility and solubility product of sparingly soluble salts in i) water, ii) various electrolytes by titrimetric method.

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