

# SHREE H.N. SHUKLA GROUP OF COLLEGES

(AFFILIATED TO SAURASHTRA UNIVERSITY & GTU)



2-vaishali nagar, Near  
Amrapali railway  
crossing,  
Raiya road, Rajkot-  
360001. Ph.No.-  
(0281)2440478, 2472590

3-vaishali nagar, Near  
Amrapali railway  
crossing,  
Raiya road, Rajkot-  
360001. Ph.No.-  
(0281)2471645

Behind marketing yard,  
Near Lalpari lake,  
Between Amargadh-  
Bhichri, Rajkot-360002.  
Ph.No.-90990 63150

## M.Sc. SEMESTER-I

### C-103: PHYSICAL CHEMISTRY

#### 1. Statistical Thermodynamics

Basic terms: probability, cell, phase, space, micro and macro states, thermodynamic probability, statistical weight factor, assembly, ensemble and its classification and statistical equilibrium. Derivation of Boltzmann-Maxwell, Bose-Einstein and Fermi-Dirac statistics, Partition function and derivations of translational, rotational, vibrational and electronic partition functions and thermodynamic functions such as internal energy, heat capacity, entropy, work function, pressure, heat content, etc. Partition function and third law of thermodynamics. Applications of partition function to monoatomic gases, diatomic molecules, equilibrium constant and equilibrium constants of metathetic reactions. Problems.

#### 2. Fugacity and Activity

Definition, determination of fugacity by graphical, equation of state, approximate and generalized methods. Variation of fugacity with temperature and pressure. Mixture of ideal gases and real gases. Activities and Activity coefficients in liquid solution. Problems.

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### 3. The Debye-Huckel Theory

Ionic interactions in solutions. Mean ionic activity coefficients (D-H limiting law). Applications of D-H theory: quantitative and qualitative, solubility and D-H theory, solubility of sparingly soluble salt in presence of inert electrolyte. The D-H theory in more concentrated solutions. D-H theory and equilibrium constant. Problems.

### 4. The properties of solutions

Ideal solutions: Properties, the Duhem-Margules equation, vapor pressure curves. Composition of liquid and vapor in equilibrium, influence of temperature on gas solubility and solid-liquid equilibria. Non ideal solutions: Deviation from ideal behavior, liquid and vapor compositions.

Dilute solutions: Determination of molecular weight by freezing and boiling point methods. Problems.

### 5. Electrochemical cells

Classification, chemical cells with and without transference, concentration cells with and without transference, liquid junction potential. Commercial cells: Dry cell, lead accumulator, nickel iron accumulator, zinc silver accumulator.

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## Reference Books

1. Thermodynamics for Chemists by Samuel Glasstone.
2. Statistical Thermodynamics by L. K. Nash.
3. Statistics in Chemistry by P. H. Parsania.
4. Thermodynamics by Gurdeep and Rajesh.
5. Glimpses of Physical Chemistry by ShipraBaluja and FalguniKaria.
6. Chemical Kinetics by Gurdeep Raj.
7. Chemical Kinetics by K. J. Laidler.
8. Electrochemistry by B. K. Sharma.