

## Basics of Physical Chemistry- II

Course Code: BEB 606

Credit: 04 (L-3, T-1, P-0)

Contact Hours: 60

MM: 100

After going through the course the teacher trainee will be able to –

- demonstrate fundamental electrochemical processes and principles important for the applications of electrochemistry in research, industry and chemical analysis.
- draw and extract information from phase diagrams.
- explain phase equilibria exhibited by pure, binary and ternary systems.
- demonstrate knowledge of concepts and principles of adsorption.
- explain types of rates of chemical reactions and effect of catalyst on reaction rate.
- demonstrate the knowledge of kinetics of a reaction and conductance measurements and apply it to the identify the reaction mechanism

### Course Outline:

#### Unit I: Electrochemistry

- Arrhenius theory of electrolytic dissociation. Kohlrausch law of independent migration of ions.
- Applications of conductance measurement: (i) degree of dissociation of weak electrolytes, (ii) ionic product of water (iii) solubility and solubility product of sparingly soluble salts, (iv) conductometric titrations, and (v) hydrolysis constants of salts.
- Chemical cells, reversible and irreversible cells with examples.
- Electromotive force of a cell and its measurement, Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half-cells

#### Unit II: Solution and Colligative Properties

- Dilute solutions, Raoult's and Henry's Laws and their applications.
- Lowering of vapour pressure by a non-volatile solute, determination of molar masses from vapour pressure lowering,
- Osmosis and Osmotic pressure, the laws of osmotic pressure, isotonic solution, Van't Hoff equation for osmotic pressure of dilute ideal solution.
- Elevation of boiling point by a non-volatile solute and determination of Molar masses, □Depression of freezing point by a non-volatile solute and determination of Molar masses.

#### Unit III: Chemical Kinetics

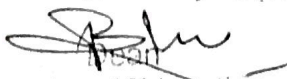
- *Kinetics*: Order and molecularity of a reaction, rate laws in terms of the advancement of a reaction, differential and integrated form of rate expressions up to second order reactions, experimental methods of the determination of rate laws,
- Temperature dependence of reaction rates; Arrhenius equation; activation energy.
- Collision theory of reaction rates, qualitative treatment of the theory of absolute reaction rates.


#### Unit IV: Colloids & Surface Phenomenon


- Classification: Lyophobic and lyophilic sols, electrical double layer, electrophoresis, origin of charge on colloidal particles, Zeta potential, protective colloids, gold number, applications.
- Heat of adsorption, Freundlich adsorption isotherm, physical adsorption and chemisorption, Langmuir's theory.

#### Suggested Reading:

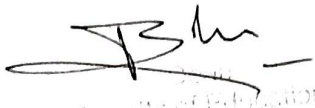
- Atkins, P. W. & Paula, J. de, Atkin's Physical Chemistry, 8th Ed., Oxford University Press (2006).
- P. C. Rakshit, Physical Chemistry, 5<sup>th</sup> Edition (1988), 4<sup>th</sup> Reprint (1997), Sarat Book House, Calcutta


  
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- K.J. Laidler and J.M. Meiser, 3<sup>rd</sup> Edition, Houghton Mifflin Comp., New York, International Edition (1999)
- B.R. Puri, L.R. Sharma and M.S. Pathania, 37<sup>th</sup> Edition (1998), Shoban Lal Nagin Chand & Co., Jalandhar

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