

GENERIC ELECTIVE– 4:

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Conductance and Chemical Kinetics; ALS CHEM GE-4	4	2	0	2	Class XII pass with Biology and Chemistry	NA

Learning Objectives:

The Learning Objectives of this course are as follows:

- To impart the knowledge about electrochemical cells like electrolytic and galvanic cells.
- To provide a detailed understanding about the measurement of conductance, emf and their applications.
- To help the students to understand the kinetics of chemical reaction, activation energy and theories of reaction rates.

Learning Outcomes:

By studying this course, students will be able to:

- Explain the factors that affect conductance, migration of ions and application of conductance measurement.
- Understand different types of galvanic cells, their Nernst equations, measurement of emf, thermodynamic properties and other parameters from the emf measurements.
- Understand the concept of rate laws e.g., order, molecularity, half-life, and their determination.

Unit –1:Conductance (8 Hours)

Conductivity, equivalent and molar conductivity, and their variation with dilution for weak and strong electrolytes, Kohlrausch Law of independent migration of ions, Transference number, Ionic mobility, applications of conductance measurements: determination of degree of ionization of weak electrolytes, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid-base).

Unit–2: Electrochemistry (10 Hours)

Reversible and irreversible cells, concept of EMF of a cell, measurement of EMF of a cell, Nernst equation and its importance, types of electrodes, Standard electrode potential, Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: G, H and S from EMF data. Calculation of equilibrium constant from EMF data, Liquid junction potential and salt bridge, pH determination using hydrogen electrode and quinhydrone electrode.

Unit 3 : Chemical Kinetics (12 Hours)

The concept of reaction rates, effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, derivation of integrated rate equations for zero, first and second order reactions (for equal concentrations of reactants), half–life of a reaction, general methods for determination of order of a reaction, Concept of activation energy and its calculation from Arrhenius equation.

PRACTICAL (60 hours)

Conductance

1. Determination of cell constant.
2. Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.
3. Perform Conductometric titrations:
 - (a) Strong acid vs strong base
 - (b) Weak acid vs strong base.

Potentiometry

1. Perform the potentiometric titrations of
 - (a) Strong acid vs strong base and
 - (b) Weak acid vs strong base

Chemical Kinetics

1. Study the kinetics of the following reactions by integrated rate method:
 - (a) Acid hydrolysis of methyl acetate with hydrochloric acid.
 - (b) Compare the strength of HCl and H₂SO₄ by studying the kinetics of hydrolysis of methyl acetate.

Essential/recommended readings

1. Castellan, G. W. (2004). *Physical Chemistry*(Vol.). Narosa.
2. Kapoor, K. L. (2015). *A Textbook of Physical Chemistry* (6th ED., Vol. 1). McGraw Hill Education.
3. Kapoor, K. L. (2013). *A Textbook of Physical Chemistry*(3rd ed., Vol. 3). McGraw Hill Education.

Suggestive readings

1. Puri, B. R., Sharma, L. R., & M. S. Pathania. (2017). *Principles of Physical Chemistry*. Vishal Publishing Co.
2. Khosla, B. D., Garg, V. C., & Gulati A. (2015). *Senior Practical Physical Chemistry*. R. Chand & Co.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.