St. Xavier's College

CEMG

SYLLABUS

(RESTRUCTURED)

PHYSICAL CHEMISTRY

Module I: (10 L)

Chemical Kinetics

a. Definition of rate of a chemical reaction in terms of degree of advancement.
b. Introduction of some methods to study a chemical reaction to find its rate.
c. Definition of order of a reaction.
d. Methods for determination of order of a reaction.
e. Dimension of rate and rate constants for reactions with different orders.
f. Integrated rate law for (i) zeroth, (ii) first, (iii) second and (iv) n'th order cases.
g. Nature of variation in concentration with time for reactions with different orders.
h. Use of the integrated rate laws in determining order of a chemical reaction.
i. Half life period, its expression for reactions with different orders.
j. Usage of half life period in determining order of a chemical reaction.
k. Expression of rate constant for binary reaction involving gases.
l. Variation of rate constant with temperature: Arrhenius equation.

Module II: (10 L)

Electrical conductance

a. Metallic and electrolytic conduction.
b. Ions as charge carrier.
c. Strong and weak electrolytes.
d. Solvation of ions in solution: effect of charge to radius ratio.
e. Interaction among ions in solution and its variation with concentration (qualitative idea of asymmetric and electrophoretic effect).
f. Definition of specific and equivalent conductance.
g. Variation in conductance, specific conductance and equivalent conductance with concentration.
h. Equivalent conductance at infinite dilution: Kohlrausch law of independent migration.
i. Interrelation among strength of current, specific conductance, ionic mobility and ion conductance.
j. Definition of transport number and expression.

Module III: (20 L)

Chemical Thermodynamics

a. Validity of thermodynamic system.
b. System, surrounding and boundary
c. Classification of systems
d. Mode of interaction between system and surrounding.
e. Reversible and irriversible path of transformation of the system.
f. Work as the path function.
g. Calculation of work in hydrostatic system (IUPAC convention).
h. Work as the area under the PV indicator diagram.
i. State functions.
j. Internal energy and its change.
k. Mathematical statement of first law of thermodynamics.
l. Calculation of heat transferred.
m. Enthalpy (state function and calculation of its change)
n. Heat capacities (at constant pressure, Cp and at constant volume, Cv).
o. Difference between the heat capacities for ideal and van der Waals gas.
p. Relation between the state parameters in case of reversible adiabatic processes involving ideal gases.
q. Need for the second law.
r. Definition of entropy.

s. Entropy change of the universe to predict the direction of spontaneous change.
t. Clausius inequality.
u. Gibbs and Helmohltz free energies and their changes with interpretation.
v. Open systems: partial molar quantities with special reference to chemical potential.
w. Variation in chemical potential with pressure and temperature.
x. Different form of chemical potential involving standard state in different scales.
y. Four fundamental equations for change in (i) internal energy, (ii) enthalpy, (iii) Gibbs free energy and (iv) Helmohltz free energy.
z. Definition of one mole of a reaction.
aa. Expression of change in free energy per mole of the reaction.
bb. van't Hoff isotherm
cc. Equilibrium constant at constant pressure and at constant volume.
dd. Variation in equilibrium constants with temperature and pressure.
ee. Interrelation between the equilibrium constants.
ff. Qualitative idea of Le Chattelier's principle.