UNIT I

I. Organometallic Compounds: Organomagnesium compounds: the Grignard reagents, formation, structure and chemical reactions. Organozinc compounds; formation and chemical reactions. Organolithium compound formation and chemical reactions.

II. Organosulphur compounds: Nomenclature, structural, features, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidene.

III. Heterocyclic compounds


UNIT II

IV. Carbohydrates: Classification and nomenclature, configuration and conformation of monosaccharides, Erythro and threo diastereomers, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Formation of glycoside, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+) glucose. Mechanism of mutarotation, structure of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose, lactose) and polysaccharide/starch and cellulose) without involving structure determination.

UNIT III


Nucleic Acids: Introduction - Classification of nucleic acids Ribonueleosides and Ribonucleotides. The double helical structure of DNA.

VI. Fats, Oils and Detergents: Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of
unsaturated oils, saponification value, iodine value, acid value, soaps, synthetic detergents alkyl and aryl sulphonates.

UNIT IV


VIII. Synthetic Dyes: Colour and constitution / electronic concept classification of dyes. Chemistry and synthesis of Methyl orange, conge red, Malachite green, crystal violet, phenophthalein, Fluorescin, Alizarin and Indigo.
UNIT I

II. Physical Properties and Molecular Structure: Optical activity, polarization (clausius-Mossotti equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment, temperature method and refractivity method, dipole moment and structures of molecules, magnetic properties i.e. paramagnetism, diamagnetism and ferromagnetism.

UNIT II
III. Photochemistry
a. Interaction of radiation with matter, difference between thermal and photochemical processes.

b. Laws of photochemistry: Grothus-Drapper law, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).

UNIT III
IV. Solutions, Dilute Solutions and Colligative Properties : Ideal and non-ideal solutions, methods of expressing concentration of solutions, activity and activity coefficient, Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination, Osmosis, theory of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure, Elevation of boiling point and depression of freezing point. Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.

UNIT IV
V. Third law of thermodynamics, Nernst heat theorem, statement and concept of residual entropy. Thermodynamic derivation of Nernst distribution law and its application. Phase rule and its derivation. Application of Gibbs phase rule for one component system- water and sulphur system, two component system- Bi-Cd, Pb-Ag, desilverization of lead.
Department of Chemistry
University of Lucknow
Lucknow
B.Sc. Syllabus

Physical Chemistry

Semester V  Paper 8  Max Marks: 100 (80 + 20)

Books suggested (Theory Courses)

b. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
A: Inorganic Chemistry
I. Synthesis and Analysis
   a. Preparation of potassium trioxalatoferrate (III), \( \text{K}_3[\text{Fe(C}_2\text{O}_4)_3] \) and determination of its composition by permagnometry.
   b. Preparation of Ni-DMG complex, \([\text{Ni(DMG)}_2]\)
   c. Preparation of copper tetraammine complex, \([\text{Cu(NH}_3)_4]\text{SO}_4\)
   d. Preparation of cis-and trans-bisoxalatodiaqua chromate (III) ion.

II. Colorimetry
   a. To verify Beer-Lambert law for \( \text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7 \) and determine the concentration of the given solution.
   b. Determination of \( \text{Fe}^{3+} \) content by thiocyanate method.

III. Solvent Extraction
   a. Separation and estimation of Mg(II) and Fe(II) Ion
   b. Separation and estimation of Mg(II) and Zn(II).

IV. Chromatography
   a. Chromatographic separation of metal ions.

B: Organic Chemistry
I. Mixture Analysis
   a. Organic mixture separation and identification (two components)

II. Preparation
   b. One step preparation.

C: Physical Chemistry
I. Electrochemistry
   a. To determine the strength of the given acid conductometrically using standard alkali solution.
   b. To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically.
   c. To determine the ionisation constant of a weak acid conductometrically.

II. Refractometry and Polarimetry
   a. To verify law of refraction of mixtures (e.g. of glycerol and water) using Abbe’s refractometer.
   b. To determine the specific rotation of cane sugar solution by polarimeter.

III. Molecular Weight Determination
   b. Determination of the apparent molecular weight of non volatile solute at different concentration and determine Van’t Hoff factor by ebullioscopy.
IV. Colorimetry
   a. To verify Beer-Lambert law for KMnO₄/K₂Cr₂O₇ and determine the concentration of the given solution of the substance.