



BHARATHIDASAN UNIVERSITY
TIRUCHIRAPPALLI- 620 024
B.Sc. Chemistry

(For the candidates admitted from the academic year 2014 -15 onwards offered through
 Centre for Distance Education)

Course Duration: 3 Years – (Non-Semester System)

Eligibility: Higher Secondary (+2) Pass with Chemistry

Year	Paper	Title of the Paper	Exam Hours	Marks
I YEAR	Language Paper – I		3	100
	English Paper –I		3	100
	Major Paper –I	General Chemistry – I	3	100
	Major Paper –II	Volumetric analysis (Practical I)	3	50
	First Allied (Physics Compulsory) (Theory 75 Practical 25)	Theory Practical	3 3	75 25
				450
II YEAR	Language Paper – II		3	100
	English Paper –II		3	100
	Major Paper –III	General Chemistry – II	3	100
	Major Paper –IV	Semi micro Inorganic qualitative analysis (Practical II)	3	50
	Second Allied Maths / Botany / Zoology		3	100
				450
III YEAR	Major Paper –V	Inorganic Chemistry	3	100
	Major Paper –VI	Organic Chemistry	3	100
	Major Paper –VII	Physical Chemistry	3	100
	Elective Paper	(Optional) Applied Chemistry / Biochemistry	3	100
	Major paper VIII	Gravimetric and organic analysis , Physical constant determination and organic preparation (Practical III)	6	150
	Major paper IX	Physical Chemistry (Practical IV)	3	50
				600
	TOTAL MARKS			1500

passing minimum

- Note 1:** 1. FOR ALL THEORY PAPERS 40 MARKS
 2. **FOR PRACTICALS** (Record has to be submitted at the time of Practical Examination)
 (a) 50 marks 20 MARKS
 (b) 25 marks 10 MARK
 (c) 150 marks 60 MARKS

Note 2: Environmental Studies UGC paper is compulsory to study in 1st year

Major Paper - I
General Chemistry – I

Unit 1: Atomic Structure, Periodic Properties, Theories Of Volumetric And Semimicro Qualitative Analyses.

1.1 Atomic Orbitals, quantum numbers - Principal, azimuthal, magnetic and spin quantum numbers and their significance-Principles governing the occupancy of electrons in various quantum levels-Pauli's exclusion principle, Hund's rule, Aufbau Principle, (n+l) rule, stability of half-filled and fully filled orbitals.

1.2 Classification as s, p, d & f block elements, variation of atomic volume, atomic and ionic radii, ionisation potential, electron affinity and electronegativity along periods and groups – Factors influencing the periodic properties.

1.3 Inorganic Qualitative Analysis: Solubility Product – Principle of Elimination of interfering anions, Common ion Effect – Complexation reactions including spot tests in qualitative analysis – Reactions involved in separation and identification of cations and anions in the analysis – Semi Micro Techniques .

1.4 Titrimetry: Definitions of Molarity, normality, molality and mole fraction – Primary and Secondary standards – Types of titrimetric reactions – acid-base, redox, precipitation and complexometric titrations – Indicators – Effect of change in pH – theory of neutralization, redox, adsorption and metal ion indicators.

Unit 2: Chemical bonding and chemistry of s- block elements

2.1 Ionic bond – Lattice Energy – Born – Haber Cycle – Pauling and Mulliken's scales of electronegativity – Polarizing power and Polarisability – partial ionic character from electronegativity – Transitions from ionic to covalent character and vice versa – Fajan's rules.

2.2 VESPR Theory – Shapes of simple inorganic molecules (BeCl_2 , SiCl_4 , PCl_5 , SF_6 , IF_7 , NH_3 , XeF_4 , XeF_6 , XeO_3 , XeOF_4 , BF_3 , and H_2O) - VB Theory – Principles of hybridization – MO Theory – Bonding and antibonding orbitals – Application of MO Theory to H_2 , He_2 , N_2 , O_2 , HF and CO – Comparison of VB and MO Theories.

2.3 s-block elements

General characteristics of Group IA elements— diagonal relationship between Li and Mg – general methods of extraction, physical, chemical properties and uses of Lithium, Sodium and Potassium.

General characteristics of Elements of Group IIA – diagonal relationship between Be and Al – Extraction of Beryllium, Magnesium and Calcium – Physical, chemical properties and Uses.

Unit 3: Theories Of Covalent Bonding And Structure, Chemistry Of Alkanes And Cycloalkanes

3.1 Covalent bonding – hybridization – Structure of organic molecules based on sp^3 , sp^2 and sp hybridization –properties of covalent molecules: bond length, bond angle, bond energy, bond polarity, inductive, mesomeric, electromeric, resonance and hyperconjugative effects.

3.2 IUPAC nomenclature of organic compounds (up to 10 carbon systems) – Hydrocarbons – Mono functional compounds – Bifunctional compounds – Isomerism – Types of isomerism (structural and stereoisomerisms) with appropriate examples .

3.3 Petroleum- Coal tar distillation- source of alkanes – Methods of preparing alkanes and cycloalkanes -Chemical properties –Halogenation of alkanes- Mechanism of free radical substitution – Conformational study of ethane and n-butane-Relative stability of cycloalkanes (from cyclopropane up to cyclooctane) – Bayer’s Strain theory – Limitations – Conformational study of cyclohexane, mono and disubstituted cyclohexanes.

Unit 4: Chemistry Of Alkenes, Alkynes, Dienes, Benzene And Benzenoid Compounds.

4.1 Chemistry of alkenes, alkynes and dienes: Nomenclature of alkenes – Geometrical Isomerism — General methods of preparation of alkenes – Chemical properties – Uses – Elimination mechanisms (E_1, E_2) – Electrophilic, Free radical additions – Ziegler – Natta Catalytic polymerization of ethylene – polymers of alkene derivatives. Nomenclature of alkynes- General methods of preparation of alkynes – Physical and Chemical properties – Uses.

4.2 General methods of preparation of Dienes and types- Physical and Chemical properties – Uses – Mechanisms of electrophilic and Free radical addition reactions – Rubber as a natural polymer.

4.3 General methods of preparation of benzene – Chemical properties – Uses – Electrophilic substitution mechanism – Orientation and reactivity in substituted benzenes. Polynuclear Aromatic compounds – Nomenclature –Laboratory preparation of Naphthalene, Anthracene

and Phenanthrene -Structure, aromatic character, physical, chemical properties and uses of Naphthalene, Anthracene and Phenanthrene – Mechanism of Aromatic electrophilic substitution – Theory of orientation and reactivity

Unit 5 :Atomic Structure, Molecular Velocities And Real Gases

5.1 Dualism of light – Wave nature of radiation, classical theory of electromagnetic radiation and classical expression for energy in terms of amplitude. Particle nature of radiation – Black body radiation and Planck’s quantum theory, photoelectric effect and Compton effect of matter – de Broglie hypothesis and Davisson and Germer experiment. Heisenberg’s uncertainty principle. Schrodinger wave equation – arguments in favour of Schrodinger wave equation. Physical significance of ψ and ψ^2 functions. Wave picture of electron – Concept of atomic orbitals. Shapes of s, p and d orbitals. Nodal planes and nodal points in atomic orbitals- g and u character of atomic orbitals.

5.2 Maxwell’s distribution of Molecular velocities (Derivation not required). Types of Molecular velocities – Mean, Most probable and root mean square velocities. Graphical representation and its significance – Collision diameter, Mean free path and collision number. Real gases – van der Waals equation of states – derivation.Law of corresponding states.

Recommended Books:

1. Soni. P.L. Textbook of Inorganic Chemistry, S. Chand & sons, New Delhi, (2010)
2. Soni. P.L. and Chawla H.M., Textbook of Organic Chemistry, S. Chand & sons, New Delhi, (2010)
3. Soni. P.L. and Dharmarha O.P. Textbook of Physical Chemistry, S. Chand & sons, New Delhi, (2010)
4. Puri B.R.,Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).
5. Puri B.R.,Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).

Books for reference:

1. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).
2. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.
3. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).
4. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
5. Frank J. Welcher and Richard B. Hahn, Semi micro Qualitative Analysis, New Delhi, Affiliated East-west Press Pvt.Ltd. (1969).

Major Paper II
Practical - I Volumetric Analysis

Titrimetric Quantitative Analysis

1. Estimation of HCl by NaOH using a standard oxalic acid solution.
2. Estimation of Na_2CO_3 by HCl using a standard Na_2CO_3 solution.
3. Estimation of oxalic acid by KMnO_4 using a standard oxalic acid solution.
4. Estimation of Iron (II) sulphate by KMnO_4 using a standard Mohr's salt solution.
5. Estimation of KMnO_4 by $\text{Na}_2\text{S}_2\text{O}_3$ using a standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
6. Estimation of copper (II) sulphate by $\text{Na}_2\text{S}_2\text{O}_3$ solution using standard CuSO_4 solution.

SCHEME OF VALUATION

Max. Marks = 50

Record - 5marks

Procedure Writing – 10 marks

Experiment – 35marks

Results

< 1 % - 35 marks

1-2 % -25 marks

2-3 % -20 marks

3-4 % -15 marks

> 4 % - 10 marks

Major Paper III

GENERAL CHEMISTRY-II

Unit 1: Chemistry of p-Block Elements – B,C and N Families

1.1 General characteristics of p-block elements – general characteristics of elements of Group III A -diagonal relationship between B and Si-extraction of boron – Physical and chemical properties of B and uses – chemistry of some compounds : Borax, Diborane, Boron nitride, Al_2O_3 , AlCl_3 , Alums.

1.2 General characteristics of elements of Group IVA – difference of carbon and silicon from the rest of the family- allotropic forms of carbon –use of CO_2 in fire extinguishers – extraction of lead – physical and chemical properties of Si and lead– uses - lead pigments.

1.3 General characteristics of elements of V A Group – the unique features of nitrogen from the rest of the family – preparation of nitrogen and phosphorus – physical and chemical properties of N_2 and P- uses of N_2 and P –chemistry of some compounds of nitrogen and phosphorus : Hydrazine, Hydroxylamine, Nitric acid –chemistry of PH_3 , POCl_3 , P_2O_5 and H_3PO_4

1.4 Anomalous behaviour of oxygen –Preparation, properties, structure and uses of oxyacids of sulphur- Caro's acid and Marshall's acid -classification of oxides based on their chemical behaviour – acidic oxide, amphoteric oxide and neutral oxides. Classification of oxides based on oxygen content – normal oxides, peroxides, super oxides, dioxides, sub oxides and mixed oxides. Chemistry of selenium and tellurium.

Unit -2: Chemistry of p-block elements- halogens, zero group and d- & f- block elements

2.1 General characteristics of halogens with reference of electro negativity, electron affinity, oxidation states and oxidizing power. Hydrides, oxides and oxo acids of halogens. Inter halogen compounds and pseudo halogens – basic nature of iodine.

Noble gases : Position in the periodic table – isolation from atmosphere – General Characteristics.

2.2 Chemistry of transition elements – electronic configuration – general periodic trend – group study of titanium, vanadium, chromium, manganese and iron groups- comparative study of zinc group - extraction of Ti, V, Cr, Mn, Fe, Co, Ni, Cu and Zn

2.3 Chemistry of f- Block Elements- General characteristics of f-block elements – comparative account of lanthanides and actinides –oxidation states, magnetic properties– separation by ion exchange method– lanthanide contraction – chemistry of thorium and uranium – ores, extraction and uses

Unit 3 :Chemistry of alcohols, phenols, ethers and carboxylic acids

3.1 Alcohols - Nomenclature – laboratory preparation of alcohols – industrial source of alcohols – physical and chemical properties – uses – chemistry of glycols and glycerols – uses – preparation of phenols including di- and trihydric phenols – physical and chemical properties – uses – aromatic electrophilic substitution mechanism – theory of orientation and reactivity, laboratory preparation of ethers, epoxides – physical, chemical properties and uses –crown ethers – structures and applications.

3.2 Carboxylic acids- Nomenclature - general methods of preparation of carboxylic acids - physical properties - structure and acidity - chemical properties - uses - preparation of dicarboxylic acid - physical and chemical properties - uses - preparation, physical and chemical properties - acyl chlorides, anhydrides, esters, amides - chemistry of compounds containing active methylene group – Reactions of acetoacetic ester and malonic ester

Unit4 :Chemistry of carbonyl compounds

4.1 Introduction - nomenclature - laboratory preparation of aliphatic carbonyl compounds - physical and chemical properties - uses - nucleophilic addition mechanism at carbonyl group - acidity of alpha - hydrogen - general methods of preparation of benzaldehyde - physical and chemical properties - uses - effect of aryl group on the reactivity of carbonyl group.

4.2Mechanisms of Aldol, Perkin, Knoevenagel, Benzoin, Cannizaro, Claisen, Reformatsky and Wittig reactions. Haloform and Michael addition reactions and Oppenauer oxidation. Mechanism of reductions with NaBH_4 and LiAlH_4 , MPV and Wolff Kishner reductions..

.Unit 5: Solid state, colloids, chemical kinetics and catalysis

5.1 Classification of solids – Isotropic and anisotropic crystals. Laws of crystallography – representation of planes – Miller indices, space lattice, seven crystal systems – seven primitive unit cells – X – ray diffraction – derivation of Bragg’s equation – determination of structure of NaCl by Debye Scherrer (powder method) and rotating crystal method – determination of Avogadro’s number – discussion of structure of KCl & CsCl –packing of ions in crystals.

5.2 Kinetics: Rate of reaction, rate equation, order of reaction. Rate laws: rate constants – derivation of rate constants and characteristics for zero, first order, second and third order

(equal initial concentration) – derivation of time for half change with examples. Methods of determination of order of reactions – experimental methods of determination of rate constant of a reaction – volumetry, manometry, polarimetry, Effect of temperature on reaction rate – concept of activation energy, energy barrier Arrhenius equation. Theories of reaction rates – collision theory – derivation of rate constant of bimolecular gaseous reaction – failure of collision theory – Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – derivation of rate constant for a bimolecular reaction – significance of entropy and free energy of activation. Comparison of collision theory and ARRT.

5.3 Catalysis – homogeneous and heterogeneous – kinetics of acid – base and enzyme catalysis. Heterogeneous catalysis – adsorption – types – chemical and physical. Characteristics of adsorption. Different types of isotherms – Freundlich and Langmuir.

Recommended Books:

1. Soni. P.L. Textbook of Inorganic Chemistry, S. Chand & sons, New Delhi, (2010)
2. Soni. P.L. and Chawla H.M., Textbook of Organic Chemistry, S. Chand & sons, New Delhi, (2010)
3. Soni. P.L. and Dharmarha O.P. Textbook of Physical Chemistry, S. Chand & sons, New Delhi, (2010)
4. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).
5. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).

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5. Frank J. Welcher and Richard B. Hahn, Semi micro Qualitative Analysis, New Delhi, Affiliated East-west Press Pvt.Ltd. (1969).

Major Paper IV
Practical – II Semimicro Inorganic Qualitative analysis

Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

Cations to be Studied: lead, copper, bismuth, cadmium, iron, aluminium, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium.

Anions to be studied: Carbonate, Sulphide, Sulphate, nitrate, chloride, bromide, fluoride, borate, oxalate, arsenite and phosphate.

MARKS DISTRIBUTION

Marks Distribution for Practical - 45 marks

Record - 5 marks

Total - 50 marks

4 radicals correct with suitable tests: 45 marks

3 radicals correct with suitable tests: 35 marks

2 radicals correct with suitable tests: 25 marks

1 radical correct with suitable tests: 15 marks

**Major Paper V
INORGANIC CHEMISTRY**

UNIT 1: COORDINATION CHEMISTRY:

1.1 Types of ligands - IUPAC nomenclature - Isomerism - theories of coordination compounds - Werner, Sidgewick, valence bond, crystal field and molecular orbital theories.

1.2 Stability of complexes - factors affecting the stability of complexes - unimolecular and bimolecular nucleophilic substitution reactions in octahedral and square planar complexes - trans effect - magnetic properties of transition metal complexes.

UNIT 2: APPLICATION OF COORDINATION COMPOUNDS AND SOME SPECIAL TYPE OF COMPOUNDS:

2.1 Application of coordination compounds - estimation of nickel using DMG and aluminium using oxine - estimation of hardness of water using EDTA

2.2 Biologically important coordination compounds - chlorophyll, haemoglobin, vitamin B12 - their structure and application . Metal carbonyls - mono and poly nuclear carbonyls of Ni, Fe, Cr, Co and Mn - synthesis and structure. Nitrosyl compounds - classification, preparation and properties - structure of nitrosyl chloride and sodium nitroprusside.

2.3 Organometallic compounds of alkenes, alkynes and cyclopenta diene - binary compounds - hydrides, borides, carbides and nitrides - classification, preparation, properties and uses. some special classes of compounds - clathrates - examples and structures - Interstitial and non - stoichiometric compounds.

2.4 silicones - composition, manufacture, structure properties and uses - silanes and their polymers - applications of phosphazenes – silicates and their polymers - classification into

discrete anions - one, two and three dimensional structures with examples - composition, properties and uses of beryl, asbestos, talc, mica, zeolites and ultramarines.

UNIT 3: NUCLEAR CHEMISTRY

3.1 Introduction - composition of nucleus and nuclear forces (meson field theory)- nuclear stability - mass defect - binding energy - packing fraction - n/p ratio, magic numbers - nuclear models - liquid drop -shell and collective model - Isotopes - detection and separation - deviation of atomic weights from whole numbers – isobars, isotones and isomers.

3.2 Radioactivity – discovery, detection and measurements, laws of radioactivity - rate of disintegration - half life and average life, group displacement law - radio active series - nuclear transformation - use of projectiles - nuclear reactions - fission and fusion - nuclear reactors, applications of nuclear science in agriculture and medicine- carbon dating - rock dating - radioactive waste disposal.

UNIT 4: INORGANIC SOLID STATE CHEMISTRY AND METALLIC BOND

4.1 Radius ratio rule and its application in determination of structure of solids like Wurzite, fluorite, anti-fluorite and CdI_2 - crystal defects - Schottky and Frenkel defects- ions - symmetry elements - symmetry operations .

4.2 Metallic state - packing of atoms in metal (BCC, FCC, HCP and Simple cube) - theories of metallic bonding - electron gas, Pauling and band theories - semi conductors - n-type and p-type, transistors - uses - structure of alloys - substitutional and interstitial solid solutions - Hume Rothery ratio.

UNIT 5 INDUSTRIAL INORGANIC CHEMISTRY

5.1 Fossil fuels - varieties of coal and petroleum - petroleum refineries in India- fuel gases - calorific value - composition and preparation of water gas, semi water gas, carburetted water gas, producer gas, natural gas, LPG and biogas.

5.2 Fertilizers - manufacture of N-P-K and mixed fertilizers - micronutrients and their role in plant life.

5.3 Safety matches, fire works and explosives - manufacturing details.

5.4 Paints and varnishes - manufacture and uses.

5.5 Glass composition, manufacture, different varieties and their uses.

Books for Reference:

1. Soni P.L., Text Book of Inorganic Chemistry, S, Chand & Co, New Delhi (2006).
2. Puri B.R., Sharma L.R. and Kalia, Principles of Inorganic Chemistry, New Delhi (2002).
3. Madan R.D., Juli G.D and Malik S.M., Selected Topics in Inorganic Chemistry, S. Chand & Co, New Delhi (2006)
4. Lee J.D., Concise Inorganic Chemistry, ELBS Edition.
5. Satyaprakash, Tuli, G.D., Basu, S.K., and Madan, R.D, Advanced Inorganic chemistry (vol I & II), S. Chand, New Delhi (2006)
6. R.Gopalan.R., Inorganic Chemistry For Undergraduates, University Press (2009).

**Major Paper VI
Organic Chemistry**

Unit 1 :Organo halogen compounds & Stereochemistry**1.1 Organo halogen Compounds**

Nomenclature – general methods of preparation of haloalkanes – physical and chemical properties – uses. Nucleophilic substitution mechanisms (**S_N1**, **S_N2** and **S_Ni**) – evidences – stereochemical aspects of nucleophilic substitution mechanism. General methods of preparation of halobenzenes – physical properties – chemical properties – uses. Mechanisms of electrophilic and nucleophilic substitution reactions – theory of orientation and reactivity.

1.2 Stereochemistry

Stereoisomerism – types – optical isomerism – chirality's based on symmetry elements (C_n, s, i and S_n) – idea of asymmetry and dissymmetry – optical activity – measurement of optical activity – concept of enantiomerism, diastereomerism – axial chirality in substituted allenes and spiranes – atropisomerism in substituted biphenyls – R,S and D, L notations to express configurations – erythro, threo conventions – meso and dl – forms of tartaric acid – stereoselectivity and stereospecificity in organic reactions with suitable examples – resolution of racemic mixture using chiral reagent – Walden inversion – asymmetric synthesis – asymmetric induction.

UNIT 2:Nitrogen Compounds&Heterocyclic compounds**2.1 Nitrogen Compounds**

Nitrogen compounds - nomenclature - nitro alkanes - alkyl nitrites - differences - aromatic nitro compounds - preparation and reduction of nitro benzene under different conditions. Amino compounds - effect of substituents on basicity, reaction of amino compounds (primary, secondary, tertiary and quaternary amine compounds). mechanism of carbylamine reaction, diazotization, and comparison of aliphatic and aromatic amines - diazonium compounds - preparation and synthetic importance of diazomethane, benzene diazonium chloride and diazo acetic ester.

2.2 Heterocyclic Compounds

Heterocyclic compounds - nomenclature - preparation and properties of furan, pyrrole, thiophen -comparison of the basicities of pyrrole, pyridine and piperidine with amines -synthesis and reactions of quinoline, isoquinoline and indole with special reference to Skraup, Fischer Napleraloski and Fischer - indole syntheses – structural elucidation of quinoline and isoquinoline.

Unit 3 : Molecular Rearrangements and Alkaloids & Terpenoids

3.1 Molecular Rearrangements

Molecular rearrangements - types of rearrangement (nucleophilic and electrophilic) – mechanism with evidence for the following re-arrangements : pinacol - pinacolone, benzil - benzilic acid, benzidine, Claisen, Fries, Hofmann, Curtius, Lossen, Beckmann, dienone - phenol and Orton - photochemical reactions of ketones - Norrish type I and II.

3.2 Alkaloids and Terpenoids

Chemistry of natural products - alkaloids – isolation- classification-general methods of elucidating structure - structural elucidation and synthesis of conine, piperine, nicotine and ephedrine. Terpenes - classification – isoprene- special isoprene rule- general methods of structural elucidation - structural elucidation and synthesis of citral, limonene, menthol and camphor.

Unit 4: Industrial Organic Chemistry

4.1 Dyes : Theory of colour and constitution - chromophore, auxochrome, classification according to application and structure. Preparation and uses of nitro dyes - naphthol yellow, nitroso fast green – O. Azo dyes - methyl orange. Triphenyl methane dyes - malachite green, Indigo dyes – Indigotin. Anthraquinone dyes – alizarin. Phthalein dyes – fluorescein. Sulphonic acid and derivatives - preparation and properties of benzene sulphonic acid. Saccharin, chloramine – T and sulphonamides.

4.2 Polymers : Definition-types of polymers-mechanism of cationic, anionic and free radical polymerisation –thermo setting polymers – preparation of caprolactam, Nylon 66, polyester, epoxide resin- molecular weight of polymers (elementary treatment)

Unit 5 :Carbohydrates,proteins&vitamins

5.1 CARBOHYDRATES

Carbohydrates - classification, properties of mono saccharide (glucose and fructose), structure and configuration of mono saccharide, interconversion, ascending and descending series, muta rotation, epimerisation- cyclic structure - determination of size of sugar rings - disaccharide - sucrose, maltose - structure elucidation - polysaccharide - starch and cellulose (elementary treatment).

5.2 PROTEINS AND VITAMINS

Amino acids - classification, general methods of preparation and reactions of amino acids, zwitter ion - isoelectric points, action of heat on amino acids. Peptides and proteins - Peptide linkage - polypeptide - classification of proteins - synthesis of peptides - Merrifield synthesis - primary structure - end group analysis - Danyl chloride, Edman method - secondary structure - tertiary structure - denaturation - colour reactions of proteins - nucleic acids - elementary treatment of DNA and RNA . Vitamins (structural elucidation not needed) - classification, biological importance of vitamins A, B₁, B₂, B₆, B₁₂ and C.

Reference:

1. Finar I.L., Organic Chemistry, Vol 1&2, (6th edition) England, Addison Wesley Longman Ltd. (1996).
2. Morrison R.T., Boyd R.N., Organic Chemistry, (4th edition) New York, Allyn & Bacon Ltd., (1976)
3. Bahl B.S, Arun Bahl, Advanced Organic Chemistry, (12th edition) New Delhi, Sultam Chand and Co., (1986)
4. Pine S.H., Organic Chemistry, (4th edition) New Delhi, McGraw - Hill International Book Company (1986)
5. Seyhan N. Ege, Organic Chemistry, New York, Houghton Mifflin Co., (2004)

Major Paper VII
Physical chemistry

UNIT 1: ELECTRICAL CONDUCTANCE & ELECTROCHEMICAL CELLS

1.1 Electrical transport and conductance in metal and in electrolytic solution.- specific conductance and equivalent conductance Measurement of equivalent conductance using Kohlraush's bridge. Variation of equivalent conductance with concentration- migration of ions - ionic mobility. .

1.2 The elementary treatment of the Debye – Huckel- Onsager equation for strong electrolytes. The conductance at high fields (Wein effect) and high frequencies (Debye - Falkenhagen effect). Transport number & Hittorf's rule. Determination by Hittorf's method and moving boundary method. Kohlrausch's law and its applications. Application of conductance measurements - Determination of K_a of acids, determination of solubility product of a sparingly soluble salt and conductometric titrations.

1.3 Electrolytic & galvanic cells - reversible and irreversible cells. Conventional representation of electrochemical cells. Electromotive force of a cell and its measurement- computation of E.M.F- calculation of thermodynamic quantities of cell reactions (ΔG , ΔH , ΔS and K)- application of Gibbs Helmholtz equation. - Nernst equation,

1.4 Types of reversible electrodes - gas/metal ion - metal/metal ion; metal/insoluble salt/ anion and redox electrodes. electrode reactions - Nernst equation – derivation of cell E.M.F and single electrode potential- standard hydrogen electrode - reference electrodes - standard electrode potentials - sign convention - electrochemical series and its significance.

1.5 Concentration cell with and without transport- liquid junction potential. Applications of EMF measurement- Valency of ion, solubility product, activity co-efficient and potentiometric titrations. Determination of pH using hydrogen and quinhydrone electrodes- Determination of pK_a of acids by potentiometric method. Corrosion - general and electrochemical theory - passivity - prevention of corrosion.

UNIT 2: PHOTOCHEMISTRY and SPECTROSCOPY

2.1 Consequences of light absorption - Jablonski diagram- radiative and non - radiative transitions. Laws of photo chemistry - Lambert – Beer, Grothus - Draper and Stark - Einstein. quantum efficiency. photo chemical reactions - rate law - kinetics of H_2-Br_2 reaction. Comparison between thermal and photochemical reactions. Photo sensitization and quenching. Fluorescence, phosphorescence and chemiluminescence.

2.2 Electromagnetic spectrum - The regions of various types of spectra. Microwave spectroscopy: Rotational spectra of diatomic molecules treated as rigid rotator, condition for a molecule to be active in microwave region, rotational constants (B), and selection rules for rotational transition. Frequency of spectral lines, calculation of inter - nuclear distance in diatomic molecules.

2.3 Infrared spectroscopy : Vibrations of diatomic molecules - harmonic and anharmonic oscillators, zero point energy and force constant, condition for molecule to be active in the IR region, selection rules for vibrational transition, fundamental bands, overtones and hot bands. Diatomic vibrating rotator - P,Q,R branches. Determination of force constant.

2.4 Raman spectroscopy : Rayleigh scattering and Raman scattering. Stokes and antistokes lines in Raman spectra, Raman frequency, quantum theory of Raman effect, condition for a molecule to be Raman active. Rule of mutual exclusion. Comparison of Raman and IR spectra- structural determination from Raman and IR spectroscopy

2.5 UV- visible spectroscopy: Conditions - theory of electronic spectroscopy - types of electronic transitions - Franck - Condon principle – pre dissociation - applications.

2.6 NMR spectroscopy : Nuclear spin and conditions for a molecule to give rise to NMR spectrum- theory of NMR spectra, number of NMR signals, equivalent and non - equivalent protons, position of NMR signals, shielding, de-shielding, chemical shift, δ and τ scales. Peak area and number of protons. Splitting of NMR signals - spin - spin coupling.

UNIT 3: THERMODYNAMICS :

3.1 System and surrounding – isolated, closed and open systems - state of the system - Intensive and extensive variables. Thermodynamic processes - reversible and irreversible, isothermal and adiabatic processes - state and path functions - exact and inexact differentials. Work of expansion at constant pressure.

3.2 First law of thermodynamics - statement - definition of internal energy (E), enthalpy (H) and heat capacity. Relation between C_p and C_v . calculation of w , q , dE and dH for expansion of ideal and real gases under isothermal and adiabatic conditions of reversible and irreversible processes. Definition of Joule - Thomson coefficient ($\mu_{J,T}$) - calculation of ($\mu_{J,T}$) for ideal and real gases - Inversion temperature.

3.3 Thermochemistry : Relation between enthalpy of reaction at constant volume (q_v) and at constant pressure (q_p) - temperature dependence of heat of reaction – Kirchoff 's equation - bond energy and its calculation from thermochemical data - Integral and differential heats of solution and dilution.

3.4 Second law of thermo dynamics - need for the law - different statements of the law - Carnot's cycle and efficiency of heat engine - Carnot's theorem - thermodynamic scale of temperature

3.5 Concept of entropy - definition and physical significance of entropy - entropy as a function of P, V and T - entropy changes during phase changes - entropy of mixing - entropy criterion for spontaneous and equilibrium processes in isolated system - Gibb's free energy (G) and Helmholtz free energy (A) - variation of A and G with P, V and T- Gibb's - Helmholtz equation and its applications - thermodynamic equation of state - Maxwell's relations - Criteria for spontaneity and equilibrium - advantage of ΔG over entropy change.

UNIT4: THERMODYNAMICS AND THERMODYNAMICS OF PHASE CHANGES

4.1 Partial molar quantities - chemical potential - variation of chemical potential with T, P and x (mole fraction) - Gibb's Duhem equation-van't Hoff's reaction isotherm - van't Hoff's isochore - Clapeyron equation and Clausius - Clapeyron equation-applications.

4.2 Third law of thermodynamics - Nernst heat theorem-statement of III law and concept of residual entropy - evaluation of absolute entropy from heat capacity data. Exception to III law (ortho and para hydrogen, CO, N₂O and ice).

4.3 Definition of terms in the phase rule - derivation of Gibb's Phase rule. One component systems - water and sulphur - super cooling- sublimation. Two component systems: solid /liquid equilibria, simple eutectic (lead-silver, Bi-Cd), desilverisation of lead - compound formation with congruent melting point (Mg-Zn) and incongruent melting point (Na-K). Solid solutions - (Ag-Au) - fractional crystallisation. Freezing mixtures, FeCl₃ - H₂O system and CuSO₄-H₂O system.

UNIT 5: SOLUTIONS

5.1 Ideal and non-ideal solutions: Methods of expressing concentrations of solutions - mass percentage, volume percentage, normality, molarity, molality, mole fraction. Concept of activity and activity coefficients. Completely miscible liquid systems - benzene and toluene. Raoult's law and Henry's law- deviation from Raoult's law and Henry's law. Duhem - Margules equation, theory of fractional distillation. Azeotropes - HCl - water and ethanol - water systems.

5.2 Partially miscible liquid systems - phenol - water, triethanolamine - water and nicotine - water systems. Lower and upper CSTs - effect of impurities on CST.

5.3 Completely immiscible liquids - principle and applications of steam distillation. Nernst distribution law - derivation-applications - determination of formula of a complex (KI + I₂ = KI₃). Solvent extraction-principle and derivation of a general formula of the amount unextracted.

5.4 Dilute solutions: Colligative properties, relative lowering of vapour pressure, osmosis, law of osmotic pressure, thermodynamic derivation of elevation of boiling point and depression in freezing point. Determination of molecular masses using the above properties. Abnormal molecular masses- molecular dissociation - degree of dissociation - molecular association.

Text book: Puri B.R., Sharma L.R., Kalia K.K., Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).

Reference Books:

1. Maron and Prutton, Physical Chemistry, London, Mac Millan.
2. Atkins P.W., Physical Chemistry, (5th edition) Oxford University Press (1994)
3. Maron S.H. and Lando J.B., Fundamentals of Physical Chemistry, Macmillan.
4. Samuel Glasstone, Thermodynamics for Chemists, Narahari Pres
5. Banwell.C.N. Fundamentals of Molecular Spectroscopy Tata McGraw-Hill Education, 1994

**Elective Paper-
Optional Paper - I**

Applied Chemistry

UNIT 1: ANALYTICAL CHEMISTRY

1.1 Types of analytical methods: Importance of analytical methods in qualitative and quantitative analysis: chemical and instrumental methods - advantages and limitations of chemical and instrumental methods.

1.2 Laboratory Hygiene and safety- Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and poisonous chemicals. Simple first aid procedures for accidents involving acids, alkalies, bromine, burns and cut by glass. Threshold vapour concentration - safe limits. Waste disposal and fume disposal.

1.3 Evaluation of analytical data- Idea of significant figures - its importance. Accuracy - methods of expressing accuracy. error analysis –types of errors-minimizing errors. Precision - methods of expressing precision - mean, median, mean deviation, standard deviation and confidence limit. Method of least squares - problems involving straight line graphs.

UNIT 2 :QUANTITATIVE ANALYSIS and CHROMATOGRAPHY TECHNIQUES

2.1 Estimations of commercial samples - determination of percentage purity of samples – Iron ore, washing soda and Bleaching power

2.2 Estimation of glucose and phenol. gravimetric analysis - principle - theories of precipitation - solubility product and precipitation –conditions of precipitations-types of precipitants-specific and selective precipitants- organic and inorganic precipitants - types of precipitation - purity of precipitates – co precipitation - post precipitation - precipitation from homogeneous solution - use of sequestering agents.

2.3 Chromatographic Techniques: Column chromatography - principle, types of adsorbents, preparation of the column, elution, recovery of substances and applications. thin layer chromatography - principle, choice of adsorbent and solvent, preparation of chromatoplates, Rf-values, factors affecting the Rf-values, Significance of Rf-values. Paper chromatography - principle, solvents used, development of chromatogram, ascending, descending and radial

paper chromatography. paper electrophoresis - separation of amino acids and other applications. Ion - exchange chromatography - principle - types of resins -requirements of a good resin -action of resins - experimental techniques and applications- gas chromatography - principle - experimental techniques - instrumentation and applications.

UNIT 3 :THERMO AND ELECTRO ANALYTICAL TECHNIQUES

3.1 Thermo analytical methods : Principle of thermo gravimetry, differential thermal analysis, differential scanning calorimetry - Instrumentation for TGA, DTA and DSC - Characteristics of TGA and DTA curves - factors affecting TGA and DTA curves. applications - TGA of calcium oxalate monohydrate. DTA of calcium acetate monohydrate - determination of purity of pharmaceuticals by DSC.

3.2 Electro analytical techniques - electro gravimetry -theory of electro gravimetric analysis - determination of copper (by constant current procedure) - electrolytic separation of metals : Principle - separation of copper and nickel, coulometry : principle of coulometric analysis - coulometry at controlled potential - apparatus and technique - separation of nickel and cobalt.

UNIT 4 :PLANT NUTRIENTS, PESTICIDES AND FUNGICIDES:

4.1 Plant nutrients – macro and micro nutrients – their role in plant growth – sources - forms of nutrient absorbed by plants – factors affecting nutrient absorption - deficiency symptoms in plants – corrective measures – chemicals used for correcting nutritional deficiencies – nutrient requirement of crops – their preparation,availability ,fixation and release of nutrients.

4.2 Pesticides: definition – Classification – organic and inorganic pesticides – mechanism of action – charecteristics, safe handling of pesticides – impact of pesticides on soil, plants and environment.

4.3 Fungicides: Definition – Classification – mechanism of action – sulphur, copper, mercury compounds, dithanes, dithiocarbamate.

UNIT 5: FOOD ADULTERATION, FOOD POISON AND FOOD ADDITIVES

5.1 Sources of food, types, advantages and disadvantages- nutritive values of pulses, cereals, vegetables and fruits- Food adulteration – contamination of Wheat, Rice, Milk, Butter,oil. with clay stones, water and toxic chemicals – Common adulterants. - ghee adulterants and their detection. Detection of adulterated food by simple analytical techniques.

5.2 Food poisons – natural poisons (alkaloids – nephrotoxin) – pesticides. (DDT, BHC, Malathion) – Chemical poisons – first aid for poison consumed victims.

5.3 Food additives –artificial sweetners – saccharin – cyclamate and aspartate. Food flavours –esters, aldehydes and heterocyclic compounds. Food colours – restricted use of spurious colours – Emulsifying agents – preservatives, leavening agents. Baking powder ,yeast – taste makers – MSG ,vinegar.

Books for Reference:

1. Douglas A. Skoog and Donald M. West, F.J. Holler, Fundamentals of Analytical Chemistry, 7th edition, Harcourt College Publishers.
2. Mendham J., Denney R.C., Barnes J.D., Thomas M., Vogel's Text book of Quantitative Chemical analysis 6th edition Pearson education.
3. Sharma, B.K., Instrumental Methods of Chemical Analysis, Coel Publishing House, Merrut, (1997)
4. Gopalan. R., Subramaniam P.S. and Rengarajan K., Elements of Analytical Chemistry, Sultan Chand and Sons.
5. Usharani S., Analytical Chemistry, Macmillian.
6. Swaminathan M., Food Science and Experimental foods, Ganesh and Company.
7. Biswas T.D and Mukherjee S.K. Text book of soil science 1987.
8. Thangamma Jacob, text book of applied chemistry for home science and allied science, Macmillan.
9. David Krupadanam G L.,Vijaya Prasad D.etal Analytical Chemistry,University Press(2012).

**Elective Paper
Optional Paper – II**

BIOCHEMISTRY

UNIT 1 :Cells and Nucleic acids

1.1 Cell structure and functions - prokaryotic and eukaryotic cells, cell organelles – structure and functions of cell membrane, nucleus, mitochondria, ribosomes, endoplasmic reticulum, golgi bodies, lysosomes and centrioles.

1.2 Nucleic acids - introduction, Nucleosides and nucleotides- purine and pyrimidine bases. Differences between DNA and RNA. Classification of RNA- biosynthesis of DNA. Replication.

structure of nucleosides and nucleotides, DNA – Watson and Crick model, RNA – ribosomal, transfer and messenger RNAs, biosynthesis of proteins.I

UNIT 2:Enzymes

2.1 Enzymes – introduction, chemical nature of enzymes, classification of enzymes, factors affecting enzyme activity, mechanism of enzyme action, -lock and key model and induced fit models. inhibition – competitive, noncompetitive, allosteric, substrate and feed back inhibitions.

2.2 Isoenzymes – definition and examples only, Co-enzymes-cofactors-prosthetic groups of enzymes and their importance in enzymatic action, mechanism of inhibition. Immobilization of enzymes. Enzyme specificity

examples, diagnostic applications and therapeutic uses of enzymes.

UNIT 3 :Metabolism of carbohydrates

3.1 Metabolic concepts – catabolism and anabolism

3.2 Classification – reducing and non-reducing sugars. Glucose: structure- conformation- stability. Carbohydrates of the cell membrane – starch, cellulose and glycogen.

- 3.3 Metabolism of carbohydrates – digestion and absorption of carbohydrates, storage of carbohydrates – glycogenesis, oxidation of carbohydrates – glycolysis (Embden – Meyerhof pathway), citric acid cycle, pentose phosphate pathway (HMP shunt), glyconeogenesis, Cori’s cycle, maintenance of blood sugar level

UNIT 4:Metabolism of proteins and lipids

- 4.1 Metabolism of proteins – digestion and absorption of proteins, metabolic nitrogen pool, nitrogen balance, transamination, deamination – oxidative pathway, disposal of nitrogen – synthetic pathway, glutamine pathway, direct excretion, formation of urea, creatine and creatinine
- 4.2 Classification- neutral lipids, phosphor lipids (lecithines, cephalins, plasmalogens) and lycolipids- importance, synthesis and degradation.
- 4.3 Metabolism of lipids – β -oxidation of fatty acids, ketone bodies – ketogenesis, ketosis, biosynthesis of fatty acids.

UNIT 5:Vitamins and Hormones

- 5.1 Vitamins – classification – fat soluble, water soluble vitamins, sources, functions and deficiency diseases of vitamins A,D,E,K,C and B Complex – B₁, B₂, B₃, B₅, B₆ and B₁₂. Structural elucidation of riboflavin only.
- 5.2 Hormones – definition, classification, biological functions of adrenaline, thyroxine and oxytocin.

Reference Books:

- 1) Lehninger, Principles of Biochemistry, IVth edition, Worth Publishers, New York 2005.
- 2) L.Veerakumari, Biochemistry, MJP Publishers, Chennai 2004.
- 3) Lubert Stryer, Biochemistry, W.H. Freeman and company, New York 1975.
- 4) G.R. Agarwaal and O.P. Agarwaal, ‘Text Book of Biochemisty’, Goel Publishing House, 7th edition, 1993.
- 5) J.L.Jain, ‘Fundamentals of Biochemistry’, S.Chand & Company Ltd., 4th revised edition, 1995.
- 6) S.C. Rastogi, ‘Biochemistry’, Tata-McGraw Hill Publishing Company Ltd., 1993.

Major Paper –VIII
Practical III GRAVIMETRIC AND ORGANIC ANALYSIS, PHYSICAL CONSTANT
DETERMINATION AND ORGANIC PREPARATION(6 Hours)

I-GRAVIMETRIC ANALYSIS:

1. Estimation of Lead as lead chromate.
2. Estimation of Barium as barium Sulphate
3. Estimation of Barium as barium chromate.
4. Estimation of Nickel as Nickel - DMG complex.
5. Estimation of Calcium as calcium oxalate monohydrate

II-Organic Qualitative Analysis and Organic Preparation:

a) Organic Analysis

Analysis of Simple Organic compounds:

(a) Characterization of functional groups

(b) Confirmation by preparation of solid derivatives / characteristic colour reactions.

Note: Mono-functional compounds are given for analysis. In case of bi-functional compounds, students are required to report any one of the functional groups.

III Determination of Physical Constants

Determination of boiling /melting points by semi micro method.

IV Organic Preparation:

Preparation of Organic Compounds involving the following chemical conversions

1. Oxidation
2. Hydrolysis
3. Nitration
4. Bromination

Reference :

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic principles of practical chemistry, 2nd edition, New Delhi, sultan chand & sons, (1997)

Practical Marks Distribution

Passing Minimum : 60 marks

TOTAL MARKS = 150

1) Record	= 15
2) Gravimetric Analysis	= 50
(i) < 2%	= 50
(ii) 2 to 3%	= 40
(iii) 3 to 4%	= 30
(iv) 4 to 5 %	= 20
(v) > 5 %	= 10
3) Organic Analysis	= 50
(i) Aromatic/Aliphatic	= 05
(ii) Sat/Unsat	= 05
(iii) Special Element	= 05
(iv) Functional group	= 25
(v) Derivatives	= 10
4) Organic Preparation	= 20
(i) Preparation of the Crude Sample	= 15
(ii) Recrystallization	= 05
5) Physical Constant	= 15

Total	150

Major Paper IX
Practical IV Physical Chemistry Practical

Marks: 50

Passing Minimum: 20 Marks

List of experiments:

1. Critical Solution Temperature of Phenol Water System
2. Effect of impurity on Critical solution Temperature of Phenol Water System
3. Transition Temperature of a salt hydrate
4. Rast Method – Molecular Weight Determination
5. Kinetics of Ester Hydrolysis
6. Partition Co-efficient of iodine between water and carbon tetrachloride.
7. Conductometric Acid-Base Titration (HCl Vs NaOH)
8. Potentiometric Redox Titration (FeSO_4 Vs KMnO_4)
9. Determination of cell constant & Equivalent Conductance

MARK DISTRIBUTION

Record: 5 marks

Aim, Formula, Table and Graph etc: 15 marks

Experiment and Result: 30 marks

Allied - Chemistry (For Botany, Maths, Physics & Zoology Major Students)

Unit 1

1.1 Coordination Chemistry

Nomenclature of mononuclear complexes, Werner, Sidgwick and Pauling's Theories. Chelation and industrial importance of EDTA, Biological role of haemoglobin - Application of complexes in qualitative and quantitative analysis.

1.2 Industrial Chemistry

Fuel gases – Water gas, producer gas, LPG, Gobar gas and natural gas.

Fertilisers – NPK and mixed fertilisers, micronutrients and their role in plant life and biofertilisers

1.3 Nuclear Chemistry

Fundamental particles of nucleus, isotopes, isobars, isotones and isomers – Differences between chemical reactions and nuclear reactions, fusion and fission reactions.

1.4 Metallic bond -band theory, Semiconductors – intrinsic, n-type and p-type.

Unit 2

2.1 Polar effects

Inductive effect – Relative Strength of Aliphatic monocarboxylic acid and aliphatic amines.

Resonance – Conditions for resonance, consequences of resonance – resonance energy., Basic property of aniline and acidic property of phenol.

2.2 Halogen containing compounds

Important chlorohydrocarbons used as solvents and pesticides – Dichloromethane, chloroform, carbon tetrachloride, DDT & BHC

2.3 Chemotherapy: Explanations with one example each for

(I) Analgesic (II) Antibacterial (III) Antiinflammatory (IV) Antidiabetics

(V) Antiseptic and disinfectant (VI) Anaesthetics: local and general

(Structures not necessary - Explanations with one example)

2.4 Heterocyclic compounds

Furan, thiophen, pyrrole and pyridine – preparation and properties – basic properties of pyridine and pyrrole.

Unit 3

3.1 Organic reactions

(i) Biuret (ii) Decarboxylation (iii) Benzoin (iv) Perkin (v) Cannizaro (vi) Claisen (vii) Haloform (viii) Carbyl amine (ix) Coupling reactions

3.2 Aromaticity of benzene - electrophilic substitution reactions

(i) Nitration (ii) Halogenation (iii) Alkylation

3.3 Synthetic polymers

Teflon, alkyd and epoxy resins, polyesters – general treatment only.

3.4 Stereoisomerism

Optical isomerism – Lactic and tartaric acid – racemic mixture and resolution. Geometrical isomerism – maleic and fumaric acids.

3.5 Amino acids and proteins

Amino acids – General methods of preparation and properties - Classification based on structure. Essential and non – essential amino acids —Proteins – Classification based on physical properties and biological functions. Structures of proteins – primary and secondary (elementary treatment).

Unit 4

4.1 , Chromatography – Column, paper and thin layer Chromatography.

4.2 Solid state

Unit cell- Weiss Indices- Miller indices- Elements of symmetry -simple cubic -body centered and face centered cubic lattices- Braggs equation

4.3 Energetics

First law of thermodynamics – state and path function –second law – Carnot's cycle and thermodynamic scale of temperature, spontaneous and non – spontaneous processes – entropy – Gibbs free energy, conditions for spontaneity and equilibrium.

Unit 5

5.1 Chemical equilibrium

Criteria of homogeneous and heterogeneous equilibria, decomposition of HI and CaCO_3 .

5.2 Chemical Kinetics

Order of reaction and its determinations. Effects of Temperature on reaction rate - Activation energy.

5.3 Electrochemistry: Specific and equivalent conductivities – their determination – effect of dilution on conductivity. Arrhenius theory of electrolytes - Ostwald's Dilution law, Kohlrausch law, Conductivity measurements, Conductometric titrations.

5.4 pH and buffer

Importance of pH and buffers in living systems – pH determination by colorimetric and electrometric methods.

Recommended Books:

1. Soni. P.L. Textbook of Inorganic Chemistry, S. Chand & sons, New Delhi, (2010)
2. Soni. P.L. and Chawla H.M., Textbook of Organic Chemistry, S. Chand & sons, New Delhi, (2010)
3. Soni. P.L. and Dharmarha O.P. Textbook of Physical Chemistry, S. Chand & sons, New Delhi, (2010)
4. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).
5. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).

Allied Chemistry - Practicals
(For Botany, Maths, Physics & Zoology Major Students)

Marks: 25

Passing Minimum: 10

I. VOLUMETRIC ANALYSIS : 10 Marks RECORD: 5 Marks

1. Acidimetry and alkalimetry :

- a) Strong acid versus strong base
- b) Weak acid versus strong base

2. Permanganimetry

- a) Estimation of ferrous sulphate using KMnO_4
- b) Estimation of oxalic acid using KMnO_4

3. Iodometry

- a) Estimation of copper using thiosulphate

II. Organic Analysis : 10 marks

A study of reactions of the following organic compounds :

- 1. Carbohydrate, 2. Amide (Aromatic & Aliphatic), 3. Aldehyde, 4. Ketone,
- 5. Acid, 6. Amine, 7. Phenol.

The students may be trained to perform the specific reactions like-Test for element (nitrogen only), Aliphatic or aromatic, Saturated or unsaturated and functional group present and record their observation.
