SCHEME OF EXAMINATION & DISTRIBUTION OF MARKS

SEMESTER - I

Paper No.	Title of the Paper (s)	Internal Assessment	Term End Exam	Practical	Total Marks
1.	Inorganic Chemistry	20	80		100
2.	Organic Chemistry, Stereochemistry & Pericyclic Reaction	20	80		100
3.	Physical Chemistry- I	20	80		100
4.	Spectroscopy And Mathematics/Biology For Chemists	20	80		100
LAB-I	Organic Chemistry				100
LAB-II	Analytical Chemistry				100
				TOTAL	**600**

SEMESTER - II

Paper No.	Title of the Paper (s)	Internal Assessment	Term End Exam	Practical	Total Marks
1.	Inorganic Chemistry	20	80		100
2.	Organic Chemistry	20	80		100
3.	Physical Chemistry	20	80		100
4.	Spectroscopy, Diffraction Methods & Computer For Chemists	20	80		100
LAB-I	Inorganic Chemistry				100
LAB-II	Physical Chemistry				100
				TOTAL	**600**

SEMESTER - III

Paper No.	Title of the Paper (s)	Internal Assessment	Term End Exam	Practical	Total Marks
COMPULSORY FOR GROUP A, B & C					
1.	Applications Of Spectroscopy	20	80		100
2.	Chemistry Of Bio-Inorganic & Bio-Organic	20	80		100
LAB-I	General (Compulsory)			200	200
OPTIONAL GROUP-A INORGANIC					
3.	Organotrasition Metal Chemistry	20	80		100
4.	Photo inorganic Chemistry	20	80		100
OPTIONAL GROUP- B ORGANIC					
3.	Physical Organic Chemistry	20	80		100
4.	Chemistry Of Heterocyclic Compounds	20	80		100
OPTIONAL GROUP-C PHYSICAL					
3.	Chemistry Of Materials	20	80		100
4.	Advanced Quantum Chemistry	20	80		100
				TOTAL	**600**

SEMESTER - IV

Paper No.	Title of the Paper (s)	Internal Assessment	Term End Exam	Practical	Total Marks
COMPULSORY FOR GROUP A, B & C					
1.	Photochemistry & Solid State Chemistry	20	80		100
2.	Bio-Physical & Environmental Chemistry	20	80		100
OPTIONAL GROUP-A INORGANIC					
3.	Bioinorganic Chemistry & Supra-Molecular Chemistry	20	80		100
4.	Analytical Chemistry	20	80		100
LAB-I	Special			200	200
OPTIONAL GROUP - B ORGANIC					
3.	Medicinal Chemistry	20	80		100
4.	Chemistry Of Natural Product	20	80		100
LAB-I	Special			200	200
OPTIONAL GROUP-C PHYSICAL					
3.	Liquid States	20	80		100
4.	Computation Chemistry	20	80		100
LAB-I	Special			200	200
				TOTAL	**600**
				GRAND TOTAL	**2400**

SEMESTER III
COMPULSORY FOR GROUP A, B & C
PAPER- I
APPLICATIONS OF SPECTROSCOPY

UNIT- I INORGANIC CHEMISTRY

Vibrational Spectroscopy: Symmetry and shape of AB_2, AB_3, AB_4, AB_5, AB_6 mode of bonding of ambidentate ligands, ethylenediamine and diketonato complexes, application of resonance Raman spectroscopy particularly metallo-proteins.
Electron Spin Resonance spectroscopy: Hyperfine coupling, spin polarization for atoms and transition metal ions, spin-orbit coupling and significance of g-tensors, application to transition metal complexes (having one, unpaired electron) including biological systems and to inorganic free radicals.
Nuclear Magnetic Resonance of Paramagnetic substances in solution: Factors affecting nuclear relaxation, some applications including biological systems, an overview of NMR of metal nuclides with emphasis ^{195}Pt and ^{119}Sn NMR.

UNIT- II ORGANIC CHEMISTRY

Ultraviolet and Visible Spectroscopy: Instrumentation and sample handling various electronic transition (185-800 *nm*) Beers-Lambert law, effect of solvent on electronic transitions, ultra-violet bands for carbonyl compounds, dienes, conjugated Polyenes, Fieser- Woodward rule for conjugated dienes and carbonyl compounds, ultra-violet spectra of aromatic and Heterocyclic compounds, steric effect in biphenyls.
Infra-Red Spectroscopy: Instrumentation and Sample Handing characteristic, vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohol, ethers, phenols and amines. Detailed study of Vibrational frequencies of carbonyl compounds (Ketones, aldehydes, esters, amides, acids, anhydrides, lactones, Lactams and conjugated carbonyl compounds), Effect of Hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance FT IR. IR of gaseous, solids and polymeric materials

UNIT- III

Nuclear Magnetic Resonance Spectroscopy: General introduction and definition, chemical shift, spin-spin interaction, Shielding mechanism, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides, mercaptol) complex, spin-spin interaction between two, three, four and five nuclei (first order spectra) vicinal coupling, stereochemistry, Hindered rotation, Karplus curve, variation of coupling constant with dihedral angle. Solvent effect, Fourier Transform Technique, Nuclear overhouser effect (NOE).

UNIT-IV

Carbon-13 NMR Spectroscopy- General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, Heteroaromatic and carbonyl carbon) coupling constants.
Optical Rotatory Dispersion (ORD) and Circular Dichroism (CD) - Definition, deduction of absolute configuration, octant rule for ketone.

UNIT-V

Mass Spectrometry- Introduction, ion production-EL, CL, F.D Factors affecting fragmentation, ion analysis. Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement, Nitrogen rule, Examples of mass special fragmentation of organic compounds with respect to their structure determination.

Books Suggested-

1. Modern Spectroscopy- J.M. Hollas Hohnwiley.
2. Applied Electron Spectroscopy for Chemical Analysis Ed. H. Windowi and F.L. Ho Willey interscience.
3. NMR, NQR, ESR and Mossbaure spectroscopy in Inorganic chemistry- R.V. Parish, Ellis Harwood.
4. Physical Method in Chemistry – R.S. Drago, Saunders College.
5. Introduction to Molecular Spectroscopy – G.M. Barrow, Mcgraw Hill.
6. Basic Principle of Spectroscopy – R. Chang Mcgraw Hill.
7. Theory and Application of UV Spectroscopy H.H. Jaffe, and M. Orchin, IBH Oxford.
8. Introduction to Photo electron spectroscopy P.K. Ghosh John Wiley.
9. Introduction to magnetic Resonance. A. Carrington and A.D. Maclachalan Harper & Row.
10. Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Ranlin and Cradock, ELBS.
11. Progress in Inorganic Chemistry, Vol. 8 Ed. F.A. Cotton Vol. 15 Ed. S.J. Lippard Wiley.

SEMESTER III
COMPULSORY FOR GROUP A, B, C
PAPER- II
CHEMISTRY OF BIO-INORGANIC & BIO-ORGANIC

UNIT- I BIO-INORGANIC CHEMISTRY:

Metal Ions in Biological Systems- Essential and trace metals. Na^+/K^+ pumps- Role of metal ions in biological processes. Bio-energetic and ATP cycle- DNA polymerization, glucose storage; metal complexes in transmission of energy, chlorophylls, Photosystem-I and Photosystem-II in Cleavage of water. Model systems.

UNIT- II

Transport and Storage of Dioxygen- Heme protein and oxygen uptake, structure and function of Hemoglobin Myoglobin. Hemocyanins and hemerythrin, model synthetic complexes iron, cobalt and copper. Electron Transfer in Biology- Structure and function of metalloproteins in electron transport processes, Cytochromes and iron-sulpher proteins, synthetic models. Nitrogenase- Biological nitrogen fixation, Mo-Nitrogenase spectroscopic and other evidences. Other nitrogenases and model systems.

UNIT-III BIO-ORGANIC CHEMISTRY

Introduction- Basic considerations, Proximity effects and molecular adaptation.
Enzymes- Introduction and historical perspective, Chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification, extractions and purification, Fischer's lock and key and Koshland's induced Fit hypothesis, Concepts and identification of active site by the use of inhibitors, affinity labeling and enzyme modification by side-directed mutagenesis. Enzyme kinetics. Michaelis- Menten and Lineweaver- Burk plots. Reversible and irreversible inhibition.

UNIT-IV

Kinds of Reaction catalysed by Enzymes- Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the coupling of ATP cleavage to endergonic processes. Transfer to sulphase, addition and elimination reactions, enolic intermediates in isomerisation reactions, Beta-cleavage and condensation, some isomerization and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation.
Co-Enzyme Chemistry- Cofactors as derived from vitamins, coenzymes, prosthetic groups, apo-enzymes structure and biological function coenzyme A thiamine pyrophosphate, pyridoxal phosphate, NAD+, NADP+, FMN, FAD, Lipoic acid. Vitamins B12 Mechanisms of reactions catalysed by above cofactors.

UNIT-V

Enzyme Models- Host-guest chemistry, chiral recognition and catalysis. Molecular recognition. Molecular asymmetry and prochirality. Biomimetic chemistry, Crown ethers, cryptates, cyclodextrins, cyclodextrin-based enzyme models, calixarenes, ionophores, micelles, synthetic enzymes or synzymes.
Biotechnological Application of Enzymes- Large scale production and purification of enzymes, techniques and methods of immobilization of enzymes, effect of immobilization on enzyme activity, application of immobilized enzymes, use of enzymes in food and drink industry-brewing and cheese making syrup from corn starch, enzymes as largets for drug design. Clinical uses of enzymes, enzyme therapy. Enzymes and recombinant DNA technology.

Book Suggested-

1. Principles of Bioinorganic Chemistry, S.J. Lippard and J.M. Berg. University Science Book.
2. Bioinorganic Chemistry I. Bertoni, H.B. Gray, S.J. Lippard and J.S. Velentine, University Science books.
3. Inorganic Biochemistry Vol. I and II Ed. GL Eichhron. Elsveier.
4. Progress in Inorganic Chemistry Vol. 18 and 38 Ed. JJ Lippard Wiley.
5. Bioinorganic Chemistry. A Chemical approach to Enzyme action. Hprmann Dugas and C Penny Spnnger Veralg.
6. Understanding Enzymes. Travor Palmer Hall.
7. Enzyme Chemistry Impact and application Ed. Collin J Suckling. Chapmad and Hall.
8. Enzyme Mechanisms Ed M.I. Page and A Williams, Royal Society of Chemistry.
9. Fundamentals of Enzymology. N.C. Price and L. Sievens Oxford University Press.
10. Immobilised Enzyme- An introduction and application in Biotechnology Michael D TreVan John Wiley.
11. Enzymatic Reaction Mechanisms- C Walsh W.H. Freeman.
12. Enzyme structure and Mechanism. – A Fersht. W.H. Freeman.
13. Biochemistry-The Chemical Reactions of living cells. DE Metzler. Academic press.
14. Principles of Biochemistry- A.L. Lehninger. Worth Publisher.
15. Biochemistry L. Stryer W.H. Freeman.
16. Biochemistry J. David Rawn. Neil Patterson.
17. Biochemistry Voiet and Voiet. John Wiley.
18. Outlines of Biochemistry. EE. Conn and PK Stumpt. John Wiley.
19. Biochemistry- L Stryer, W.H. Freeman
20. Biochemistry- J.David Rawn, Neil Patterson
21. Biochemistry- Voet & Voet John Wiley
22. Biochemistry- Jain & Jain, S. Chand
23. Bio-Inorganic Chemistry By Katsi

SEMESTER III
GROUP-B
ORGANIC CHEMISTRY
PAPER-III
PHYSICAL ORGANIC CHEMISTRY

UNIT - I

Concepts in Molecular orbital (MO) and Balance Bond (VB) Theory:
Introducation to Huckel molecular orbital (MO) method as a means to explain modern theoretical methods.Advanced techniques in PMO and FMO theory.Molecular mechanics.semi empirical methods and ab initio and density functional methods.
Quabtiative MO theory - Huckel molecular orbial (HMO) method as applied to ethane allyl and butadiene. Qualitative MO theory - ionization potential.Electron affinities.MO energy levels.Orbital symmetry.orbital interaction diagrams. MO of simple organic systems such as ethene, allyl, butadiene, methane and methyl group.conjugation and hyperconjugationaromaticity. valence bond (VB) configuration mixing diagrams.hyperconjugationaromaticity. valence bond (VB) configuration mixing diagrams. relationship between VB configuration mixing and resonance theory. reaction profiles. potential energy diagrams curve-crossing model - nature of activation barrier in chemical reactions.

UNIT - II

Solvation and Solvent Effects & Acids, Bases, Electrophiles, Nucleophiles, Catalysis: Qualitative understanding of solvent-solute effects on reactivity.thermodynamic measure of solvation. Effects of solvation on reaction rates and equilibria. various emperical indexes of solvation based on physical properties. solvent-sensitive reaction rates. spectroscopic properties and scales for specifc solvation use of solvation scales in mechanistic studies. Solvent effects from the curve-crossing model.Acid-base Dissociation, Electronic and structural Efects, acidity and basicity ,acidily functions and their application.hard and soft acids and bases. nucleophilicity scales. nucleofugacity. The alpha-effect.Ambivalent nucleophiles . Acid-Bases catalysis-specific and General Catalysis.Bronsted catafysis.nucleophilic and electrophilic catalysis. Catalysis by non covalcnt binding-micellar catalysis.

UNIT - III

(a) Principles of Reactivity: Mechanistic significance of entropy enthalpy and Gibb's free energy.Arrhenius equation.transition state theory. Uses of activation parameters. Hammond's postulate Bell-Evans-Polanyi principle potential energy surface model.Marcus theory of electron transfer.reactivity and selectivity principles.
(b) Radical and Pericyclic Reactions: Radical stability, polar influences, solvent and steric effects a curve crossing approach to radical addition. Factor affecting barrier heights in additions regioselectivity in redical reaction. Reactivity specificity and periselectivity in perictions.

UNIT - IV

Nucleophillic and Electrophilic Reactivity:
Structural and electronic effects on S_N 1 and S_N 2 reactivity. Solvent effects.Kinetic isotope effects.Intramolecular assistance. Electron transfer nature of S_N 2 reactions. Nucleophilicity and S_N 2 reactivity based on curve-crossing model. relationship between polar and electron transfer reactions. S_{RN} 1 mechanism.electrophilic reactivity. general mechanism kinetic of S_E 2 Ar reaction. structural effects on rates and selectivtity Curve-crossing approach to electrophilic reactivity.

UNIT - V

Steric and Conformational Properties:

Various types of steric strain and their influence on reactivity. Steric acceleration.Molecular measuremebt of steric effects upon rates.Steric LFER.Conformational barrier to bond rotation-spectroscopic detection of individual comformers.Acyclic and monocyclic systems.rotation around partial double bonds. Winstein-Holness and Curtin-Hammett principle.

Book Suggested:

1. Molecular mechanics U Burkert and N.L. Allinger ACD Monograph 177. 1982.
2. Organic Chemists Book of Orbirals. L. Salem and W.L. Jorgensen, Academic Press.
3. Mechanism and Theory in Organic Chemistry, T.H.Lowry and K.C. Richardson. harper and Row.
4. Introduction to Theoretical Organic Chemistry and Molecular Modeling. W.B. smith VCH.Weinheim.
5. Physical Organic Chemistry. N.S. Isaacs.ELBS/ Longman.
6. Supramolecular Chemistry Concepts and Perspectives, J.M. lehn. VCH.
7. The physical Basis of Organic Chemistry, H. Maskill, Oxford University Press.

SCHEME OF EXAMINATION & DISTRIBUTION OF MARKS

SEMESTER - I

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1.	Inorganic Chemistry	20	80		100
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3.	Physical Chemistry- I	20	80		100
4.	Spectroscopy And Mathematics/Biology For Chemists	20	80		100
LAB-I	Organic Chemistry				100
LAB-II	Analytical Chemistry				100
				TOTAL	**600**

SEMESTER - II

Paper No.	Title of the Paper (s)	Internal Assessment	Term End Exam	Practical	Total Marks
1.	Inorganic Chemistry	20	80		100
2.	Organic Chemistry	20	80		100
3.	Physical Chemistry	20	80		100
4.	Spectroscopy, Diffraction Methods & Computer For Chemists	20	80		100
LAB-I	Inorganic Chemistry				100
LAB-II	Physical Chemistry				100
				TOTAL	**600**

SEMESTER - III

Paper No.	Title of the Paper (s)	Internal Assessment	Term End Exam	Practical	Total Marks
COMPULSORY FOR GROUP A, B & C					
1.	Applications Of Spectroscopy	20	80		100
2.	Chemistry Of Bio-Inorganic & Bio-Organic	20	80		100
LAB-I	General (Compulsory)			200	200
OPTIONAL GROUP-A INORGANIC					
3.	Organotrasition Metal Chemistry	20	80		100
4.	Photo inorganic Chemistry	20	80		100
OPTIONAL GROUP- B ORGANIC					
3.	Physical Organic Chemistry	20	80		100
4.	Chemistry Of Heterocyclic Compounds	20	80		100
OPTIONAL GROUP-C PHYSICAL					
3.	Chemistry Of Materials	20	80		100
4.	Advanced Quantum Chemistry	20	80		100
				TOTAL	**600**

SEMESTER - IV

Paper No.	Title of the Paper (s)	Internal Assessment	Term End Exam	Practical	Total Marks
COMPULSORY FOR GROUP A, B & C					
1.	Photochemistry & Solid State Chemistry	20	80		100
2.	Bio-Physical & Environmental Chemistry	20	80		100
OPTIONAL GROUP-A INORGANIC					
3.	Bioinorganic Chemistry & Supra-Molecular Chemistry	20	80		100
4.	Analytical Chemistry	20	80		100
LAB-I	Special			200	200
OPTIONAL GROUP- B ORGANIC					
3.	Medicinal Chemistry	20	80		100
4.	Chemistry Of Natural Product	20	80		100
LAB-I	Special			200	200
OPTIONAL GROUP-C PHYSICAL					
3.	Liquid States	20	80		100
4.	Computation Chemistry	20	80		100
LAB-I	Special			200	200
				TOTAL	**600**
				GRAND TOTAL	**2400**

SEMESTER-III
GROUP-B
ORGANIC CHEMISTRY
PAPER-IV
CHEMISTRY OF HETEROCYCLIC COMPOUNDS

UNIT - I

(a) Nomenclature of Heterocycles -

Replacement and systematic nomenclature (Hantzsch - Widman system) for monocyclic, fused and bridged heterocycles.

(b) Aromatic Heterocycles -

General chemical behaviour of aromatic heterocycles. Classification (structure type) criteria of aromaticity (bond lengths, ring current and chemical shift in 'H-NMR spectra, Empirical resonance energy, delocalisation energy and Dewar resonance energy, Heteroaromatic reactivity and tautomerism in aromatic heterocycles.

UNIT - II

Non aromatic Heterocycles -

Strain-Bond angle and torsional strain and their consequences in small ring heterocycles. Conformation of six menbered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and I, 3 diaxial interaction, stereo-electronic effect, anomeric effect, Attractive interaction hydrogen bonding and intermolecular nucleophilic-eletrophilic interactions.

UNIT - III

(a) Heterocyclic synthesis -

Principle of heterocyclic synthesis involving cyclisation reactions and cyclo addition reactions.

(b) Small Ring Heterocycles

Three menbered and four membered Heterocycles - synthesis and reactions of Aziridines, oxirane, thirane, Azetidine.Oxitanes and Thietanes.

UNIT - IV

(a) six membered Hetericycles with one Hetero atom

Synthesis and reactions of pyrylium salts and pyrones and their comparison with pyridinium and thiopyrylium salts and pyridones. coumarins and chromones.

(b) six membered Heterocycles with two or more Hetero atoms

Synthesis and reactions of diazines, Triazines and Thiazines.

UNIT - V

(a) Benzo-fused five membered Heterocycles

Synthesis and reaction including medicinal application of Benzo-pyrrole, Benzo-furans and Benzo-thiophenes.

(b) Seven and large memberad Heterocycles

Synthesis and reaction of azepines, thiepines.diazepines. Thiazepines.

Book Suggested:

1. Hetericyclic Chemistry by J.A. Joule, K. Mills and G.F. Smith. Chapman & Hall
2. Hetericyclic Chemistry by T.L. Gilchrist, Longman Scientific Technical.
3. An Introduction to Heterocyclic Chemistry by R.M. Acheson. John Wiley.
4. Organic Chemistry Vol. II by I.L. Finar ELBS

5. Rodds Chemistry of Carbon Compounds Ed. S. Coffery Elsevier
6. Natural Products chemistry and Bioligical Significance by J. Mamm, R.S. Davidson, J.B. Hobbs, J.B. harborne, Longman, Essex.
7. Heterocyclic Chemistry, Vol. 1 to 3, by R.D. Gupta, --------Kumar and v. Gupta. Springer Verlog.
8. Chemistry of Heterocycles, by T. Eicher and S. Hanpalmann. Thieme.
9. Contemporary Heterocyclic Chemistry by G.R. Newkome,

SEMESTER - III
COMPULSORY FOR GROUP - A, B & C
LABORATORY COURSE - I (GENERAL)

MM-200 **Duration-12 hrs.**

Note: The laboratory course (general) will be of 12 hours duration spread over two days. The examinee will have to perform three experiments. These experiments will be of 40 marks each 40 marks each will be allotted for viva - voce and Sessional work.

PHYSICAL CHEMISTRY

A. Conductometry

a. Verify Debye Huckel and Onsager limiting law for strong electrolyte
b. Determine the degree of hydrolysis and hydrolysis constant of
   (a) CH3COONa (b) NH_4Cl (c) Aniline hydrachloride
c. Determine the basicity of an organic acid by conductometric measurements.
d. Determine the equivqlent conductance of an electrolyte and determine the dissociation constant.
e. Determine solubility of sparingly soluble salts.

B. Colorimetry

a. Determine the composition of $K_2 Cr_2 O_7$ and $KMnO_4$ using spectrophotometer
b. Determine the dissociation constant of methyl red by Spectrophotometric method.
c. To verify additivites of absorbances of a mixture of a coloured substance of $K_2 Cr_2 O_7$ and $KMnO_4$using spectrophotometer.

C. pH metry

Determine pK value of given dibasic and tribasic acid by pH meter.

D. Potentiometry

Titrate ferrous ammonium sulphate against $K_2 Cr_2 O_7$ and KM nO_4 and determine redox potential of ferric system.

E. Distribution coefficient

a. Determine the equilibrium constant of the reaction KI + I_2<-> $KI_3$by distribution method.
b. Determine the formula of complex formed between cupric ion and ammonia by distribution method.

F. Partial molar volume:

Determine the partial molar volume of Na CI in aq. Solution at room temperature.

INORGANIC CHEMISTRY

A. Instrumental method and Analytical Technique

Spectrophotometric determination

a. Manganese/Chromium/Vanadium in steel sample.
b. Iron-salycylic acid complex by Job's method of continuous varation of concentration
c. Zirconium-Alizarin red-s-complex; Mole ratio method.
d. Copper Ethylenediamine Complex; Slope ratio method.

B. Separation & determination of two metal ions: Cu - Ni Zn-Ni-Mg-Ni involving volumetric & gravimetric method.

C. Polarography

Composition and stability constant of complexs

D. Flame Photometric determination

a. Sodium and Potassium when present together
b. Lithium/Calcium/Barium/Strontium
c. Cadmium and Magnesium in tap water

E. Quantitative & Qualitative Analysis:

a. Paper chromatography - Cadmiun and Zinc and Magnesium
b. Thin layer chromatography-separation of Nickel. Manganese.Cobalt and Zinc. Determination of R_f values.
c. lon Exchange.
d. Solvent Extraction
e. Electrophoretic separation.

F. (i) Analysis of Dolomite.
(ii) Estimation of available oxygen in H_2 O_2 by lodometry.

ORGANIC CHEMISTRY

A. Quantitative organic analysis Analytical Techniques.
a. Estimation of Sulphur by messengers method.
b. Estimation of Nitrogen by Kjeldahl method.
c. Estimation of Halogen by Fusion method.
d. Estimation of carbon and hydrogen by combustion method

B. Functional Group Estimation -
a. Estimation of Aniline
b. Estimation of Amino group by Acetylation method
c. Estimation of Hydroxyl group by Acetylation method
d. Estimation of Carboxyl group by Hydrazone formation method.
e. Estimation of Glucose
f. Estimation of Sucrose
g. Estimation of methoxy group.

C. Chromatography -separation and identification of sugars present in the given mixture of glucose. Fructose, and sucrose by paper chromatography and determination of R_f value.

ANALYTICAL CHEMISTRY

1. Preparation of Homo and Hetero-Polyacids of Sb. V. Nb. Ta. Cr. Mo ,W etc and study their properties
2. Determination of Pka of weak acids by pH metric and spectrophotometric methods.
3. Purification of water by using natural meterials, i. e. silica. alumina. iron oxide and ziedite. dolomite. charcoal etc.
4. Determination of distribution ratio and distribution co-efficient of organic and inorganic compounds.
5. Determination of percentage Extraction of Species of Interest.
6. Separation of organic compounds by the chromatographic technique i. e. TLC, paper Chromatography, column chromatography, column chromatography, Electrophoresis.
7. Analysis of carbohydrates. Amino acids, protein, alkaloid etc.
8. Analysis of pharmaceutical materials.
9. Analysis of surfactants. Detergents. Soap, oil etc.
10. Analysis of ore minerals. alloy, soil sediment
11. Application of Redox titration for analysis of Sn (iv), Fe (iii), Cr (VI), Mn (vii).
12. Analysis of water.
13. Collection, sampling, digestion and extraction of volatile materials.
14. Determination of equilibrium constant and composition of complexes.
15. Determination of dimerization/polymerization constant.