SYLLABUS FOR M.Sc FINAL ORGANIC CHEMISTRY

III - SEMESTER

Paper I - Organic Reaction Mechanisms-I and pericyclic reactions

UNIT-I

Aliphatic Nucleophilic Substitution Mechanisms  Nucleophilic substitution: Substitution reactions of ambident nucleophiles, neighbouring group participation of O, S, N, halogens, aryl groups, alkyl and cycloalkyl groups in nucleophilic substitution reactions. Sigma, Pi bond participation in acyclic and bicyclic systems (Non-classic carbocations) Substitution at allylic, trigonal and Vinylic carbons, hydrolysis of esters, Meyer's aldehydes, ketones and carboxylic acids, alkylation with triakyl boranes.

Aliphatic Electrophilic substitutions:  SE$^1$, SE$^2$, and SE$^i$ mechanisms hydrogen exchange, migration of double bonds, halogenation of aldehydes, ketones, acids, acylhalides sulphoxides and sulphones, aliphatic diazonium coupling, nitrosation at Carbon and nitrogen diazo transfer reaction carbene and nitrène insertion, formation of sulphur yield, metation with organometallic compounds and with metals. Decarboxylation of aliphatic acids. Haloform reaction and Haller-Baner reaction.

UNIT-II

Aromatic nucleophilic substitution: A general introduction to different mechanisms of aromatic substitution SN Ar, AN and aryne Von richter rearrangement, sommlet, Hauser rearrangement Smiles rearrangement.

Radical substitution Mechanism: Reaction at Sp3 carbon: Reactivity in aliphatic substrates reactivity at bridged position, reactivity at Sp2 carbon. Reactivity in aromatic substrates, neighbouring group assistence in free radical reactions, effect of reactivity in the attacking radical effect of solvent on reactivity halogenation at an alkyl carbon and allylic carbon, hydroxylation at aromatic carbon by means of Fenton's reagent, oxidation of aldehydes to carboxylic acids, formation of cyclic ethers with Pb(OAC)4 Reed reaction, sandmayer reaction, kolbe reaction and Hunsdiecker reaction.

UNIT-III

Molecular orbital symmetry, frontier orbitals of ethylene, 1,3 Butadiene, 1,3,5- Hexatriene, allyl system, classification of pericyclic reactions FMO approach, Woodward-Hoffman correlation diagram method and perturbation of molecular (PMO) approach for the explanation of pericyclic reactions under thermal and photochemical conditions.

Electrocyclic Reactions: Conrotatory and disotatory motions (4n) and (4n+2), allyl systems and secondary effects.
Cycloadditions: Antarafacial and suprafacial additions, notation of cycloadditions, (4n) and (4n+2) systems with a greater emphasis on (2+2) and (4+4) - cycloadditions, (2+2) - additions of ketones secondary effects of substitutes on the rates of cycloadditions and chelotropic reactions.

UNIT-IV

FMO approach and perturbation of molecular (PMO) approach for the explanation of sigma tropic rearrangements under thermal and photochemical conditions. suprafacial and antarafacial shifts of H Sigmatropic shift involving carbon moieties, retention and inversion of configurations, (3.3) and (5.5) sigmatropic rearrangements detailed treatment of Claisen and Cope rearrangements fluxional tautomerism, aza-Cope rearrangements and Barton reaction.

3) Pericyclic reactions by S.N. Mukharji, Mcmilan.

Reference Books:

2) The modern structural theory in Organic Chemistry by L.N. Ferguson, Pretice Hall
UNIT-I

Infrared spectroscopy: Units of frequency wave length and wave number, molecular vibrations, factors influencing vibrational frequencies, the IR spectrometer, sampling techniques, characteristic frequencies of organic molecules and interpretation of spectra.

UNIT-II

Ultraviolet spectroscopy: Introduction, the absorptioÁ laws, measurement of the spectrum, chromophores, standard works of reference, definitions, applications of UV spectroscopy to Conjugated dines, trienes, unsaturated carbonyl compounds and aromatic compounds.

UNIT-III

Nuclear Magnetic Resonance Spectroscopy (Proton and Carbon -13 NMR)

The measurement of spectra: the chemical shift: the intensity of NMR signals and integration factors affecting the chemical shifts: spin-spin coupling to 13C IH-IH first order coupling: some simple IH-IH splitting spatterns: the magnitude of IH-IH coupling constants:

Mass spectroscopy: Basic Principles: instrumentation: the mass spectrometer, isotope abundances; the molecular ion, metastable ions

UNIT-IV


Text books:

Books in Reference:
1) Book 2 mentioned above.
III - SEMESTER
Paper III -- Organic Synthesis-I

UNIT-I
Formation of Carbon-Carbon single bonds: alkylations via enolate the enamine and related reactions umplong (dipole inversion) - The aldol reaction- applications of organ palladium, organo nickel and organo copper reagents , applications of thiecarbonions- selenocarbonions and sulphur yields, synthetic applications of carbenes and carbenoids.

UNIT-II

UNIT-III
Methods of polymerization (a) Addition polymerization (b) Condensation polymerization and (c) Radical polymerizations (two examples of each method). Reactions of unactivated carbon-hydrogen bonds: The HoffmannLieffier- Freytag reaction-the Barton reaction-Photolysis of organic hypothalites.

UNIT-IV
Synthetic applications of organobormanes
Organoboranes: Preparation of Organobornaes viz hydroboration with BH3-THF, dicylohexyl borane, disiamyl borane, theryl borane, 9-BBN and disopincamphyel borne, functional group transformations of Organo boranes-Oxidation, protonolysis and rearrangements. Formation, of carbon-carbon-bonds viz organo boranes carbonylation, the cyanoborate process and reaction of alkenyl boranes and trialkenyl borates.

Textbooks:

Books for Reference:
III – SEMESTER

Paper IV- Natural Products and Biopolymers-I

Study of isolation, structure, stereochemistry, synthesis, biogenesis and biological properties of the following classes of natural products from plant, animal, and microbial sources and biopolymers.

UNIT-I

Acetogenins and shikimates:

Microbial metabolites: Pencillin G, Cephalosphorin-Ö and streptomycin.

UNIT-II

Terpenes: Forskolin, taxol and azadirachtin.

UNIT-III

Alkaloids: Morphine, reserpine and vincristine

UNIT-IV

Biopolymers:

Note: The scope of the topics of this unit, i.e., Unit IV is limited to the material contained in the books by Finar and Heathocock mentioned below.

Reference Material:
4) Introduction to Organic Chemistry, A Streitweiser, CH Heathcock and E.M/ Kosover IV Eeition, Me.Milan, 1992. (For Merrifield synthesis of peptides and also for other aspects of Unit IV),
5) Primary literature, For Unit 1B, forskolin, taxol, azadirachtin, Unit III (minus morphine) and dolastatin-10, Details and copy of the relevant material are
available with the Department of Organic Chemistry, FD & W, Andhra
University, Visakhapatnam.

Details of Primary literature:
Nomenclature:
(synthesis).
Taxol: JACS, 1971, 93, 2325 (structure), Tetrahedron, 1996, 45, 14081-102, 14103-146,
14147-176 (synthesis).
Azadirachtin: JCS Perkin I, 1972, 2445; JACS, 1975, 97, 1975; JCS Chem Comm. 1985,
968, ibid, 1986, 46; Compendium of Indian Medicinal plants, Vol. 4, 1985-88, R.P.
Rastogi and B.N. Malhora, CDRI & Publications & Information Directorate, New Delhi,
pp. 87-95.
Dolastatin-10: JACS, 1987,109,6883(Structure), ibid, 1989, 111, 5463, JCS, Parkin 1,
1996,859(synthesis).

Department of Chemistry
M.Sc. Chemistry (Final Year)
Specialization: ORGANIC CHEMISTRY
Practical syllabus for III Semester CH-305

Practical-I: Multi stage organic synthesis
Multistage Organic synthesis involving three or four stages
Paracetamol, 6-Methyluracil, Methyl orange, p-Aminobenzoic acid, Acridone and 2-Iodobenzoic
Acid

Practical syllabus for III Semester CH-306

Practical-II: Chromatography and Viva-Voce
1. Thin layer chromatography: Determination of purity of a given sample and identification of
unknown organic compounds by comparing the Rf values of known standards.
2. Separation by column chromatography
3. Viva-voce
SYLLABUS FOR M.Sc FINAL ORGANIC CHEMISTRY  
IV - SEMESTER  
Paper I - Organic Reaction Mechanisms-II and organic photochemistry  

UNIT-I  
Addition Elimination Mechanisms: (a) Addition to carbon multiple bonds- Addition reactions involving electrophiles, nucleophiles and free radicals, cyclic mechanisms, orientation and stereochemistry, hydrogenation of double and triple bonds, hydroboration, birch reduction. Michael reaction, addition of oxygen and N\textsubscript{2}O\textsubscript{4}; (b) Addition to carbon-hetero atom multiple bonds: Mannich reaction AH reductions of Carbonyl compounds acids, esters, nitrites, addition of Grignard reagents, Reformatsky reaction, Tollens reaction, witting reaction, Prins reaction; (c) Elimination reactions: Stereochemistry of eliminations in acyclic and cyclic systems, orientation in eliminations - Saytzeff and Hoffmann elimination propolitic elimination.  

UNIT-II  
Rearrangements: Classification and general mechanistic treatment of nucleophilic, free radical and electrophilic rearrangements, Wagner - Meerwein and related reactions Tiffeman Demzanox rearrangement, a- ketone arrangement, Neber, Hofmann, Bayer- villiger, stevens witting rearrangements.  

UNIT-III.  
Organic Photochemistry:  
Photochemical energy plank Condon Principle, Jabionski diagram singlet and triplet states, dissipation of photochemical energy, photosensitization, quenching, quantum efficiency and quantum yield, experimental methods of photochemistry.  
Photochemistry of carbonyl compounds- \( n-\pi, \pi=\pi^* \) transitions Norrish type I and Norrish type II cleavages, patterno-Buchi reaction.  

UNIT-IV  
Photoreduction photochemistry of enone - Hydrogen abstraction, rearrangement of \( \alpha ; \beta - \) unsaturated ketones and cyclohexadienes, Photochemistry of p- Benzoquinones, photochemistry of unsaturated systems - Olefins, cis trans Isomerisation and dimerization hydrogen abstractions and, addition acetylenes dimerisation, dienes - Photochemistry of 1,3 butadienes (2+2) additions leading to cage structures photochemistry .of cyclohexadienes.  
Photochemistry of aromatic compounds - Excited state of benzene its 1,2-1,3 1-4 additions, photo Fries rearrangements, photofries reactions of anilides, photosubstitution reactions of bermene derivatives.
Photochemistry of pyridinium yields, pyrolysis of nitrites esters and barton reaction.

Text books:


Reference Books:


2) The modern structural theory in Organic Chemistry by L.N.Ferguson, Pretice Hall


IV - SEMESTER
Paper II- Organic Spectroscopy -- II

UNIT-I

Optical rotatory dispersion and circular dichroism: Phenomena of ORD and CD. Classification of ORD and CD Curves; Cotton effect curves and their application to stereochemical problems; the Octant rule and its application to alicyclic ketones.

UNIT-II

Improving the NMR spectrum: the mean, pulse experiment, new techniques in FT NMR.spectroscopy: the separation of chemical shift and coupling on to different axes (2D-NMR,cosy), spin decoupling, the nuclear over hauser effect associating the signals from directly bonded 13 C arid IH. ESR Derivative curves: values and hyperfine splitting.

UNIT-III

Fragmentation processes; fragmentation associated with functional groups; rearrangement and mass spectra of some chemical classes.
Structural elucidation of Organic compounds by a combined application of the special methods of Units 1-III.

UNIT-IV

Separation Techniques; Instrumentation – Gas Chromatography, High performance Liquid Chromatography, X – Ray diffraction (XRD)

Text books:

Books in Itetence:
1) Book 2 mentioned above.

IV-SEMESTER

Paper III - Organic Synthesis-II

UNIT-I

Organo silanes. Synthetic applications of trimethylsilyl chloride dimethyl-t-butyldimethyl silyl chloride, trimethylsilyl cyanide, trimethylsilyl iodide and trimethylsilyl triflate, synthetic applications of silyl carbanion and B-silyl carbonium ions.

Phase transfer catalysis-Principle and applications.

UNIT-II

Oxidation: Oxidations of hydrocarbons, aikenes, alcohols aldehydes and ketones oxidative coupling reactions. Use of Pb (OAC)4, NBS.. CRO3, SeO2, NinO2 Dc- alkoxylphonium yields, KMnO4, OsO4, peracids and Ti (III) nitrate.

UNIT-III
REDUCTION: Catalytic hydrogenation (homogeneous and heterogeneous), reduction by dissolving metals. reduction by hydride transfer -reagents, reduction with hydrazine and diamide, selectivity in reduction of nitroso and nitro compounds, reductive cleavage.

UNIT-IV

Design of Organic Synthesis: Retrosynthesis the disconnection approach-basic principles convergent and linear synthesis.

Textbooks:


Books for Reference:

Study of isolation, structure, stereochemistry, synthesis, biogenesis and biological properties of the following classes of natural products from plant, animal, and microbial sources and biopolymers.

UNIT-I

Acetogenins and shikimates:
Prostaglandin 15 R F GAY podophyllotoxin, etoposide and rotenone.

UNIT-II

Terpenes and Steroids:
cholesterol, progesterone And β-amyrin

UNIT-III

Alkaloids:
strychnine, colchicines and camptothecin.

UNIT-IV

Nucleic acids: Basic concepts of the structures of RNA and DNA and their hydrolysis products nucleotides, nucleosides and heterocyclic bases.

Reference Material:

2) Chemical Apects of Biosynthesis, John Mann, Oxford University Press, Oxford, 1996

Primary literature, For Unit 1, Unit III (minus morphine) and Details and copy of the relevant material are available with the Department of Organic Chemistry, FD & W, Andhra University, Visakhapatnam.
Practical-I: Organic mixture analysis

Separation of two component mixtures by chemical methods and their identification by chemical reactions — separation by using solvent ether, 5% aqueous sodium bicarbonate, 5% sodium hydroxide and dil hydrochloric acid, checking the purity of the two components by TLC, identification of the compounds by a systematic study of the physical characteristics (mp/bp), extra elements (nitrogen, halogens and sulfur), solubility, functional groups, preparation of crystalline derivatives and identification by referring to literature. A minimum of 5 mixtures should be separated and analyzed by these procedures.

Practical-II: Estimations and Isolation

A) Estimation of the following compounds
   i) Glucose ii) Phenol iii) Aniline iv) Aspirin (titrimetry) v) Ibuprofen (titrimetry)
B) Isolation of the following compounds
   i) Caffeine from tea leaves (solvent extraction) ii) Piperine from pepper (Soxhlet extraction)
   ii) Lycopene from tomato

Books Suggested:
2. Practical Organic chemistry by Mann and Saunders, ELBS and Longman group
3. Laboratory Manual of Organic Chemistry by Raj K Bansal
M.Sc. (PREVIOUS)
(SCHOOL OF CHEMISTRY)
I SEMESTER
PAPER I: GENERAL CHEMISTRY:
QUANTUM CHEMISTRY-I AND MOLECULAR SPECTROSCOPY

BASIC QUANTUM CHEMISTRY:

UNIT I:

UNIT II:

MOLECULAR SPECTROSCOPY:

UNIT III:

UNIT IV:
Raman effect- Classical and Quantum mechanical explanations- Rotational Raman and Vibrational Raman spectra; Electronic spectra of diatomic molecules- Vibrational coarse structure-intensity of spectral lines- Franck Condon principle, applications, Rotational line structure-band head and band shaping. Charge transfer spectra
UNIT-I
Structure & Bonding: Applications of VSEPR, Valence Bond and Molecular orbital theories in explaining the structures of simple molecules - role of p and d orbitals in pi bonding.
Application of MO theory to square planar (PtCl$_4^{2-}$) and Octahedral complexes (CoF$_6^{3-}$, Co(NH$_3$)$_6^{3+}$).
Walsh diagram for H$_2$O molecule.

UNIT-II
Inorganic cage and ring compounds – preparation, structure and reactions of boranes, carboranes, metallocarboranes, boron–nitrogen (H$_3$B$_3$N$_3$H$_3$), phosphorus–nitrogen (N$_3$P$_3$Cl$_6$) and sulphur–nitrogen (S$_4$N$_4$, (SN)$_x$) cyclic compounds.
Isopoly and heteropoly acids.

UNIT-III
Coordination compounds: Crystal field theory - crystal field splitting patterns in octahedral, tetrahedral, tetragonal, square planar, square pyramidal and trigonal bipyramidal geometries.
Calculation of crystal field stabilization energies. Factors affecting crystal field splitting energies – Spectrochemical series – Jahn – Teller effect, nephelauxetic effect – ligand field theory.

Term symbols – Russell – Sanders coupling – derivation of term symbols for various configurations. Spectroscopic ground states.

UNIT-IV

Text books:
I. Inorganic Synthesis: Preparation of
- Tetraamminecopper(II) sulphate
- Potassium tris-oxalato ferrate(III) trihydrate
- Tris-thiourea copper(I) sulphate

II. Semimicro qualitative analysis of six radical mixtures
(One interfering anion and one less familiar cation for each mixture)

Anions: \( \text{CO}_3^{2-}, \text{S}_2^{2-}, \text{SO}_3^{2-}, \text{Cl}^-, \text{Br}^-, \text{I}^-, \text{NO}_3^-, \text{SO}_4^{2-}, \text{CH}_3\text{COO}^- \)
\( \text{C}_2\text{O}_4^{2-}, \text{C}_2\text{H}_4\text{O}_6^{2-}, \text{PO}_4^{3-}, \text{CrO}_4^{2-}, \text{AsO}_4^{3-}, \text{F}^-, \text{BO}_3^{3-} \)

Cations: Ammonium (NH\(_4^+\))
1\(^{st}\) group: Hg, Ag, Pb, Ti, W
2\(^{nd}\) group: Hg, Pb, Bi, Cu, Cd, As, Sb, Sn, Mo
3\(^{rd}\) group: Fe, Al, Cr, Ce, Th, Ti, Zr, V, U, Be
4\(^{th}\) group: Zn, Mn, Co, Ni
5\(^{th}\) group: Ca, Ba, Sr
6\(^{th}\) group: Mg, K, Li

SYLLABUS FOR M.Sc CHEMISTRY

Organic Chemistry

Specialisations (1) Organic Chemistry and (2) Chemistry and Analysis of Foods, Drugs and Water, of the Department of Organic Chemistry, and Chemistry and Analysis of Foods, Drugs and Water, Andhra University, Visakhapatnam - 530 003.

I - SEMESTER

Course/Paper - III: Organic Chemistry - 1

UNIT - I

Structure and reactivity: Localised and delocalised covalent bond - Concept of resonance and aromaticity - Hückel's rule for aromaticity in benzenoid and non-benzenoid compounds, anti-aromaticity and homo-aromaticity. Nature of reaction energy and kinetic considerations - types of organic reactions - reagents - reactive intermediates. Their formation and stabilization - inductive and mesomeric effects.

UNIT - II

Stereochemistry and stereoisomerism. Conformational isomerism and analysis in acyclic and simple cyclic systems - substituted ethanes, cyclopentane, cyclohexane cycloheptane, cyclo octane and decalins, optical isomerism - optical activity - molecular dissymmetry and chirality - elements of symmetry.

Fisher's projection D,L. and R,S. configurations - relative and absolute configurations optical isomerism due to asymmetric carbon atoms - optical isomerism in biphenyls, Allenes and spirans
- optical isomerism of nitrogenous compounds racemisation and resolution - geometrical isomerism and E,Z configurations, properties of geometrical isomers.

UNIT - III

Chemistry of heterocyclic compounds, synthesis and reactivity of the following systems - Pyridine, quinoline, Isoquinoline, Indole, Benzo furan, Benzo thiophene - Pyrazole, Imidazole, Oxazole, Isoxazole, Thiazole, Isothiazole, Pyridazine, py.rimidine and Pyrazine.

UNIT - IV

Chemistry, of some typical natural products. A study of the following compounds involving their isolation, structure elucidation, synthesis and biogenesis - flavonoids - quercetin, cyanidin and genistein, terpenoids, α- terpeneol a α - pinene, campihor, farnesol.

First SEMESTSER

PRACTICAL IIP: ORGANIC CHEMISTRY PRACTICAL –I CH106

synthesis of Aspirin , benzoic acid , p-nitroaniline from aniline, methyl, 2-naphthyl ether, Anthranilic acid, 2,4-dinitro phenyl hydrazine, Sym- Tribromo benzene, Benzanilide.

ANDHRA UNIVERSITY-SCHOOL OF CHEMISTRY
I Semester
CH-104 PHYSICAL CHEMISTRY-I
(Effective from the admitted batch of 2011-12)

UNIT-I:


UNIT-II:

Micelles and Macromolecules: Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization- phase separation and mass action models, solubilization, micro emulsion, reverse micelles. Polymers- Definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of polymerization. Molecular mass- Number and mass average molecular mass, molecular mass determination- Osmometry, viscometry, diffusion and light scattering methods. Sedimentation, chain configuration of macromolecules, calculation of average dimensions of various structures.

UNIT-III:


UNIT-IV:

**Text Books:**
1. Physical Chemistry by Peter Atkins and Julio de Paula, Oxford University Press.
2. Physical Chemistry by G.W. Castellon, Narosha Publishing House
3. Physical chemistry by K.L. Kapoor

**Reference Books:**
1. Thermodynamics for Chemists, Samuel Glasstone
5. Micelles, Theoretical and applied aspects, V.Moroi, Plenum publishers.

**First SEMESTSER**

**PRACTICAL IIIP: PHYSICAL CHEMISTRY PRACTICAL –I CH107**

2. Effect of electrolyte (NaCl) on miscibility temperature.
3. Determination of cell constant.
4. Determination of Pk, value of acetic acid by conductometric method.
5. Conductometric titration of strong acid with strong base (HCL vs NaOH)
6. Conductometric titration of a weak acid strong base (HOAc vs NaOH)

**Books suggested:**
11. Physical chemistry experiments by P. Ghosh.
M.Sc. (Previous)
(School of Chemistry)
II Semester

Paper I: General Chemistry — II


UNIT I:

Hydrogen atom-solution of R( r ), ψ( φ ) and θ( θ ) equations-probability density in orbitals-shapes of orbitals. Perturbation theory-time independent perturbation (only first order perturbation is to be dealt with)—application to ground state energy of helium atom-variation principle-applications-calculation of zero point energy of harmonic oscillator-many electron atom—Hartee-Fock self-consistent field method (qualitative treatment only).

UNIT II:


MOLECULAR SYMMETRY AND GROUP THEORY

UNIT III:

Basic concepts of Symmetry and Group theory—Symmetry elements, symmetry operations and point groups—Semenlits symbols—Classification of molecules into point groups—Axioms of Group theory—Group multiplication tables for C2v and C3v point groups—Similarity Transformation and classes—Representations—reducible and irreducible representations, Mulliken symbols, Orthogonality theorem and its implications, Character table and its anatomy.

ELEMENTS OF COMPUTER PROGRAMMING:

UNIT IV:

Basic components of Computers, higher and lower level languages, Microsoft Fortran: constants, variables and operators, arithmetic expressions, assignment and replacement statements, Input and Output statements—Format free and Format directed I/O statements—Iw, Fw.d, Ew.d and Gw.d format specifications, conditional and unconditional statements—Logical IF, Block IF and Go To statements, Do statement—syntax and rules.

Application to Chemical Problems:

Flowcharts and Programs for
M.Sc. Previous Chemistry Syllabus, Semester - II  
**Paper- II: Inorganic Chemistry - II**

**UNIT-I**  
**Metal cluster compounds** - definition – evidences for existence of M-M bonds - conditions favorable for formation of M-M bonds – preparation, structure and bonding of the following metal cluster compounds.  
\[ \text{Re}_2\text{Cl}_8^{2-}, \quad \text{Mo}_2\text{Cl}_8^{4-}, \quad \text{Re}_2(\text{RCOO})_4\text{X}_2, \quad \text{Mo}_2(\text{RCOO})_4(\text{H}_2\text{O})_2, \quad \text{Cr}_2(\text{RCOO})_4(\text{H}_2\text{O})_2, \quad \text{Cu}_2(\text{RCOO})_4(\text{H}_2\text{O})_2, \quad \text{Cr}_2\text{Cl}_9^{3-}, \quad \text{Mo}_2\text{Cl}_9^{3-}, \quad \text{W}_2\text{Cl}_9^{3-}, \quad \text{Re}_2\text{Cl}_9^{5-}, \quad \text{Mo}_6\text{Cl}_8^{4+}, \quad \text{Nb}_6\text{X}_{12}^{2+}, \quad \text{Ta}_6\text{X}_{12}^{2+}. \]

Polyatomic clusters – Zintl ions, Chevrel phases.

**UNIT-II**  
**Organometallic compounds** - 16 and 18 electron rules.  
Isolobal relationship – H, Cl, CH\(_3\), Mn(CO)\(_5\); S, CH\(_2\), Fe(CO)\(_4\); P, CH, Co(CO)\(_3\).  
Synthesis, structure, bonding and reactions of metallocenes with special reference to ferrocene

**UNIT-III**  
**Metal Ligand equilibria in solution:**  

Reactivity of metal complexes – inert and labile complexes. Explanation of lability on the basis of valence bond and crystal field theories.

**UNIT-IV**  
**Inorganic Reaction Mechanisms:**  

Electron transfer reactions of complexes – concept of complementary and non-complementary reactions with examples. Inner and outer sphere mechanisms.

**Text books:**


**DEPARTMENT OF INORGANIC AND ANALYTICAL CHEMISTRY**

**List of Experiments for M.Sc., previous Inorganic chemistry practicals CH-205**

Semester –II

**III Quantitative analysis:**

a) **Volumetric**: i) Determination of Ferric iron by photochemical reduction
ii) Determination of Nickel by EDTA
iii) Determination of Calcium and Magnesium in a mixture by EDTA
iv) Determination of Ferrocyanide by Ceric sulphate
v) Determination of Copper(II) in presence of iron(III)

b) Gravimetric: i) Determination of Zinc as Zinc pyrophosphate
ii). Determination of Nickel from a mixture of Copper and Nickel.

Course/Paper - III: Organic Chemistry - 2 ,

UNIT - I

Aromatic substitution reactions - electrophilic, nucleophilic and through benzenes - radical substitution of arenes - orientation of nucleophilic substitution at a saturated, carbon, SN1, SN2, SNi reactions - effect of structure, nucleophile, leaving group, solvent. Additions involving electrophiles, nucleophiles and free radicals.

Elimination reactions - E1, E1CB, E2 reactions – elimination versus substitution reactions.

UNIT - II


UNIT - III

Spectra and structure - application of organic spectroscopy UV, IR, ¹HNMR and Mass spectral data.

UNIT - IV

Isolation, structure elucidation and synthesis of alkaloids; atropine, nicotine, and quinine. Purines - Caffeine configuration and ring structures of glucose and fructose, anomeric effects.

Text books:

1. Organic Chemistry Vol. I (Sixth Edn.) and Vol. II (Fifth Ed.,) by IL finar ELBS.
2. Organic Chemistry (fifth Edn., ) by Morrison and Boyd, PHI, India.
4. Reaction Mechanism in Organic Chemistry by Mukherjee Sirigh, NTermitarr, India
5. A guide book to mechanism in Organic Chemistry by Peter Sykes, ELBS.

REFERENCE BOOKS:

Practical-II: Organic analysis

Identification of the compounds by a systematic study of the physical characteristics (mp/bp), extra elements (nitrogen, halogens and sulfur), solubility, functional groups, preparation of crystalline derivatives and identification by referring to literature. A minimum of 6 compounds should be analyzed by these procedures.

SCHOOL OF CHEMISTRY ANDHRA UNIVERSITY
II Semester
CH-204 PHYSICAL CHEMISTRY-II
(Effective from the admitted batch of 2011-12)

UNIT-I:

UNIT-II:
Electron Spin Resonance: Principle and experimental technique- g-factor, line shapes and line widths- hyperfine interactions- applications of ESR studies to the structure of free radicals, metal complexes and biological systems.

UNIT-III:

UNIT-IV:
Electrochemistry II: The electrode-electrolyte interface. The electrical double layer. The Helmoltz-Perrin parallel-plate model, the Gouy-Chapman diffuse-charge model and the Stern model. Electrodes: Charge transfer reactions at the electrode-electrolyte interface.

**Text Books:**
4. Physical Chemistry by Peter Atkins and Julio de Paula, Oxford University Press.
5. Physical Chemistry by G.W. Castellon, Narosha Publishing House
6. Physical chemistry by K.L. Kapoor

**Reference Books:**
6. Introduction to Electrochemistry, S.Glasstone.
7. Fundamentals of Molecular Spectroscopy, Banwell
8. Spectroscopy by Barrow.

**II SEMESTER**

**PRACTICAL IIIIP: PHYSICAL CHEMISTRY PRACTICAL – II CH207**

1. Determination of composition of cuprammonium cation.
2. Determination of equilibrium constant of the reaction: \( \text{KI} + \text{I}_2 = \text{KI}_3 \)
3. Conductometric titration of mixture of a strong acid and weak acid weak acid with a strong base (HCl + HOAc) vs NaOH.
4. Potentiometric titration of iron (II) with \( \text{K}_2\text{Cr}_2\text{O}_7 \)
5. Determination of relative strength of acids (HCl) by ester hydrolysis
6. Polarimetric determination of relative strength of acids by hydrolysis of sucrose.

**Books suggested:**
1. Practical Experiments in Physical Chemistry by Alexander Finallay
3. Physical chemistry experiments by P. Ghosh.