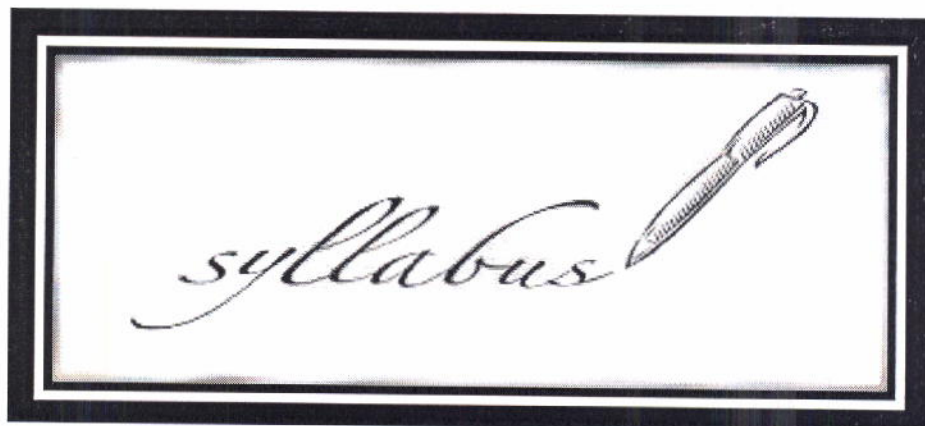


**DUVVURU RAMANAMMA WOMEN'S COLLEGE GUDURU
(AUTONOMOUS)**

**Re-Accredited by NAAC with 'A' Grade
Recognized by UGC as " College with Potential for Excellence**



DEPARTMENT OF CHEMISTRY

2016-2017

CBCS UG PROPOSED SYLLABUS
Subject: CHEMISTRY (wef. 2016-2017)

SEMESTER I

Paper I (Inorganic & Organic Chemistry) 60 hrs (4 h / w)

INORGANIC CHEMISTRY 30 hrs (2h / w)

UNIT -I

p-block elements -I 15h

- Group-13: Synthesis and structure of diborane and higher boranes
(B_4H_{10} and B_5H_9), boron-nitrogen compounds ($B_3N_3H_6$ and BN)
Group - 14: Preparation and applications of silanes and silicone
Group - 15: Preparation and reactions of hydrazine, hydroxylamine.

UNIT-II

1. p-block elements -II

8h

- Group - 16: Classifications of oxides based on (i) Chemical behaviour and
(ii) Oxygen content.

Group-17: Inter halogen compounds and pseudo halogens.

2. Organometallic Chemistry

7h

Definition and classification of Organometallic compounds, nomenclature, preparation, properties and applications of alkyls of Li and Mg elements.

ORGANIC CHEMISTRY

30hrs (2h /w)

UNIT-III

Structural theory in Organic Chemistry 10 h

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H_2O , NH_3 , & $AlCl_3$).

Bond polarization : Factors influencing the polarization of covalent bonds, electro negativity - inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes, carbanions, carbenes and nitrenes.

Types of Organic reactions : Addition - electrophilic, nucleophilic and free radical. Substitution - electrophilic, nucleophilic and free radical. Elimination- Examples.

UNIT-IV

1. Acyclic Hydrocarbons 6 h

Alkenes - Preparation of alkenes. Properties: Addition of hydrogen - heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H_2O , HOX , H_2SO_4 with mechanism and addition of HBr in the presence of peroxide (anti - Markonikov's addition). Dienes - Types of dienes, reactions of conjugated dienes - 1,2 and 1,4 addition of HBr to 1,3 - butadiene and Diels - Alder reaction.

Alkynes - Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties; Acidity of acetylenic hydrogen (formation of Metal acetylides). Preparation of higher acetylenes, Metal ammonia reductions, Physical properties. Chemical reactivity - electrophilic addition of X_2 , HX, H_2O (Tautomerism), Oxidation with KMnO_4 , OsO_4 , reduction and Polymerisation reaction of acetylene.

2. Alicyclic hydrocarbons (Cycloalkanes)

4 h

Nomenclature, Preparation by Freund's methods, heating dicarboxylic metal salts. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes, Stability of cycloalkanes - Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory. Conformational structures of cyclobutane, cyclopentane, cyclohexane.

UNIT-V

Benzene and its reactivity 10h

Concept of resonance, resonance energy. Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of Benzene. Concept of aromaticity - aromaticity (definition), Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation)

Reactions - General mechanism of electrophilic substitution, mechanism of nitration, Friedel Craft's alkylation and acylation. Orientation of aromatic substitution - Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens

(Explanation by taking minimum of one example from each type)

LABORATORY COURSE-I
Practical-I (At the end of Semester-I)

30 hrs (2 h / w)

Qualitative inorganic analysis

Analysis of simple salt containing the following one anion and cation

Analysis of Anions: Carbonate, sulphate, chloride, bromide, iodide, acetate, nitrate, borate, phosphate.

Analysis of cations: Lead, copper, cadmium, iron, aluminum, zinc, manganese, nickel, calcium, strontium, barium, potassium and ammonium.

List of Text Books

1. Unified chemistry Vol- I by O.P.Agarwal
2. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
3. Selected topics in inorganic chemistry by W.D.Malik, G..D.Tuli, R.D.Madan
4. A Text Book of Organic Chemistry by Bahl and Arun bahl
5. Reactions and Mechanisms by P. S. Kelsi
6. Telugu Academy Textbook of Chemistry Vol- I
7. Unified chemistry Vol- I by K.Ramarao and Y. R. Sharma (KalyaniPublishers)

List of Reference Books

1. Inorganic Chemistry by J.E.Huheey
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. A textbook of qualitative inorganic analysis by A.I. Vogel
4. Organic Chemistry by Morrisson and Boyd
5. A Text Book of Organic chemistry by I L Finar Vol I
6. Concise Inorganic Chemistry by J.D.Lee

SEMESTER II
Paper II (Physical & General Chemistry) 60 hrs (4 h / w)

PHYSICAL CHEMISTRY 30 hrs (2h / w)

UNIT-I

Solidstate 10h

Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. Miller indices, Miller indices. The law of symmetry. Definition of lattice point, space lattice, unit cell. Bravais lattices and crystal systems. Bragg's law. Defects in crystals. Stoichiometric and non-stoichiometric defects. And Applications.

UNIT-II

1. Gaseous state 6 h

Compression factors, deviation of real gases from ideal behavior. Vander Waal's equation of state. P-V Isotherms of real gases, Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. The Vander Waal's equation and the critical state. Law of corresponding states. Relationship between critical constants and Vander Waal's constants. Joule Thomson effect.

2. Liquid state 4 h

Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state. Classification of liquid crystals into Smectic and Nematic. Differences between liquid crystal and solid/liquid. Application of liquid crystals as LCD devices.

UNIT-III

Solutions 10h

Liquid-liquid - ideal solutions, Raoult's law. Ideally dilute solutions, Henry's law. Non-ideal solutions. Vapour pressure - composition and vapour pressure- temperature curves. Azeotropes-HCl-H₂O, ethanol-water systems and fractional distillation. Partially miscible liquids-phenol-water, trimethylamine-water, nicotine-water systems. Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

GENERAL CHEMISTRY 30 hrs (2h / w)

UNIT-IV

1. Surface chemistry 8 h

Definition of colloids. Solids in liquids (sols), preparation, purification, properties - kinetic, optical, electrical. Stability of colloids, Hardy-Schulze law, protective colloid.

Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation, uses.

Adsorption: Physical adsorption, chemisorption. Freundlich, Langmuir adsorption isotherms. Applications of adsorption

2. Chemical Bonding 7h

Valence bond theory, hybridization, VB theory as applied to ClF_3 , $\text{Ni}(\text{CO})_4$, Molecular orbital theory - LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2 , O_2 , CO and NO).

UNIT-V

Stereochemistry of carbon compounds 15 h

Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae.

Optical isomerism: Optical activity- wave nature of light, plane polarised light, optical rotation and specific rotation.

Chiral molecules- definition and criteria (Symmetry elements)- Definition of enantiomers and diastereomers - Explanation of optical isomerism with examples Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane.

D,L and R,S configuration methods and E,Z- configuration with examples.

LABORATORY COURSE -II
Practical-II (At the end of Semester-II)30 hrs (2 h / w)

Qualitative inorganic analysis

Analysis of mixture salt containing two anions and two cations (From two different groups) from the following:

Anions: Carbonate, sulphate, chloride, bromide, iodide, acetate, nitrate, borate, phosphate.

Cations: Lead, copper, iron, aluminum, zinc, manganese, calcium, strontium, barium, potassium and ammonium.

List of Text Books

1. Advanced physical chemistry by Gurudeep Raj
2. Advanced physical chemistry by Bahl and Tuli
3. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
4. Stereochemistry by P.S.Kelsi
5. Stereochemistry of Organic compounds by D. Nasipuri
6. Telugu Academy Textbook of Chemistry Vol- I (English medium)
7. Unified chemistry Vol- I by K.Ramarao and Y. R. Sharma (Kalyani Publishers)
8. Unified chemistry Vol- I by O.P.Agarwal

List of Reference Books

1. Principles of physical chemistry by Prutton and Marron
2. Solid State Chemistry and its applications by Anthony R. West
3. Text book of physical chemistry by K L Kapoor
4. Text book of physical chemistry by S Glasstone
5. Stereochemistry of Organic compounds by E L Eliel
6. Advanced Organic Chemistry by F A Carey and R J Sundberg

MODEL PAPER

THREE YEAR B.Sc, DEGREE EXAMINATION FIRST YEAR EXAMINATIONS SEMESTER I

Paper –I: INORGANIC & ORGANIC CHEMISTRY - I

Time: 3 hours

Maximum Marks: 70

PART- A

Answer any **FIVE** of the following questions Each carries **Four** marks **5x4 = 20 Marks**

1. Define the electron deficient molecules and draw the structure of Borazole and Diborane.
2. Classify the Oxides based on the oxygen content with one example to each.
3. How the following are synthesized from Organo Lithium Compounds.
a) Acetic acid b) Ethyl alcohol
4. Define the Carbonium ion and explain the stability with no bond resonance.
5. Define the Markonikov's rule and explain the addition of 1- Propene with HBr.
6. Explain the acidity of the Acetylinic hydrogen with example.
7. Draw the conformational structures of Cyclohexane.
8. Define aromaticity and apply the Huckel's rule to benzene and naphthalene.

PART- B

Answer **ALL** the questions Each carries **TEN** marks

5x10 = 50 Marks

9. (a) Write note on Preparation, Structure and Properties of Silicones.
(OR)
(b) Explain the Preparation and Oxidation- Reduction reactions of Hydroxylamine.
10. (a) Give an account on different types of interhalogen compounds.
(OR)
(b) How the following are prepared from the Methyl Magnesium bromide and methyl lithium
1) Formaldehyde 2) Acetaldehyde 3) Acetone 4) t- butyl alcohol
11. (a) Describe different types of Organic Reactions with one example to each.
(OR)
(b) Write notes on the following
1) Mesomeric effect 2) Hyper conjugation 3) Inductive effect
12. (a) Explain the addition of these reagents to alkenes with mechanism.
1) H_2O 2) HOX 3) H_2SO_4
(OR)
(b) Explain Baeyer's bond angle strain theory.
13. (a) Describe the Molecular Orbital structure of Benzene.
(OR)
(b) Explain the orientation in benzene with respect to alkyl and nitro groups.

II B.SC CHEMISTRY - IV SEMESTER – PAPER IV –SYLLABUS

UNIT-I - INORGANIC CHEMISTRY-II

1. Chemistry of f-block elements

Chemistry of Lanthanides- electronic structure, oxidation states, Lanthanide contraction, consequences of Lanthanide contraction, magnetic properties, spectral properties chemistry of actinides-electronic configuration, oxidation state, actinide contraction, position of actinides in the periodic table, comparison with Lanthanides in terms of magnetic properties, spectral properties and complex formation .

2.Co-ordination chemistry :

IUPAC nomenclature, bonding theories – review of Werner's theory and Sidgwick's concept of coordination, Valence bond theory, geometries of coordination numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, crystal field theory, splitting of d- orbitals in octahedral, tetrahedral and square-planar complexes-low spin and high spin complexes-factors affecting crystal-field splitting energy ,merits and demerits of crystal-field theory. Isomerism in coordination compounds-structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 numbers. Metal Carbonyls and related compounds: EAN Rule, classification of metal carbonyls. Structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni. Metal nitrosyls and metallocenes (only Ferrocene) .

UNIT-II ORGANIC CHEMISTRY-II

1. Hydroxy Compounds : Nomenclature and classification of hydroxyl compounds. Alcohols: Preparation with hydroboration reaction, Grignard synthesis of alcohols. Phenols: Preparation (1) from diazonium salt, (2)from Aryl sulphonates, (3) from cumene Physical properties-Hydrogen bonding (intermolecular and intramolecular). Effect of hydrogen bonding on boiling point and solubility in water. Chemical properties: (a) acidic nature of phenols (b)formation of alkoxides / phenoxides and their reaction with RX (C) Replacements of OH by X using PCl_5 , PCl_3 , PBr_3 , SOCl_2 and with HX/ZnCl_2 (d) esterification by acids (mechanism) (e) dehydration of alcohols. (f) oxidation of alcohols by CrO_3 , KMnO_4 . (g) special reaction of phenols: Bromination, Kolb-Schmidt reaction, Riemer-Tiemann reaction, Fries rearrangement, Azo-coupling. Identification of alcohols by oxidation with KMnO_4 , ceric ammonium nitrate, Lucas reagent and phenols by reaction with FeCl_3 . Polyhydroxy compounds: pinacol- pinacolone rearrangement

2. Carbonyl compounds :

Nomenclature of aliphatic and aromatic carbonyl compounds, structure of the carbonyls group. Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1, 3 dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties; absence of hydrogen bonding, keto- enol tautomerism, reactivity of carbonyl group in aldehydes and ketones. Nucleophilic Addition reaction with (a) NaHSO_3 , (b) HCN (C) RMgX (d) NH_2OH (e) PhNH NH_2 (f) 2,4 - DNPH (g) Alcohols- formation of hemiacetal and acetal. Halogenation using PCl_5 with mechanism. Base catalysed reactions; Aldol, Cannizzaro reaction, Perkin reaction, Benzoin condensation, Haloform reaction, Knoevenagel reaction . Oxidation of aldehydes- Baeyer-Villiger oxidation of ketones Reduction- Clemmensen reduction, Wolf- Kishner reduction, MPV Reduction, reduction with LiAlH_4 and NaBH_4 . Analysis of aldehydes and ketones with (A) 2,4- DNP test , (B) Tollen's test (C) Fehling test (D) Schiff test (E) Haloform test (with equation).

UNIT-III- PHYSICAL CHEMISTRY-II

1. Dilute solutions :

Colligative properties, Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis, osmotic pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal colligative properties. Van't Hoff factor, degree of dissociation and association.

2. Electro chemistry-II

Types of reversible electrodes –the gas electrode, metal-metal ion, metal-insoluble salt and redox electrodes. Electrode reaction, Nernst equation, single electrode potential, Standard Hydrogen electrode, reference electrodes, standard electrode potential, sign convention, electrochemical series and its significance. Reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements, computation of cell EMF. Applications of EMF Measurements - potentiometric titrations.

UNIT-IV - GENERAL CHEMISTRY-II

1. Molecular symmetry:

Concept of symmetry in chemistry- symmetry operations, symmetry elements. Rotational axis of symmetry and types of rotational axis. Planes of symmetry and types of planes. Improper rotational axis of symmetry. Inversion center identity element. The symmetry operations of a molecule form a group. Flow chart for the identification of molecular point group.

2. Infrared absorption spectroscopy :

Energy levels of simple harmonic oscillator, molecular vibrations Hooke's law, intensity, determination of force constant and qualitative relation of force constant bond energies, effect of anharmonicity and isotope on the spectrum, modes of vibrations in polyatomic molecules, intensity and position of IR bands. Instrumentation, characteristic absorption bands of various functional groups-Interpretation of IR spectra of simple organic molecules- CH_3CHO , $\text{C}_2\text{H}_5\text{OH}$

LABORATORY COURSE-III Inorganic chemistry:

I.Titrimetric Analysis:

1. Determination of Carbonate and bicarbonate in a mixture.
2. Determination of Fe(II) using KMnO_4 with Oxalic Acid as Primary Standard
3. Determination of Zinc using EDTA

LABORATORY COURSE-IV

1. Determination of Fe(II) using $\text{K}_2\text{Cr}_2\text{O}_7$
2. Determination of Hardness of Water
3. Determination of Magnesium using EDTA

III B.Sc-V-SEMESTER –PAPER-V- SYLLUBUS

PAPER –V INORGANIC CHEMISTRY

1. Materials science :

Superconductivity, characteristics of superconductors, Meissner effect, types of superconductors and applications. Nanomaterials- synthetic techniques, bottom-up-sol-gel method, top-down- electro deposition method. Properties and applications of nano-materials.

2. Spectral and magnetic properties of metal complexes: Electronic absorption spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion. Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility – Gouy method.

3. Reactivity of metal complexes: Labile and inert complexes, ligand substitution reactions – $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$, substitution reactions of square planar complexes – Trans effect and applications of trans effect.

4. Stability of metal complexes: Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

5. Bioinorganic chemistry: Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride (Cl^-). Metalloporphyrins – hemoglobin, structure and function, Chlorophyll, structure and role in photosynthesis.

V-SEMESTER

PAPER VI –ORGANIC CHEMISTRY

1. Nitrogen compounds:

Amines (Aliphatic and Aromatic): Nomenclature, Classification into 1^o, 2^o, 3^o Amines and Quarternary ammonium compounds. Preparative methods -1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism). 4. Reduction of Amides and Schmidt reaction. Physical properties and basic character – Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline – comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aqueous medium), steric effects and substituent effects. Use of amine salts as phase transfer catalysts. Chemical properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation e) Reaction with Nitrous acid of 1^o, 2^o, 3^o (Aliphatic and aromatic amines).

2. Heterocyclic Compounds :

Introduction and definition: Simple 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring system – presence in important natural products like hemoglobin and chlorophyll. Numbering the ring systems as per Greek letter and Numbers. Aromatic character – 6- electron system (four-electrons from two double bonds and a pair of non-bonded electrons from the hetero atom). Tendency to undergo substitution reactions. Resonance structures: Indicating electron surplus carbons and electron deficient hetero atom. Explanation of feebly acidic character of pyrrole, electrophilic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions. Reactivity of furan as 1,3-diene, Diels Alder reactions (one example). Sulphonation of thiophene purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene from 1,4,- dicarbonyl compounds only, Paul-Knorr synthesis, structure of pyridine, Basicity – Aromaticity – Comparison with pyrrole – one method of preparation and Chichibabin Reaction.

3. Carboxylic acids and derivative:

Nomenclature, classification and structure of carboxylic acids. Methods of preparation by a) hydrolysis of nitriles, amides and esters. b) carbonation of Grignard reagents. Special methods of preparation of aromatic acids by a) oxidation of side chain. b) hydrolysis by benzotrichlorides. c) Kolbe reaction. Physical properties: Hydrogen bonding, dimeric association, acidity- strength of acids with examples of trimethyl acetic acid and trichloroacetic acid. Relative differences in the acidities of aromatic and aliphatic acids.

Chemical properties: Reactions involving H, OH and COOH groups- salt formation, anhydride formation, acid chloride formation, amide formation and esterification. Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt-Eistert synthesis, halogenation by Hell-Volhard- Zelinsky reaction.

Derivatives of carboxylic acids: Reaction of acid chlorides, acid anhydrides, acid amides, esters (mechanism of the hydrolysis of esters by acids).

Active methylene compounds Acetoacetic esters: preparation by Claisen condensation, keto-enol tautomerism. Acid hydrolysis and ketonic hydrolysis. Preparation of a) monocarboxylic acids.n-butyric acid & Iso butyric acid b) dicarboxylic acids.Succinic acid & Glutaric acid Reaction with urea Malonic ester: preparation from acetic acid. Synthetic applications: Preparation of a) monocarboxylic

acids (propionic acid and n-butyric acid). b) dicarboxylic acids (succinic acid and adipic acid). c) α,β -unsaturated carboxylic acids (crotonic acid). Reaction with urea.

4. Carbohydrates : Monosaccharides: All discussion to be confined to (+) glucose as an in support of ring structure. Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation). Cyclic structure of glucose. Decomposition of cyclic structure (Pyranose structure, anomeric Carbon and anomers). Proof for the ring size (methylation, hydrolysis and oxidation reactions). Different ways of writing pyranose structure (Haworth formula and chair conformational formula).

Structure of fructose: Evidence of 2 - ketohexose structure (formation of penta acetate, formation of cyanohydrin its hydrolysis and reduction by HI to give 2-Carboxy-nhexane). Same osazone formation from glucose and fructose, cyclic structure for fructose (Furanose structure and Haworth formula). Interconversion of Monosaccharides: Aldopentose to aldo hexose - eg: Arabinose to DGlucose, D-Mannose (Kiliani - Fischer method). Epimers, Epimerisation - Lobry de bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose eg: D-glucose to D- arabinose by Ruff's degradation. Aldohexose (+) (glucose) to ketohexose (-) (Fructose) and Ketohexose (fructose) to aldohexose (Glucose).

5. Amino acids and proteins ; Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: α - amino acids from a) Halogenated Carboxylic acids b) Malonic ester synthesis c) Strecker's synthesis. (specific examples Glycine & Alanine.) Physical properties: Optical activity of naturally occurring amino acids: L-configuration, irrespective of sign rotation, Zwitterion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point.

Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating Peptide bond (amide linkage). Structure and nomenclature of peptides and proteins. (Elementary treatment only)

III B.Sc., - SIXTH SEMESTER

PAPER: VII- PHYSICAL CHEMISTRY

- 1. Chemical kinetics :** Rate of reaction,. Definition of order and molecularity. Derivation of Rate constants for first, second, third and zero order reactions and examples. Derivation for half life equations. Methods to determine the order of reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Theories of reaction rates- collision theory- derivation of rate constant for bimolecular reaction. The transition state theory (elementary treatment).
 - 2. Photochemistry :** Differences between thermal and photochemical processes. Laws of photochemistry- Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield. Ferri oxalate actinometry. Photochemical hydrogen-chlorine, hydrogen- bromine reaction. Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing). Photosensitized reactions- energy transferprocesses (simple example).
 - 3. catalysis :** Homogenous and heterogeneous catalysis, comparison with examples. Kinetics of acid and base catalyzed reactions, - hydrolysis of an ester, inversion of cane sugar, mutarotation of glucose. Theories of catalysis. acid – base catalysis, enzyme catalysis and Autocatalysis
Macromolecules: classification of polymers, chemistry of polymerization, chain polymerization, step polymerization, coordination polymerization – tacticity. Molecular weight of polymers-number average and weight average molecular weight, degree of polymerization, determination of molecular weight of polymers by viscometry, end group analysis,. Preparation and industrial application of Teflon, poly acrylonitrile, terelene and Nylon-66.
 - 4. Thermodynamics :** The first law of thermodynamics-statement, definition of internal energy and enthalpy. Heat capacities and their relationship. Joule-Thomson effect co-efficient. Calculation of w , for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. State function. Temperature dependence of enthalpy of formation- Kirchoff's equation. Second law of thermodynamics. Different Statements of the law. Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. Concept of entropy, entropy as a state function, entropy changes in reversible, and irreversible processes. Calculation of entropy changes with changes in V & T and P & T . The Gibbs (G) and Helmholtz (A) energies. Derivation of Gibb's Helmholtz equation.
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VI - SEMESTER

PAPER- VIII- GENERAL CHEMISTRY

Unit – I Physico Chemical methods of analysis :

1. Separation techniques

1.Solvent extraction: Principle and process, Batch extraction, continuous extraction and counter current extraction. Application – Determination of Iron(III)

2.. Chromatography: Classification of chromatography methods, principles of differential Migration absorption phenomenon, Nature of adsorbents, solvent systems, R_f values, factors effecting R_f values.(a). Paper Chromatography: Principles, R_f values, experimental procedures, choice of paper and solvent systems, developments of chromatogram – ascending, descending and radial. Two dimensional chromatography, applications.

(b). Thin layer Chromatography (TLC): Advantages. Principles, factors effecting R_f values. Experimental procedures. Adsorbents and solvents. Preparation of plates. Development of the chromatogram. Detection of the spots. Applications.

UNIT - II 1. Spectrophotometry

General features of absorption – spectroscopy, Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert law for quantitative analysis of

1. Chromium in $K_2Cr_2O_7$ 2.Manganese in $KMnO_4$

UNIT - III Molecular Spectroscopy :

i) Mass Spectrometry:

Basic principles – Molecular ion / parent ion, fragment ions / daughter ions. Theory – formation of parent ions. Representation of mass spectrum. Identification of parent ion (M+1), (M+2), base peaks (relative abundance 100%) Determination of molecular formula with suitable example.

(ii) Electronic spectroscopy: Interaction of electromagnetic radiation with molecules and types of molecular spectra. Potential energy curves for bonding and antibonding molecular orbitals. Energy levels of molecules (σ, π, n) . Selection rules for electronic spectra. Types of electronic transitions in molecules effect of conjugation. Concept of chromophore.

(iii) Proton magnetic resonance spectroscopy (1H -NMR) Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, Position of signals. Chemical shift, NMR splitting of signals – spin-spin coupling, coupling Constants Explanation with one example.

Unit – IV - Drugs & pesticides

A . Drugs : 1.Introduction: Drug, disease (definition), Historical evolution, Sources – Plant, Animal synthetic, Biotechnology and human gene therapy

2.Terminology: Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics (ADME, Receptors – brief treatment) Metabolites and Anti- metabolites.

3. Nomenclature: Chemical name, Generic name and trade names with examples.

4. Classification: Classification based on structures and therapeutic activity with one example each.

5. Administration of Drugs

6. Synthesis: Synthesis and therapeutic activity of the following drugs., L-Dopa, Chloroquin, Ciprofloxacin, Acyclovir (Antiviral) and valium (Tranquilizer).

LABORATORY COURSE – V

(Organic Chemistry)

1. Synthesis of Organic Compounds
 - i. Aromatic electrophilic substitution Nitration: Preparation of nitro benzene .
 - ii. Diazotization and coupling: Preparation of phenyl azo β -naphthol
2. Organic Qualitative Analysis:
 - i. Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives. Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic Primary Amines, Amides and Simple sugars

LABORATORY COURSE – VI

(Physical Chemistry))

1. Chemical kinetics
 - i. Determination of specific reaction rate of the hydrolysis of methyl acetate catalyzed by hydrogen ion at room temperature.
2. Distribution law
 - i. Determination of molecular status and partition coefficient of benzoic acid in Benzene and water.
3. Electrochemistry
 - i. Determination of concentration of HCl conductometrically using standard NaOH solution.
 - ii. Determination of redox potentials of $\text{Fe}^{2+}/\text{Fe}^{3+}$ by potentiometric titration of ferrous ammonium sulphate vs. potassium dichromate.
4. Adsorption
 - i. Surface tension and viscosity of liquids.
 - ii. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm.

Recommended Text Books and Reference Books

Inorganic Chemistry

1. Concise Inorganic Chemistry by J.D.Lee
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
4. Inorganic Chemistry by R R Heslop and P.L. Robinson
5. Modern Inorganic Chemistry by C F Bell and K A K Lott
6. University Chemistry by Bruce Mahan
7. Qualitative Inorganic analysis by A.I.Vogel
8. A textbook of qualitative inorganic analysis by A.I. Vogel
9. Inorganic Chemistry by J.E.Huheey
10. Inorganic Chemistry by Chopra and Kapoor
11. Coordination Chemistry by Basalo and Johnson
12. Organometallic Chemistry – An introduction by R.C.Mehrotra and A.Singh
13. Inorganic Chemistry by D.F.Shriver, P.W.Atkins and C.H.Langford
14. Inorganic Chemistry by Philips and Williams, Lab Manuals
15. Introduction to inorganic reactions mechanisms by A.C.Lockhart
16. Theoretical inorganic chemistry by McDay and J.Selbin
17. Chemical bonding and molecular geometry by R.J.Gillepsy and P.L.Popelier
18. Advanced Inorganic Chemistry By Gurudeep Raj
19. Analytical chemistry by Gary D Christian, Wiley India
20. Analytical Chemistry by G.L.David Krupadanam, et al, Univ. Press
21. Selected topics in inorganic chemistry by W.D.Malik, G..D.Tuli, R.D.Madan
22. Concepts and models of Inorganic Chemistry by Bodie Douglas, D.McDaniel and J.Alexander
23. Modern Inorganic Chemistry by William L. Jolly
24. Concise coordination chemistry by Gopalan and Ramalingam
25. Satyaprakash's modern inorganic chemistry by R.D.Madan.

Organic Chemistry

1. Organic Chemistry By R T Morrison and R.N.Boyd
2. Organic Chemistry by T.J.Solomons
3. Organic Chemistry by L.G.Wade Sr
4. Organic Chemistry by D.Cram, G.S.Hammond and Herdricks
5. Modern Organic Chemistry by J.D.Roberts and M.C.Caserio
6. Text book of Organic Chemistry by Ferguson
7. Problems and their solutions in organic Chemistry by I.L.Finar
8. Reaction mechanisms in Organic Chemistry by S.M.Mukherji and S.P.Singh
9. A guide book to mechanisms in Organic Chemistry by Peter Sykes
10. Organic spectroscopy by J.R.Dyer
11. Organic Spectroscopy by William Kemp
12. Fundamentals of organic synthesis and retrosynthetic analysis by Ratna Kumar
13. Comprehensive practical organic qualitative analysis by V.K.Ahluwalia & Sumta Dhingra
14. Comprehensive practical organic chemistry: Preparation and quantitative analysis by V.K.Ahluwalia and Reena Agarwal.
15. Organic Chemistry by Janice Gorzynski
16. Organic Chemistry by Stanley H Pine
17. Fundamentals of Organic Chemistry by John Mc Murray, Eric Simanek
18. Organic Chemistry by Francis A Carey
19. Text book of Organic Chemistry by K.S.Mukherjee
20. Organic Chemistry by Bhupinder Meha & Manju Mehta

21. Organic Chemistry by L.G.Wade Jr, Maya Shankar Singh
22. Elementary organic spectroscopy by Y.R. Sharma
23. Chemistry & Industry by Gurdeep R. Chatwal
24. Applied Chemistry by Jayashree Ghosh
25. Drugs by David Krupadanam
26. Pharmacodynamics by R.C.Srivastava, Subit Ghosh
27. Analytical Chemistry by David Krupadanam
28. Green Chemistry – V.K.Ahluwalia
29. Organic Synthesis by V.K.Ahluwalia and R.Agarwal
30. New trends in Green Chemistry –by V.K.Ahluwalia & M.Kidwai
31. Industrial Chemistry by B.K.Sharma
32. Industrial Chemistry by Banerji
33. Industrial Chemistry by M.G.Arora
34. Industrial Chemistry by O.P.Veramani & A.K.Narula
35. Synthetic Drugs by O.D.Tyagi & M.Yadav
36. Medicinal Chemistry by Ashutoshkar
37. Medicinal Chemistry by P.Parimoo
38. Pharmacology & Pharmacotherapeutics by R.S Satoshkar & S.D.Bhandenkar
39. Medicinal Chemistry by Kadametal P-I & P.II
40. European Pharmacopoeia
41. Vogel's Qualitative organic analysis.
42. Laboratory manual of Organic Chemistry by Raj K Bansal

Physical chemistry books.

1. Physical chemistry A molecular approach by Donald A. Mcquarrie and John D. Simon.
2. Physical chemistry by G M Barrow
3. Principles of physical chemistry by Prutton and Marron
4. Physical chemistry by Peter Atkins, Julio D. Paula
5. Physical Chemistry by Ira N Levine
6. Elements of Physical Chemistry by Peter Atkins, Julio D. Paula
7. Text book of Physical Chemistry by P.L.Soni, O.P.Dharmarha and Q.N.Dash
8. Solid State Chemistry and its applications by Anthony R. West
- 9 Text book of physical chemistry by K L Kapoor
10. Thermodynamics for Chemists by S Glasston
11. Chemical Kinetics by K J Laidler
12. An Introduction to Electrochemistry by S Glasston
13. Physical chemistry through problems By S K Dogra
14. Thermodynamics by J Jayaram and J C Kuriakose
15. Introductory Quantum Chemistry by A K Chandra
16. Physical Chemistry by J W Moore
17. Kinetics and mechanism by J W Moore and R G Pearson
18. Fundamentals of photochemistry by K K Rohtagi Mukharjee
19. Chemical thermodynamics by R P Rastogi and S S Misra
20. Advanced physical chemistry by Gurudeep Raj
21. Physical chemistry by G W castellan
22. Physical chemistry by Silbey, Alberty and Bawendi.
23. Elements of physical chemistry by Glasstone and Lewis
24. Text book of physical chemistry by S Glasstone
25. Fundamentals of Molecular spectroscopy by C.N.Banwell and E.M.McCash
26. Nanochemistry by Geoffrey Ozin and Andre Arsenault
27. Catalysis: Concepts and green applications by Gadi Rotherberg

28. Green Chemistry: Theory and practice by P.T.Anastas and J.C.Warner
29. Polymer Science by Gowriker, Viswanathan and Jayadev Sridhar
30. Introduction polymer Chemistry By G.S.Misra
31. Polymer Chemistry by Bilmayer
32. Kinetics and Mechanism of Chemical Transformations by Rajaram and Kuriacose.
33. Senior practical physical chemistry by Khosla

MODEL-QUESTIONPAPER

Duration:3hours

Maxmarks:70M

PART-A

Answer any six questions. Each carries five marks

6x5=30M

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

PART-B

Answer all the questions. Each question carries ten marks

4x10=40M

UNIT-I

9 or10

UNIT-II

11or12

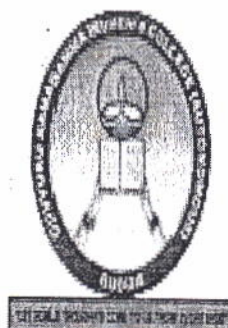
UNIT-III

13or14

UNIT-IV

15or16

DUVVURU RAMANAMMA WOMEN'S COLLEGE(AUTONOMOUS)
GUDUR,S.P.S.R. NELLORE DIST,A.P.
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DEPARTMENT OF ORGANIC CHEMISTRY
SYLLABUS FOR
MASTER OF SCIENCE
In
ORGANIC CHEMISTRY
2015-2017 BATCH

2015-2016
SEMESTER-1

<u>PAPER-I</u> <u>CHE-101</u>	<u>CHE-101 INORGANIC CHEMISTRY</u> UNIT-I Co-Ordination compounds UNIT-II Chemistry Of Non Transition Elements. UNIT-III Reaction Mechanism In Complexes UNIT-IV Metal Complexes
<u>PAPER-II</u> <u>CHE-102</u>	<u>CHE-102 ORGANIC CHEMISTRY-I</u> UNIT-I Aromaticity UNIT-II Substitution Reactions UNIT-III Stereochemistry-1 UNIT-IV Reactive Intermediates
<u>PAPER-III</u> <u>CHE-103</u>	<u>CHE- 103-PHYSICAL CHEMISTRY</u> UNIT-I Quantum Chemistry -I UNIT-II Chemical Dynamics UNIT-III Phase Rule UNIT-IV Electrochemistry -I
<u>PAPER-IV</u> <u>CHE-104</u>	<u>CHE-104:SPECTROPHOTOMETRY</u> <u>GROUP THEORY AND ANALYTICAL METHODS</u> UNIT-1 Introduction to Spectroscopy And SpectroPhotometry UNIT-II Symmetry And Group Theory UNIT-III Treatement Of Analytical Data UNIT-IV Thermal Methods and Radio Analytical methods
<u>CHE-205</u>	<u>Inorganic Chemistry Lab</u>
<u>CHE-206</u>	<u>Organic Chemistry Lab</u>
<u>CHE-207</u>	<u>Physical Chemistry Lab</u>
<u>CHE-208</u>	<u>Human Values And Professional Ethics-I</u>

SEMESTER-II

<u>PAPER-I</u> <u>CHE-201</u>	<u>CHE-201: INORGANIC CHEMISTRY</u> UNIT-I Transition Metal II –Complexes UNIT-II Electronic Spectra Of Complexes UNIT-III Magnetic Properties Of Transition Metal Complexes UNIT-IV Catalysis
<u>PAPER-II</u> <u>CHE-202</u>	<u>CHE-202: ORGANIC CHEMISTRY-II</u> UNIT-I Elimination Reactions & Esterification UNIT-II Stereochemistry2 UNIT-III Three And Four Membered Heterocycles UNIT-IV TERPENOIDS
<u>PAPER-III</u> <u>CHE-203</u>	<u>CHE- 203-PHYSICAL CHEMISTRY</u> UNIT-I Quantum Chemistry-II UNIT-II surface Chemistry UNIT-III classical Thermodynamics& Stastistical Thermodynamics UNIT-1V Electro Chemistry-II
<u>PAPER-IV</u> <u>CHE-204</u>	<u>CHE-204 BIO INORGANIC &BIO ORGANIC,BIO PHYSICALCHEMISTRY AND CHEMOTHERAPY</u> UNIT-I Bio Inorganic Chemistry UNIT-II Bio Organic Chemistry, UNIT-III Biophysical chemistry UNITIV Antimalarials& Anti Biotics
<u>CHE- 205</u>	<u>Inorgani Chemistry Lab</u>
<u>CHE-206</u>	<u>Organic Chemistry Lab</u>
<u>CHE -207</u>	<u>Physical Chemistry Lab</u>
<u>CHE-208</u>	<u>Human Values And Professional Ethics-1</u>

2015-2017
SEMESTER-III

<u>PAPER-I</u> <u>CHE-301</u>	<u>CHE-301: ORGANIC CHEMISTRY-1</u> Unit-I Addition Reaction Unit-II Reagents In Organic Synthesis Unit-III Organometallic Reagents Unit-IV Asymmetric Synthesis
<u>PAPER-II</u> <u>CHE-302</u>	<u>CHE-302: ORGANIC CHEMISTRY-2</u> Unit-I Five Membered Heterocycles UNIT-II Benzofused Five And Six Membered Heterocyclic Compounds UNIT-III Synthetic Polymers Unit-IV Oxidations And Reductions
<u>PAPER-III</u> <u>CHE-303</u>	<u>CHE-303: ORGANIC SPECTROSCOPY AND ITS APPLICATIONS</u> UNIT-I UltravioletAndVisibleSpectroscopy UNIT-II Infrared Spectroscopy UNIT-III NMR UNIT-IV Mass Spectrometry
<u>PAPER-IV</u> <u>CHE-304</u>	<u>CHE-304 :GENERAL CHEMISTRY</u> UNIT-I Vitamins And Prostaglandins Unit-II Enzymes And Enzyme Inhibition UNIT-III Drug Discovery And Principles Of Drug Design Unit-IV Modern Seperation Methods
<u>CHE-405:Practical-1</u>	<u>Lab:Preparations</u>
<u>CHE-406:Practical-II</u>	<u>Lab:Estimations</u>
<u>CHE-407:Practical- III</u>	<u>Lab:Spectral Identification Of Organic Compounds</u>
<u>CHE-407</u>	<u>Human Values And Professional Ethics-II</u>

SEMESTER-IV

<u>PAPER-1</u> <u>CHE-401</u>	<u>CHE-401- ORGANIC SYNTHESIS</u>
	UNIT-I Chemistry Of Organo Boron, Phosphorus, Sulfur And Silicon Reagents
	UNIT-II Rearrangements
	UNIT-III Newer Methods In Organic Synthesis
	UNIT-IV Pericyclic Reactions -1
<u>PAPER-11</u> <u>CHE-402</u>	<u>CHE-402 ORGANIC SYNTHESIS -II</u>
	UNIT-I Designing Of Organicsynthesis-1
	UNIT-II Designing Of Organicsynthesis -2
	UNIT-III Photochemistry
	UNIT-IV Pericyclic Reactions -2
<u>PAPER-1II</u> <u>CHE-403</u>	<u>CHE-403:CHEMISTRY OF NATURALPRODUCTS</u>
	UNIT-I Steriods And Hormones
	UNIT-II Alkaloids
	UNIT-III Peptides And Proteins
	UNIT-IV Flavanoids And Isoflavonoids
<u>PAPER-1V</u> <u>CHE-404</u>	<u>CHE-404 –GREEN CHEMISTRY</u>
	UNIT-I Green Chemistry-I
	UNIT-II MULTISTEPSYNTHESIS
	UNIT-III Nanomaterials
	UNIT-IV Nucleic Acids And Nucleotides
<u>CHE-405:Practical-I</u>	<u>Lab:Preparations</u>
<u>CHE-406:Practical-II</u>	<u>Lab:Estimations</u>
<u>CHE-407:Practical-III</u>	<u>Lab:Spectral Identification Of Organic Compounds</u>
<u>CHE-407</u>	<u>Human Values And Professional Ethics-II</u>

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M.Sc., CHEMISTRY SYLLABUS
First semester

CHE-101: INORGANIC CHEMISTRY

UNIT-I: Co-Ordination Compounds:

15 Hrs

Introduction to crystal field theory, CFSE and its calculations, pairing energy, splitting of d-orbitals in trigonal bi pyramidal, square planar, Square pyramid & pentagonal bi pyramidal geometries. John-Teller effect, Application of CFT, OSSE, Site selection in spinels, short comings of CFT, Evidence for covalency, Nephelauxetic effect, MOT of co-ordinate bonds, M.O. Diagrams for Octa- hedral, Tetrahedral &, Square planar complexes.

UNIT-II: Chemistry of Non-Transition elements:

15 Hrs

General characteristics of the Non-Transition elements, special features of individual elements, Synthesis, properties & structure of their halides & Oxides , Polymorphism of Carbon, phosphorous & sulphur. Synthesis, properties & structure of Boranes, Carboranes, Borazines, Silicates, Carbides, Sulphur- Nitrogen compounds.

UNIT-III: Reaction Mechanism in Complexes:

15 Hrs

Reactivity of metal complexes, inert & labile complexes , kinetics & mechanism of substitution reactions, substitution reactions in Octa hedral complexes. Acid hydrolysis-factors effecting acid hydrolysis. Base hydrolysis-Conjugate base mechanism. Anation reactions, substitution reactions in square planar complexes. Trans effect- mechanism of Trans effect, Electron transfer reactions, Inner sphere & Outer Sphere mechanisms, Marcus Theory.

UNIT-IV: Metal complexes:

15 Hrs

a) Metal carbonyls: Preparation of Metal carbonyls of Mn, Fe, Co & Ni –bonding in Carbonyls, EAN, VBT, MOT- Terminal & bridging Carbonyls – Synergic interaction & Structure of mono nuclear, bi nuclear, tri nuclear & tetra nuclear carbonyls.

b) Metal nitrosyls: Preparation, bonding and structures of metal nitrosyls-chemistry of linear and bent –nitrosyls-nitrosyls as NO^+ and NO^- donors –Analytical uses of nitrosyl complexes.

Books Suggested

1. F.A.Cotton and G.Wilkinson, Advanced In-organic chemistry VI Edition, 1999. John wiley & sons. Inc., New York.
2. James E. Huheey, Inorganic chemistry- Principles of structure and reactivity, VI Edition 1993. Harper Collins College Publishers, New York.
3. J.D.Lee: Concise Inorganic Chemistry (Blackwell)
4. Gary Wolfsburg: Inorganic Chemistry (5th Ed. (Viva Books)
5. W.L.Jolly: Modern Inorganic Chemistry (McGraw-Hill)
6. B.N Figgis: Introduction to Ligand Fields (John-Wiley)
7. S.F.A.Kettle: Coordination compounds.
8. Coordination Chemistry. Bassalo & Jahnson.

CHE-102: ORGANIC CHEMISTRY-I

UNIT-I: AROMATICITY

15 Hrs

Huckle's rule and the concept of aromaticity, Aromaticity in benzenoid and non benzenoid Compounds, Alternant and Non-alternant hydrocarbons, Metallocenes- Ferrocene, Azulenes, Annulenes, Fulvenes. Anti-aromaticity, Pseudo-aromaticity, Homo-aromaticity.

UNIT-II: SUBSTITUTION REACTIONS

15 Hrs

i. Aliphatic Nucleophilic Substitutions: The S_N^2 , S_N^1 , mixed S_N^1 and S_N^2 , SET Mechanism, The Neighboring Group mechanism, Neighboring Group participation by π and σ bonds, Anchimeric assistance, Classical and Non classical carbocations, Phenonium ions, Norbornyl system, common carbocations, Rearrangements-Primary, Secondary and Tertiary.

The S_N^1 mechanism: Nucleophilic substitution at an allylic, aliphatic triagonal and vinylic carbons. Reactivity-Effects of substrate, attacking nucleophile, Leaving group reaction medium.

ii. Aromatic Nucleophilic Substitution: The $S_N Ar$, S_N^1 , Benzyne and S_{RN}^1 mechanisms, Reactivity-Effect of substrate structure, Leaving group and attacking nucleophile. The von Richter, Sommelet-Hauser and Smiles rearrangements.

UNIT-III STEREOCHEMISTRY-I

15 Hrs

Molecular representation of organic molecules: Wedge, Fisher, Newman and Sawhorse formula, their description and interconversion.

Optical isomerism: Molecular Symmetry and Chirality - stereoisomers - classification-configuration-R,S-Nomenclature - Axial chirality - stereochemistry of allenes, spiranes, Atropisomerism - biphenyl derivatives, Planar chirality - Ansa compounds, *trans*-cycloalkanes, Helicity.

UNIT-IV: REACTIVE INTERMEDIATES

15Hrs

Type of reactions and mechanisms, Thermodynamic and Kinetic requirements, Kinetic and Thermodynamic control, Potential energy diagrams, Transition states and intermediates, Methods of determining mechanisms, isotope effects. Generation, structure, stability and reactivity of Carbocations, Carbanions, Free radicals, Carbenes, Nitrenes and Arynes.

Books Suggested:

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
2. Advanced Organic Chemistry, F.A. Carey and R.J Sundberg, Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
4. Structure and Mechanism in Organic Chemistry C.K. Ingold, Cornell University Press.
5. Organic Chemistry, R.T Morrison and R.N. Boyd, Prentice - Hall.

6. Modern Organic Reactions, H.O. House, Benjamin.
7. Principles of Organic Synthesis, R.O.C Norman and J.M.Coxon, Blackie Academic & Professional.
8. Reaction Mechanism in Organic Chemistry, P.S. Kalsi, New Age International
9. Text book of Organic Chemistry, M.C. Murry.
10. Advanced Organic Chemistry: Reactions and mechanisms, Bernord Miller.
11. Advanced Organic Chemistry, F.A. Carey and R.J Sundberg, Plenum.

CHE- 103-PHYSICAL CHEMISTRY

UNIT-I: QUANTUM CHEMISTRY-I

15Hrs

a) Introduction to Exact Quantum Mechanical Results: Operator algebra . Eigen values and Eigen functions. Operators for momentum and energy. The derivation of schrodingers equation and the postulates of Quantum mechanics. Discussion of solution of the schrodingers equation to some model systems, viz., particle in a box, harmonic oscillator, rigid rotar, hydrogen atom.

b) Approximate Methods: The variation theorem, linear variation principle, perturbation theory (first order and non degenerate), Application of variation method a perturbation theory to the helium atom.

UNIT-II: CHEMICAL DYNAMICS

15Hrs

Methods of determining Rate laws, collision theory of reaction rates, steric factor, Activated complex theory. Treatment of unimolecular reactions-Lindemann, Lindemann-Hinshelwood-Elementary treatment of RRKM theory. Rate -expression hydrogen -bromine reaction, pyrolysis of acetaldehyde, decomposition of ethane, photo chemical reactions-hydrogen, bromine, hydrogen-chlorine reactions .Autocatalysis - hydrogen- oxygen reaction, explosion limits.

UNIT-III : PHASE RULE

15Hrs

Thermodynamic derivation of phase rule, solid -liquid equilibria, thermal analysis, simple eutectic, congruent fusion, incongruent fusion and systems consisting of both. Application of phase rule to three component system, stokes and roozeboom plots. Three component liquid system-formation of one pair, two pairs and three pairs of partially miscible liquids: Two salts and water-no chemical combination: double salt formation, one salt forms hydrate and two salts form hydrates.

UNIT-IV: ELECTROCHEMISTRY -I

15Hrs

a) Strong Electrolytes: Effect of dilution on equivalent conductance-inter ionic attraction, Debye-Huckel-Onsagar treatment, derivation of Debye -Huckel Onsagar equation. verification and limitation of Onsagar equation, Debye- Falkenhagen and Wien effects.

b) Activity and activity coefficients: Relation between different types of activity coefficients, Determination of mean ionic activity coefficients by solubility and EMF methods. Debye Huckel Limiting law and its verification.

c) Reversible electrochemical cells: Thermodynamics of electrochemical cells, concentration cells with and without transference-liquid junction potentials, General equation for liquid junction potential.

d) Electro catalysis: Influence of various parameters

Books Suggested

1. physical chemistry, P. W. Atkins (ELBS)
2. Introduction to quantum chemistry, A. K. Chandra (Tata McGraw Hill)
3. Quantum Chemistry, Ira N. Levine (Prentice Hall)
4. Atomic Structure and Chemical bond, Manas Chandra.
5. Chemical Kinetics, K.J. Laidler (Mc Graw Hill)
6. Kinetics and Mechanism of Chemical Transformations, J. Rajaraman and J. Kuriacose (McMilan)
7. Thermodynamics for chemists, S. Glasstone
8. Chemical thermodynamics, I.M. Klotz
9. Statistical Thermodynamics, M. Dole
10. Modern Electrochemistry, Vol. I & II, J.O. M. Bockris and A.K.N. Reddy (Plen)
11. An Introduction to Electrochemistry (3rd ed.), S. Glasstone (Affiliated East-West)

CHE-104: INTRODUCTION SPECTROSCOPY, GROUP THEORY AND ANALYTICAL METHODS

UNIT-1: INTRODUCTION SPECTROSCOPY & SPECTRO PHOTOMETRY 15

Spectroscopic principles: Electromagnetic radiation and its interaction with matter –

Absorption and Emission. Quantization of energy – Regions of the electromagnetic spectrum and the mode of interactions with molecules. Representation of spectra .

Basic components of a spectrometer .Signal to noise ratio. Factors influencing the intensity and width of spectral lines.

UV & Visible spectroscopy: The Franck Condon principle. Types of electronic transitions in molecules chromophores and oxo chromes, Chemical analysis by

electronic spectroscopy- Beer- Lambert 's law. Deviations from Beer's law .Quantitative determination of metal ions (Mn^{+2} , Fe^{+2}) Simultaneous determination of Chromium and Manganese in a mixture.

UNIT-II: SYMMETRY AND GROUP THEORY 15Hrs

symmetry elements and symmetry operation, Definitions of a group, sub group, Relation between

orders of a finite group and its sub group- conjugacy Relation and classes- point symmetry group, schonflies symbols - Representation of groups by matrices (representation for C_n , C_{nv} , D_{nh} , etc groups to be worked out explicitly), character of representation. the great orthogonality theorem (with out proof) - character tables and their use in spectroscopy.

UNIT-III; TREATMENT OF ANALYTICAL DATA

15Hrs

Precision and accuracy, mean and median values - standard deviation - Types of errors: Determinate, indeterminate and Gross errors, sources of error, statistical evaluation of data-rejection of measurements rules for retention of significant figures, significances of testing-student's t-test, f-test, Linear regression, test for linearity, calibration of weights, volumetric glassware.

UNIT-IV: THERMAL METHODS AND RADIO ANALYTICAL METHODS

15 Hrs

Thermal Methods

Thermo gravimetry –Principle, Factors affecting the results, instrumentation. Application with special reference to $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, $\text{CaC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$. Different thermal analysis – principle, instrumentation, difference between TG and DTA, applications with special reference to the clays and minerals.

Different scanning calorimetry –principle, and applications to inorganic materials like chlorates and perchlorates, ammonium nitrate.

Radioanalytical Methods: Definition and measurement of radioactivity. Devices G.M counter

and scintillation counter. Radio active tracers. Typical applications of radioisotopes as tracers.

Principle and applications of Isotope dilution technique and Activation analysis.

Books Suggested

- 1) Vogel's Text book of Quantitative Inorganic Analysis
- 2) H.W. Willard, L.L. Merritt and J.A. Dean: Instrumental Methods of Analysis
- 3) F.A. Cotton, Introduction to Group Theory and Symmetry in chemistry
- 4) George Davidson Elsevier, Introductory Group Theory for. Chemists.
- 5) Gurudeepraj, Ajay Bhagi & Vinod Jain; Group Theory
- 6) H.W. Willard, L.L. Merritt and J.A. Dean; Instrumental Methods of Analysis (Affiliated east-west)
- 7) D.A. Skoog and D.M. West; principles of instrumental analysis.
- 8) J.D. Dick; Analytical chemistry. (Mc Graw Hill)
- 9) Instrumental Methods of Analysis H. Kaur

M.SC II SEM SYLLABUS
CHE-201: INORGANIC CHEMISTRY

UNIT-I: TRANSITION METAL II –COMPLEXES

15Hrs

Transition metal π – complexes with unsaturated organic molecules – alkenes, alkynes, diene, dienyl and Cyclopentadienyl complexes and arene complexes-general methods of preparation, properties, nature of bonding and structural features – Important reactions relating to Nucleophilic and Electrophilic attack on ligands and to organic synthesis

UNIT-II: ELECTRONIC SPECTRA OF COMPLEXES

15Hrs

Frank-condon principle - Russel saunders coupling - spectroscopic term symbols-selection rules - break down of selection rules- Orgel Diagrams for d^1 to d^9 configurations in octahedral and tetrahedral fields. Tanabe - Sugano diagrams of d^2 to d^8 -spectra of octahedral and tetrahedral complexes of metal ions of d^1 to d^9 configurations- calculation of Dq and B^1 parameters-charge transfer spectra. Differences between ligand field spectra and charge transfer spectra.

UNIT-III: MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEX

15Hrs

Diamagnetism and paramagnetism-orbital and spin contributions, spin-orbit coupling, Hund's third rule and Energies of J levels – Curie law and Curie – Weiss law- Ferromagnetism and antiferromagnetism – Temperature independent magnetism Magnetic susceptibility and its determination by Gouy's and Faraday methods.

Calculation of magnetic moment from magnetic susceptibility, spin-only formula, Orbital contribution to magnetic moment (Oh and Td Complexes) –Paramagnetism and crystalline fields – Ti (III), V (III), VO^{2+} , Cr (III), Mn (II), Fe (III), Co(II), Ni (II) and Cu (II). Magnetic Exchange in copper acetate and other dimers – spin cross over in complexes .

UNIT-IV: CATALYSIS

15Hrs

Homogeneous catalysis, Metal ion catalysed reactions - Redox potentials and processes - Mechanism of redox processes involving ligands- factors affecting redox potentials -other types of metal catalysed reactions-Reactions involving Ag(I), Cu(II), and Os(VIII)-Reactions of oxoanions - Factors affecting rate(General discussion only)-induced reactions- Free radical reactions-Thermal Decomposition of peroxy disulphate- Fe(III)- S_2O_8 reactions- chain reactions-HBr reactions, H_2O_2 - S_2O_8 reactions.

Books Suggested

1. Inorganic Chemistry principles of Structure and Reactivity 6th Edition. James E. Huheey.
2. Organometallic Chemistry: R.C.Mehrotra and Singh.
3. R. S. Drago: Structural methods in Inorganic Chemistry.
4. H. H. Willard, L. L. Merritt, Jr., J. A. Dean and F. A. Settle, Jr.: Instrumental Methods of Analysis (CBS Publishers).
5. R. L. Carlin: Magnetic Chemistry. R. L. Datta and A. Syamal: Elements of Magnetic Chemistry.

CHE-202: ORGANIC CHEMISTRY-II

UNIT-I: ELIMINATION REACTIONS & ESTERIFICATION

15Hrs

i. Elimination reactions: Types of elimination reactions, mechanisms, stereochemistry and Orientation, Hofmann and Saytzeff rules, *syn* elimination versus *anti*-elimination, competition between elimination and substitution, Factors influencing elimination and substitution reactions, dehydration, dehydrogenation, dehalogenation, decarboxylative elimination, pyrolytic elimination, molecular rearrangement during elimination, Fragmentation reactions.

ii. Esterification and hydrolysis: mechanism of hydrolysis of esters, amides and acyl halides, Esterification of acids and *trans* esterification.

UNIT-II: STEREOCHEMISTRY-2

15Hrs

Geometrical isomerism: E,Z-Nomenclature, Physical and Chemical methods of determining the configuration of geometrical isomers, stereoisomerism in cyclic compounds.

Conformational analysis; conformation of acyclic molecules – alkanes, substituted alkanes- compounds having intramolecular hydrogen bonding, ethylene glycol, butane 2,3 diol, amino alcohols, halohydrin.

Conformations of cyclohexane-mono and di substituted cyclohexanes, cyclohexenes and cyclohexanone. stereochemistry of decalins and decalones, effect of conformation on reactivity.

Conformational effects on stability and reactivity of cyclic and acyclic molecules, steric and stereo electronic factors – examples involving E_2 , NGP, intra molecular rearrangements and *syn* eliminations, Curtin-Hammett principle.

UNIT-III: Three And Four Membered Heterocycles

15Hrs

Nomenclature of Heterocycles: Replacement and systematic nomenclature (Hantzsch-Widman) for monocyclic compounds (Three and four membered rings).

Three and four membered heterocycles, Synthesis and reactions of aziridines, oxiranes, thiirane, azetidines, Oxetanes and thietanes.

UNIT-IV: TERPENOIDS

15Hrs

Definition, general methods of isolation, isoprene rule, special isoprene rule and classification based on isoprene rule, structure elucidation, stereochemistry, biosynthesis and synthesis of the following representative molecules; Farnesol, Zingiberene, Cadinene and Abietic acid.

Books Suggested:

1. Stereochemistry to Organic Compounds, E.L. Eliel and others, John Wiley.
2. Stereochemistry to Organic Compounds, D. Nasipuri, New Age International.

3. Stereochemistry, P.S. Kalsi, Wiley Eastern.
4. Reaction Mechanism in Organic Chemistry, P.S. Kalsi, New Age International.
5. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
6. Advanced Organic Chemistry, F.A. Carey and R.J Sundberg, Plenum.
7. Principles of Organic Synthesis, R.O.C Norman and J. M. Coxon, Blackie Academic & Professional.
8. Guide book to Organic synthesis, Michael B Smith, ELBS.
9. Heterocyclic chemistry Vol. 1-3, R.R. Gupta, M. Kumar and V. Gupta, Springer Verlag.
10. Heterocyclic Chemistry, J.A. Joule, K. Mills and G.F. Smith, Chapman and Hall.
11. Heterocyclic Chemistry, T.L. Gilchrist, Longman Scientific Technical.
12. Contemporary Heterocyclic Chemistry, G.R. Newkome and W.W. Paudler, Wiley- Inter Science.
13. New Trends in Natural Products Chemistry, Atta-ur-Rahman and M.I. Choudhary, Harwood Academic Publisher.
14. Chemistry of Organic Natural Products, O.P. Agrawal, Vols., 1 & 2, Goel

CHE-203 : PHYSICAL CHEMISTRY-II

UNIT-I: QUANTUM CHEMISTRY-II

15Hrs

Angular momentum- Generalised Angular momentum- Eigen functions and Eigen values of angular momentum, operator using ladder operators, addition of angular momentum spin, anti symmetry and Pauli exclusion principle, Slater determinant.

Electronic structure of Atoms: Russel –sanders coupling, term. Symbols, term separation energies of p^n and d^n configurations, magnetic effects: spin orbit coupling and zeeman splitting- introduction to the methods of self-consistent field.

Molecular orbital theory: Huckel theory of conjugated systems, bond order and charge density calculations, application to ethylene and cyclobutadiene.

UNIT-II

15Hrs

Surface chemistry : Surface tension, capillary action, pressure difference across curved surface, (Laplace equation), vapour pressure of droplets (Kelvin equation), Gibbs adsorption isotherm, BET adsorption isotherm, estimation of surface area (BET equation), surface films on liquids, concepts of electric double layer model - Helmholtz, Perrin, Guoy- Chapman and Stern models (no derivation)

Micells: Surface active agents, classification of surface active agents, micellisation, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of Surfactants, thermodynamics of micellisation, reverse micelles.

UNIT-III

15Hrs

Classical Thermodynamics: Fugacity and its determination, partial molar properties, chemical potential, Derivation of Gibbs- Duham's equation. significance of partial molar properties, Determination of partial molar volume.

Statistical Thermodynamics: concept of distribution, thermodynamic probability and most probable Distribution-Ensemble averaging, postulates of Ensemble averaging, - canonical, grand canonical, and micro - canonical ensembles, partition functions- translational, rotational, vibrational and electronic partition functions, calculation of thermodynamic properties in terms of partition functions - Heat capacity, chemical equilibria and equilibrium constant in terms of partition functions Entropy of Mono atomic Gases (Sackur-Tetrad equation).

UNIT-IV: ELECTRO CHEMISTRY-II

15Hrs

Irreversible electrode phenomenon; Reversibility and irreversibility, Dissolution and deposition potentials, Decomposition voltage, over voltage, diffusion over voltage, charge transfer over voltage, reaction over voltage. concentration over voltage, hydrogen and oxygen over voltages, Tafel plots, Exchange current density and transfer coefficient, Butler- volmer equation for one electron transfer processes.

Polarography: Theory of polarography, diffusion current, ilkovic equation for half wave potentials for reversible system when oxidant alone, reductant alone and both are present.

Books Suggested

1. P.W. Atkins: Physical Chemistry (ELBS).
2. A.K. Chandra: Introduction to quantum Chemistry (Tata Mc Graw Hill).
3. Ira N. Levine: Quantum Chemistry (Prentice Hall).
4. R. Mcweeny: Coulson's Valence (ELBS).
5. J.O.M. Bockris and A.K.N. Reddy, Modern Electrochemistry, vol. I & II (Plenum).
6. S. Glasstone; An Introduction to Electrochemistry (3rd ed.) (Affiliated East-West).
7. V. Moroi: Micelles, theoretical and applied aspects (Plenum).
8. S. Glasstone: A text Book of physical Chemistry (2nd Ed.) (Macmillan).
9. Maron and prutton: principles of physical Chemistry.
10. Silbey, Alberty, Bawendi. Physical Chemistry. Jhon-Wiley & Sons. 4th edition-2006.
11. V.S. Bagotsky. Fundamental of Electrochemistry. Jhon Wiley & sons. 2nd editions-2006.
12. Jack Simons. An Introduction to theoretical chemistry. The press Syndicate of the University of Cambridge.
13. D.N. Bajpai: Advanced physical Chemistry: S. Chand & Company, 1998.

CHE-204: BIO INORGANIC, BIO ORGANIC, BIOPHYSICAL CHEMISTRY AND CHEMOTHERAPY

UNIT-I: BIOINORGANIC CHEMISTRY:

15Hrs

Metal ion transport and storage in biological system, metal ions in biology, molecular mechanism of ion transport across membrane, ionophores, photosynthesis.

Hydrolytic metallo enzymes: carbonic anhydrase, carboxy peptidase, calcium in control process, calcium and muscle construction, calcium and secretion, calcium in blood clotting mechanism, Therapeutic uses of enzymes.

Importance of trace metals in biology: metal ions as chelating agents in medicine, trace metal ions, metal and nonmetal deficiency. metal chelates as anti microbial agent, metal complexes as anti tumour agents.

UNIT-II: BIO ORGANIC CHEMISTRY:

15Hrs

a) Carbohydrates and lipid: Structure and biological functions Of mucopolysacharides, glycoproteins and glycol lipids, role of sugars in biological recognition, blood group substances .

b) Fatty acids: Essential fatty acids-structure and function of triglycerol, glycerophospho lipids, cholesterol, bile acids, prostaglandins-composition and functioning of lipoproteins. properties of lipids. Aggregates- liposomes and their biological functions.

UNIT-III : BIO PHYSICAL CHEMISTRY

15Hrs

Standard free energy change in biochemical reactions, exergonic and endergonic reactions, hydrolysis of ATP, thermodynamics of biopolymer solutions ,chain configuration of bio polymers, statistical distribution of end to end dimensions, calculation of average dimensions, Membrane equilibrium, Ion transport through cell membrane. Structure and functions of proteins, enzymes DNA and RNA in living systems, forces in biopolymer interactions, electrostatic forces, hydrophobic forces, molecular expansion.

UNIT-IV: ANTIMALARIALS AND ANTI BIOTICS

15Hrs

Chemotherapy: Structure activity relationship

Antimalarials: synthesis and activity of quinolene groups-quinine, plasmoquine and chloroquin-acridine group- quinacrine- guanidine group- paulidrine.

Antibiotics: synthesis and activity of pencillin, chloramphenicol and streptomycin - broad spectrum antibiotics- tetracyclines. novobiocin.

Books Suggested

- 1.A.L.lehniger;Principles of Biochemistry(Worth)
- 2.L.Stryer,W.H.Freeman;Biochemistry.
- 3.J.David Rawn.Neil atterson;Biochemistry.d
- 4.Voet and Voet;Bio chemistry(JOHN wiley)
- 5.E.F.Conn and P.K.stuph; outlines of Biochemistry(JOHN wiley)
- 6.I.R. FINAR VOL 1&11
- 7.Williams;An introduction of Bio INORGANIC CHEMISTRY.
- 8.Bio Physics by Narayanam
- 9.W.Cham.L.Jooly Modern Inorganic chemistry.
- 10.Burger; Medicinal chemistry.
- 11.A.Kar; Medicinal chemistry
- 12.W.O.Foye;Principles of Medicinal chemistry

M.Sc THIRD SEMESTER SYLLABUS

CHE-301-ORGANIC CHEMISTRY

UNIT-I: ADDITION REACTION

15Hrs

i. Addition to carbon - carbon multiple bonds: Mechanistic and stereo chemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio and chemoselectivity, Orientation and reactivity – Addition to cyclopropane ring, Hydrogenation of double and triple bonds, Hydrogenation of aromatic rings, Hydroboration, Michael reaction, Sharpless asymmetric epoxidation.

ii. Addition to carbon-hetero multiple bonds: Steric course of addition reactions to $C=O$ and $C=N$, Cram's rule, Aldol condensation, Claisen - Schmidt, Cannizzaro, Knoevenagel condensation, Perkin, Stobbe condensation, Mannich, Benzoin, Grignard, Wittig, Claisen-Ester condensation and Dieckmann reaction. Hydrolysis of Carbon-Nitrogen double bonds, Isocyanates and Isothiocyanates.

UNIT-II: REAGENTS IN ORGANIC SYNTHESIS

15Hrs

Use of the following reagents in organic synthesis; Anhydrous $AlCl_3$, Borontrifluoride (BF_3), N-Bromosuccinimide, Diazomethane, Dicyclohexyl carbodimide, Lead tetraacetate, Ziegler - Nattacatalyst, DDQ, Dithianes, Merrifield resin.

UNIT-III: ORGANOMETALLIC REAGENTS

15Hrs

Synthesis and application of Grignard reagents, Organo Lithium, Zinc, Copper, Mercury, Cadmium, Palladium, Rhodium and Nickel compounds in organic synthesis, Homogeneous catalytic Reactions, Hydrogenation, Hydroformylation.

UNIT-IV: ASYMMETRIC SYNTHESIS

15Hrs

Topicity, Prochirality, Pro stereoisomerism-Substrate Selectivity, Diastereo selectivity.

i. **Substrate controlled methods:** Use of chiral substrates examples.

ii. **Auxiliary Controlled Methods:** Use of chiral auxiliaries- chiral enolates, Alkylation of chiral imines- Asymmetric Diels-Alder reaction.

iii. **Reagents Controlled Methods:** Use of chiral reagents- Asymmetric oxidation- Sharpless epoxidation, Asymmetric reduction- Use of lithium Aluminium hydride and boron reagents.

Books Suggested

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John
2. Wiley. Advanced Organic Chemistry, F.A. Carey and R.J Sundberg, Plenum.

3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman. .
4. Principles of Organic Synthesis, R.O.C Norman and J.M Coxon, Blackie Academic & Professional.
5. Reaction Mechanism in Organic Chemistry, P.S. Kalsi, New Age International.
6. Principles of organometallic chemistry, P. Powell, ELBS.
7. Organo transition metal chemistry-Applications to organic synthesis, S.G. Davis, Pergmon.
- 8.Principles of organometallic chemistry, P. Powell, ELBS.
- 9.Name reactions and reagents in organic synthesis, B.P. Muway and M.G Ellord, John Wiley.
10. Stereochemistry, P.S.Kalsi, Wiley Eastern.

CHE-302- ORGANIC CHEMISTRY

UNIT-I: FIVE MEMBERED HETEROCYCLES

15Hrs

Replacement and Hantzsch-Widman nomenclature of five membered, six membered and fused heterocycles .

Synthesis and reactions of Pyrazole, Imidazole, Oxazole, Thiazole, Isoxazole and Isothiazole.

UNIT-II: Benzofused Five and Six Membered Heterocyclic Compounds

15Hrs

Fused five membered Heterocycles: Synthesis and reactions, including medicinal applications of Benzofuran, Benzothiophene, Benzopyrazole, Benzimidazole and Benzoxazole.

Six membered Heterocycles: With one Heteroatom Synthesis and reactions of Pyridine and pyrrolium salts.

With two Heteroatoms: Synthesis and reactions of Diazenes - Pyrimidine, Pyridazine and Pyrazine.

UNIT-III: SYNTHETIC POLYMERS

15Hrs

Polymer Reactions-Addition and condensation polymerization processes- Bulk, Solution, Suspension and Emulsion polymerization.

Stereospecific Polymers- Preparation and significance - classification of polymers based on physical properties-Thermoplastics-Thermosetting plastics-Fibers and elastomers- General applications.

Preparation of Polymers- Preparation of Polymers based on different types of monomers Industrial applications-olefin polymers-Diene polymers-nylons- Glyptal resins-Urea-formaldehyde, phenol-formaldehyde and melamine resins-Epoxy resins-Ion exchange resins.

CHE-303: ORGANIC SPECTROSCOPY AND ITS APPLICATIONS

UNIT-I;

15 Hrs

A. Ultraviolet and Visible Spectroscopy: Various electronic transitions (185-800 nm), effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyene, Fieser-Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic and heterocyclic compounds. Steric effect in biphenyls.

B. ORD: α -Axial halo ketone rule and octant rule - Application of these rules in the determination of absolute configuration of cyclohexanones, decalones and cholestanones.

C. Circular Dichroism Principle - positive and negative cotton effects - Absolute configuration.

UNIT-II: INFRARED SPECTROSCOPY

15 Hrs

Instrumentation and sample handling. Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, 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.

UNIT-III: NMR

15 Hrs

A. Nuclear Magnetic Resonance Spectroscopy (^1H NMR): Nuclear spin, nuclear resonance, Saturation, shielding of magnetic nuclei, chemical shifts and its measurements, factors influencing chemical shift, deshielding, spin-spin interactions, factors influencing coupling constants ' J ', classification (ABX, AMX, ABC, A_2B_2 etc.), spin decoupling, basic ideas about instrument, FT-NMR, advantages of FT-NMR.

B. Applications of ^1H NMR: Shielding mechanism, measurement of chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydes and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines and amides) chemical exchange, effect of deuteration, complex spin-spin interaction between two, three, four and five nuclei (first order spectra), virtual coupling, stereochemistry, hindered rotation. Karplus curve variation of coupling constant with dihedral angle, simplification of complex spectra, Nuclear Magnetic Double Resonance, contact shift reagents, Nuclear Overhauser effect (NOE).

C. ^{13}C NMR Spectroscopy: General considerations, chemical shift (aliphatic olefinic, alkyne, aromatic, hetero aromatic and carbonyl carbon), coupling constants, Two dimensional NMR spectroscopy- COSY, NOESY, DEPT HSQC HMBC.

UNIT-IV: MASS SPECTROMETRY

15 Hrs

Introduction, ion production, type of ionization, EI, CI, FD and FAB affecting fragmentation, ion analysis, ion abundance, mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement, nitrogen rule, isotope labeling, High Resolution Mass Spectrometry, examples of mass spectral fragmentation of organic compounds with respect to their structure determination.

UNIT-IV: OXIDATIONS AND REDUCTIONS

15Hrs

A. Oxidations:

- i. Alcohols to Carbonyl compounds- Chromium(VI) oxidants, Dimethyl sulfoxide oxidation, Periodate oxidation, Oppenauer oxidation, oxidation with Manganese dioxide, oxidation with Silver carbonate.
- ii. Alkenes to epoxides- Peroxide induced epoxidations.
- iii. Alkenes to diols- oxidation with potassium permanganate, Osmium tetroxide, prevost reaction.
- iv. Ketones to esters-Baeyer-Villiger oxidation.
- v. Oxidative bond cleavage of alkenes by transition metals.
- vi. Oxidation of alkyl or akenyl fragments- Selenium dioxide and chromium trioxide oxidations.

B. Reduction:

Reduction with Lithium Aluminium hydride, Sodium borohydride - bis-methoxy ethoxy aluminium hydride, Di isobutyl aluminium hydride. Catalytic hydrogenation - dissolving metal reduction, Non metallic reducing agents including enzymatic and microbial reduction.

Books Suggested

1. polymerchemistry-G.S.Mishra.
2. A.Text book of polymerscience.Bill mayer
3. polymerchemistry-gowrikar
- 4.Principles of Organic Synthesis, R.O.C Norman and J.M Coxon, Blackie Academic & Professional.
- 5.Heterocyclic Chemistry, T.L. Gilchrist, Longman Scientific Technical.
- 6.Contemporary Heterocyclic Chemistry, G.R. Newkome and W.W. Wiley- Inter Science.
7. New Trends in Natural Products Chemistry, Atta-ur-Rahman and M.I.Choudhary, Harwo Acaemic Publisher.
- 8.Heterocyclic chemistry Vol. 1-3, R.R. Gupta, M.Kumar and V. Gupta, Springer Verlag.
- 9.The Chemistry of Heterocycles, T. Eicher and S. Hauptmann, Thieme.
- 10.Heterocyclic Chemistry, J.A. Joule, K. Mills and G.F. Smith, Chapman and Hall.
- 11.An Introduction to the Heterocyclic Compounds, R.M. Acheson, Jonn Wiley.
- 12.Comprehensive Heterocyclic Chemistry, A.R. Katritzky and C.W. Rees, eds. Pergamon Press.
- 13.Organic Chemistry, Vol. 2, I. L. Finar, ELBS.

CHE-303: ORGANIC SPECTROSCOPY AND ITS APPLICATIONS

UNIT-I;

15 Hrs

A. Ultraviolet and Visible Spectroscopy: Various electronic transitions (185-800 nm), effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyene, Fieser-Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic and heterocyclic compounds. Steric effect in biphenyls.

B. ORD: α -Axial halo ketone rule and octant rule - Application of these rules in the determination of absolute configuration of cyclohexanones, decalones and cholestanones.

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UNIT-II: INFRARED SPECTROSCOPY

15 Hrs

Instrumentation and sample handling. Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, 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.

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15 Hrs

A. Nuclear Magnetic Resonance Spectroscopy (^1H NMR): Nuclear spin, nuclear resonance, Saturation, shielding of magnetic nuclei, chemical shifts and its measurements, factors influencing chemical shift, deshielding, spin-spin interactions, factors influencing coupling constants J , classification (ABX, AMX, ABC, A_2B_2 etc.), spin decoupling, basic ideas about instrument, FT-NMR, advantages of FT-NMR.

B. Applications of ^1H NMR: Shielding mechanism, measurement of chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydes and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines and amides) chemical exchange, effect of deuteration, complex spin-spin interaction between two, three, four and five nuclei (first order spectra), virtual coupling, stereochemistry, hindered rotation. Karplus curve variation of coupling constant with dihedral angle, simplification of complex spectra, Nuclear Magnetic Double Resonance, contact shift reagents, Nuclear Overhauser effect (NOE).

C. ^{13}C NMR Spectroscopy: General considerations, chemical shift (aliphatic olefinic, alkyne, aromatic, hetero aromatic and carbonyl carbon), coupling constants, Two dimensional NMR spectroscopy- COSY, NOESY, DEPT HSQC HMBC.

UNIT-IV: MASS SPECTROMETRY

15 Hrs

Introduction, ion production, type of ionization, EI, CI, FD and FAB affecting fragmentation, ion analysis, ion abundance, mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement, nitrogen rule, isotope labeling, High Resolution Mass Spectrometry, examples of mass spectral fragmentation of organic compounds with respect to their structure determination.

Books Suggested

1. Organic spectroscopy, W. Kemp 5th Ed, ELBS
2. Spectroscopy of organic compounds, RM Silversteen and others, 5th Ed, John Wiley
3. Spectroscopy of organic compounds, P.S. Kalsi, Wiley, 1993.
4. NMR in chemistry-A multi nuclear introduction, William Kemp, Mc Millan, 1986.
5. Spectroscopic methods in Organic chemistry, DH Williams & I Flemmi, TMH. 2005.

CHE-304 –GENERAL CHEMISTRY

UNIT-I: VITAMINS AND PROSTAGLANDINS

15 Hrs

Vitamins: Structure, synthesis and importance of vitamin B₁, vitamin B₂, vitamin B₆, vitamin B₁₂ (synthesis not expected), vitamin E and vitamin K.

Prostaglandins: Nomenclature, Classification, Synthesis, Biosynthesis and mode of action of PGE₁, PGE₂, PGE₃ (Primary prostaglandins)

Stereochemical structures, Biosynthesis and mode of action of PGF₁, PGF₂, PGD₁, PGD₂, PGD₃, Thromboxane A₂, Prostacyclin (synthesis not expected).

UNIT-II: ENZYMES AND ENZYME INHIBITION

15 Hrs

Definition, History, and Classification of Enzymes - Enzyme inhibition – Kinetic Theories of enzyme inhibition- Stereoselectivity in enzyme catalyzed reactions - Factors affecting enzyme catalyzed reactions - Enzyme inhibition as a tool for drug development.

i) **Reversible inhibition** (Folate synthetase - Methotrexate, PG synthetase – Aspirin).

ii) **Irreversible inhibition**- DHF reductase - Sulphonamides, Acetylcholine esterase -Parathion). Immobilized enzymes: Design and construction of novel enzymes.

UNIT-III: DRUG DISCOVERY AND PRINCIPLES OF DRUG DESIGN:-

15 Hrs

Introduction to drug discovery, folklore drugs, Natural products as lead structures in drug discovery, structure pruning technique in modifications (e.g.morphin) serendipitous discovery of leads (e.g.pencillin). Drug targets and receptor theory . Agonists, Antagonists and enzyme inhibitors. Discovery of lead structure from natural hormones and neuro transmitters. existing drugs has leads (me to drugs). principles of designing in agonists (e.g.salbutamol), antagonists (e.g.cimetidine) and enzyme inhibitors (e.g.captopril), principles of prodrug design.

UNIT-IV MODERN SEPERATION METHODS:

15Hrs

GAS LIQUID CHROMATOGRAPHY: Gas liquid chromatography instrumentation, (columns and detectors), retention time, and retention volume. chromatographic behavior of solutes, column efficiency and resolution. column process and band broadening, time of analysis and resolution. quantitative determinations. Vandeemter equation.

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY: Theory and instrumentation-column performance, gradient elution delivery system, sample introduction, separation, column detectors.

Books Suggested

1. I.R. FINAR; A. Text book of organic chemistry. Vol & 11
2. Burger Medicinal chemistry.
3. A. Kar Medicinal chemistry
4. W.O. FOYE; Principles of Medicinal chemistry.
5. Wilson, Gijvold & Dorque text book of organic and medicinal and pharmaceutical chemistry
6. A. MITRA; synthesis of prostaglandins.
7. WOGNER; vitamins and coenzymes.
8. WILLIAM; Introduction to the chemistry of enzyme action.
9. C.J. GRAY; Enzyme catalysed reactions.
10. H.H. WILLARD, L.L. Merit, jr, J.A. Dean and F.A. Settle, jr; Instrumental methods Analysis (CBS publishers).
11. ANALYTICAL Chemistry, SKOOG, WEST, HOLAR, 7th edition.
12. Instrumental methods of chemical analysis, G.E. EVING, 5th edition.
13. Instrumental methods of chemical analysis, Willard, merit, Dean, stella jr 6th edition.
14. Instrumental methods of chemical analysis.

CHE-401- ORGANIC SYNTHESIS-I

UNIT-I: CHEMISTRY OF ORGANO BORON, PHOSPHORUS, SULFUR AND SILICON REAGENTS

15 Hrs

Electronic structure and bonding in boron, Phosphorus, sulphur and silicon compounds - Their reactivity and applications in Organic Synthesis.

Boron Reagents: Hydroboration, Oxidation, Isomerization of organoboranes, Carbonylation of organo boranes – primary, secondary, tertiary alcohols, carbonyl compounds – Reaction of organo boranes with diazoester, α -halo ketones, α -halo esters – Synthesis of alkenes - Free radical reactions of organo boranes.

Phosphorus Reagents: Formation of carbon-carbon double bonds - functional group transformations – deoxygenation reactions - reactivity as electrophiles and nucleophiles - reactions of quaternary phosphonium compounds.

Sulphur Reagents: Sulphur ylides, stabilized and non-stabilized - Preparation and reactivity - sulphonyl carbanions.

Silicon Reagents: Peterson's olefination, influence of trialkyl silyl reagents in electrophilic reactions, reactivity of aryl silanes, alkenyl silanes, allyl silanes.

UNIT-II: REARRANGEMENTS

15 Hrs

Rearrangements involving electron deficient carbon: Pinacol-Pinacolone rearrangement, Wagner-Meerwein rearrangement, Demjanov rearrangement, Dienone-Phenol rearrangement, Wolff rearrangement.

Rearrangements involving electron deficient nitrogen: Beckmann rearrangement, Hofmann rearrangement, Curtius rearrangement, Schmidt rearrangement, Lossen rearrangement.

Rearrangements involving electron deficient oxygen: Baeyer-Villiger rearrangement, Dakins rearrangement, Benzilic acid rearrangement, Favorskii rearrangement, Neber rearrangement.

Aromatic rearrangements: Fries rearrangement, Claisen rearrangement.

UNIT-III: NEWER METHODS IN ORGANIC SYNTHESIS

15 Hrs

Phase Transfer Catalysis: Solid-Solid, Solid-Liquid systems-Mechanism of catalytic action, types of catalysts, application in few important reactions.

Enamine Mediated Reactions: Formation, role of enamines as synthons for the synthesis of Organic Molecules.

Microwave induced reactions: Principle, conditions, advantages over conventional heating methods-Applications.

Ionic Liquids: Definition of ionic liquid, synthesis, and its applications.

UNIT-IV: PERICYCLIC REACTIONS -1

15 Hrs

Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3 butadiene, 1,3,5-hexatriene and allyl system. Classification of pericyclic reactions. Woodward-Hoffmann correlation diagrams. FMO and PMO (Möbius Hückel) approach.

Electro cyclic reactions- Conrotatory and disrotatory. $4n$, $4n+2$ and allyl systems.

Books Suggested

1. Principles of Organometallic chemistry, P. O'Neil, ELBS.
2. Organotransition metal chemistry-Applications to organic synthesis, S.G. DAVIS PERGAMON.
3. Advanced organic chemistry, reaction mechanisms and structure J. MARCH, JOHN WILEY.
4. Modern synthetic reactions, H.O. HOUSE, W.A. BENJAMIN.
5. Name reactions and reagents in organic synthesis, B.P. MUWATY and M.G. ELLORD, JOHN WILEY.
6. Principles of organic synthesis, R. NORMAN and J.M. COXON, BLACKIE Academic and professional.
7. Organic synthesis, R.E. Ireland, Prentice Hall.
8. Guide book to organic synthesis, R.K. Mackie and D.N. Smith, ELBS.
9. A Text book organic chemistry I.R. FINAR. VOL-2, ELBS.
10. Newer methods of Organic synthesis by V.K. Ahluwalia

CHE-402: ORGANICSYNTHESIS -II

UNIT-I: DESIGNING OF ORGANICSYNTHESIS-1

15Hrs

Disconnection Approach: Classification of organic reactions. Functionalisation and interconversion of functional groups, formation of carbon-carbon single and double bonds, general strategy, disconnection and synthon approach, retrosynthetic analysis, key intermediates and starting materials in designing a synthesis, linear and convergent synthesis, one group C-X and two group C-X disconnections, chemoselectivity, reversal of polarity, cyclization reactions, amine synthesis.

- a. Protecting Groups:** Principles of protection of alcohol, amine, carbonyl and carboxyl groups.
- b. One Group C-C Disconnections:** Alcohols and carbonyl compounds, regioselectivity. Alkene synthesis, use of acetylenic compounds in organic synthesis.
- c. Two Group C-C Disconnections:** Diels-Alder reaction, 1,3-difunctionalised condensations, unsaturated carbonyl compounds, control in carbonyl condensations, 1,5-difunctionalised compounds, Michael addition and Robinson annulation.

UNIT-II: DESIGNING OF ORGANICSYNTHESIS -2

15Hrs

UNIT-II: DESIGNING OF ORGANICSYNTHESIS -2

15Hrs

- a. Protecting Groups: Principles of protection of alcohol, amine, carbonyl and carboxyl groups.
- b. One Group C-C Disconnections: Alcohols and carbonyl compounds, regioselectivity. Alkene synthesis, use of acetylenic compounds in organic synthesis.
- c. Two Group C-C Disconnections: Diels-Alder reaction, 1,3-difunctionalised condensations, unsaturated carbonyl compounds, control in carbonyl condensations, 1,5-difunctionalised compounds, Michael addition and Robinson annulation.

UNIT-III: PHOTOCHEMISTRY

15 Hrs

Photochemical energy, Frank-Condon principle, Jablonski diagram, singlet and triplet states, dissipation of photochemical energy, photosensitization, quenching, quantum efficiency and quantum yield. Photochemistry of carbonyl compounds $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transitions. Norrish type-I and Norrish type-II cleavages. Paterno-Buchi reaction, Photo reduction, photochemistry of enones - hydrogen abstraction, rearrangements of α , β -unsaturated ketones and cyclo hexadienones, photochemistry of p-benzoquinones.

Photochemistry of unsaturated systems (olefins), cis-trans isomerization, dimerization, hydrogen abstraction and additions (acetylenes)- dimerization.

Dienes - photochemistry of 1,3-butadienes, (2+2) additions leading to cage structures, photochemistry of cyclohexadienes, photochemistry of aromatic compounds, excited state of benzene and its 1,2-, 1,4- additions, photo substitution reactions of benzene derivatives, Photo-Fries rearrangement, photo-Fries reactions of anilides,

Photolysis of nitric esters – Hoffmann-Loeffler-Freytag reaction and Barton reaction.

UNIT-IV: PERICYCLIC REACTIONS -2

15 Hrs

Cyclo additions-antarafacial and suprafacial additions, $4n$ and $4n+2$ systems, 2+2 addition of ketene, 1,3 dipolar cycloadditions and cheletropic reactions of dienes, trienes and simple alkenes. diels alder reaction and stereochemistry and regio chemistry of diels alder reaction.

Sigmatropic rearrangements - Suprafacial and antarafacial shifts of H, Sigmatropic shifts involving carbon moieties, 3,3 and 5,5 sigmatropic rearrangements. Claisen, Cope and Oxy-Coperearrangements, Ene reaction.

Books Suggested

- 1.Designing organic synthesis.S.WARREN.WILEY.
- 2.organic synthesis-concept,Methods,AND Starting materials,J.FUHRHOP, and G.Perzillin,verlage VCH.
- 3.Principles of organic synthesis,R.O.C.NORMAN&J.M.COXON,3rd Edition.
- 4.the logic of chemical synthesis,E.J.COREY and X-CHANG
- 5.Fundamentals of photochemistry.K.K.Raotagi-Mukhergi, Wiley-Eastern.
6. Essential of s of Molecular photochemistry,A..Gilbert, AND Jj.Baggat Blackwell scientific publications.

7. Molecular photochemistry, N.J. TURRO, W.A. Benhamin.
8. photochemistry R. P. Kundall and Gilbert, Thomson Nelson.
9. Introductory photochemistry, A. COX. and T. Camp, Mc Gra Hill.
10. Organic photochemistry, J. COXON and B. Halton, Cambridge University.
11. organic chemistry, paula yurkanis Burice, printice Hall.
12. organic chemistry, L.G., Wade, printice Hall.
13. A. Primer to mechanism in organic chemistry, pete sykes, PSN Education.
14. Mechanism and Theory in organic chemistry Thomas HLOWry, Addison wesly Longman.
15. Introduction to organic chemistry, Andrew streitwieser and Elaton H. Heath cock, Prince Hall.
16. Advanced organic chemistry; Reactions and Mechanisms, Bernord Miller;

CHE-403-CHEMISTRY OF NATURAL PRODUCTS

UNIT-I: STERIODS AND HARMONES

15Hrs

Occurrence, Nomenclature, Basic skeleton, Diel's hydrocarbon and Stereochemistry, Isolation, structure determination and synthesis of cholesterol, Bile acids, Androsterone, Testosterone, Estrone, Progesterone, Biosynthesis of Steroids.

UNIT-II: ALKALOIDS

15Hrs

Occurrence, isolation, general methods of structure elucidation and physiological action, degradation, classification based on nitrogen heterocyclic ring, structure, stereochemistry, synthesis and biosynthesis of the following ; Atropine, Papavarine and Quinine.

UNIT-III: Peptides And Proteins

15 Hrs

Peptides and proteins- Methods of peptide synthesis, solid phase peptide synthesis- sequence determination- N-terminal and C-terminal determination, structure of oxytocin, proteins-classification, properties, structure – primary, secondary, tertiary and quaternary — conformation.

UNIT-IV: FLAVANOIDS AND ISOFLAVONOIDS

15Hrs

Occurance, Nomenclature and general methods of structure determination, isolation and synthesis of Apigenin, Luteolin, Kampferol, Quercetin, Butein, Daidzein, Biosynthesis of Flavonoids and Isoflavonoids- Acetate pathway and Shikimic acid pathway, Biological importance of Flavonoids and Isoflavonoids.

Books Suggested

1. Natural products; chemistry and Biological significance, J.Mann, R.S, Davidson, Hobbs, D.V. Bantroppe and J.B. Harbome, Longman, Essex.
2. Organic chemistry, Vol 1, 2I.L.FINAR, ELBS.
3. Stereoselective synthesis; A. Practical Approach. m. nogradi. VCH.
4. Chemistry, Biological and pharmacological properties of medicinal plants from Americas, .kurthostettman, M.P. Gupta and Marston, Harwood Academy publishers.
5. Introduction to FLVANOIDs, T.A, Geissman.
6. New Trends in Natural products chemistry, Atta-ur-Rahman and M.I. chowdary Harwood publisher.
7. Principles of organic synthesis. R.O.C. NORMAN and J..M. COXON, ELBS.
8. Chemistry of Natural products P.s. Kalsi. kalyani publishers.
9. Biosynthesis of steroids, terpenes and acetogenins, J.H. Richards j.r. Hendrieson.
10. The bio synthesis of secondary metabolites, R.D. Herbert, chapman and Hall.
11. Chemistry of organic Natural products, O.P. AGARWALL, VOL 1&2. GOEL Pubs.
12. Natural products of Chemistry. K.B. GTorsell. john wiley, 1983
13. The biosynthesis of secondary Metabolites, R.D. Herbert, second edi chapman and Hall 1984.

CHE-404 –GREEN CHEMISTRY

UNIT-I: GREEN CHEMISTRY-I

15 Hrs

Introduction, principles, atom economy and scope, inception to green chemistry, introduction to alternative approaches,

solvent free reactions at room temperatures

Introduction, solvent free techniques-reactions on solid mineral supports, solid liquid phase transfer catalysts-reactions without solvent support or catalyst.

Examples for green reactions. Hoffmann Elimination, esterification reactions, Diels alder reaction.

UNIT-II: MULTISTEP SYNTHESIS

15 Hrs

Multistep synthesis of some complex naturally occurring compounds involving through retrosynthetic analysis and control of stereochemistry: Taxol, Juvabione, Fredericamycin- A.

UNIT-III: NANOMATERIALS

15 Hrs

UNIT-III: NANOMATERIALS

15 Hrs

introduction to nano particles. preparation of nano particles. a) physical/aerosol methods, vapour condensation method, spray pyrolysis b) chemical methods, sol-gel, micelles/reverse microemulsion method.

Characterization of nano particles using powder x-ray diffraction, scanning electron microscope and transmission electron microscope. optical and electrical properties of nano particles.

Reduced dimensionality in solids, zero dimensional systems, fullerenes, quantum dot. one dimensional systems, carbon nano tubes, electric, mechanical and other properties of carbon nano tubes.

Applications of nanoparticles, photo catalysis, laser and light emitting diodes optical band gap materials.

UNIT-IV NUCLEIC ACIDS AND NUCLEOTIDES:-

15 Hrs

NUCLEIC ACIDS:-

DNA and RNA, structure and conformation, purine bases, pyrimidine, guanine, cytosine, uridine,

STRUCTURE OF NUCLEOTIDES :- adenylic acid (AMP), uridylic acid (UMP), cytidylic acid (CMP) and guanylic acid (GMP). thiamine acid (TMP)

structure and conformation protein synthesis, replication, transcription, translation of genetic material, genetic code, gene expression, gene mutation,

Books Suggested

1. Applied chemistry-11, V.M. Balsaraf.
2. A. Text book organic chemistry; I.R. FINAR. VOL-2, 1. elbs.
3. A. Lehniger; principles of biochemistry. (Worth)
4. Stryer, W.H. Freeman; Biochemistry.
5. Voet and Voet; Biochemistry. (John Wiley)
6. Green chemistry theory and practice; Paul T. Anastas. John C. Warner.
7. Green chemistry; An introductory text; Mike Lancaster.
8. Green Chemistry Fundamentals and Applications, Editors: Suresh C. Ameta, PhD, Rakshit Ameta, PhD, ISBN: 9781926895437
9. *Green Chemistry: Theory and Practice*, Paul T. Anastas, John C. Warner, Oxford University Press, ISBN-13 978-0-19-850698-0, first published in 1998, and now as paperback in 2000
10. *Green Chemistry: Porter*
11. *Green Chemistry by: V.K. Ahluwalia*.

M.Sc., DEGREE EXAMINATIONS -2013

MODEL QUESTION PAPER

TIME: 3Hours

Max.Marks: 70

SECTION-A

Answer answer any SIX questions . Each question carries 5 marks.

6x5 = 30 M

- 2 questions from unit -1
- 2 questions from unit -2
- 2 questions from unit -3
- 2 questions from unit -4

SECTION-B

Answer 4 questions choosing one question from each unit .Each question carries 10 marks.

4x10=40M

- 2 questions from unit -1
- 2 questions from unit -2
- 2 questions from unit -3
- 2 questions from unit -4

FIRST SEMESTER AND SECOND SEMESTER PRACTICALS

(For students admitted from 2010-2011)

(NOTE: Practical examinations at the end of the II semester)

CHE-205: INORGANIC CHEMISTRY PRACTICALS

1. Semi micro qualitative Analysis; Qualitative Analysis of a mixture containing four cations including two less common cations (viz., W, Mo, Se, Te, V, Ce, Th, Zr, Li and U).
2. Quantitative Analysis; Analysis of two component mixtures

(The determination involves a single component after separating the one components from a two components mixture)

- i) copper, Nickel and Zinc. ii) calcium, Magnesium and iron.
- ii) Iron, Aluminium and Titanium, iv) copper, Iron and zinc.

CHE-206: ORGANIC CHEMISTRY PRACTICALS

1. The systematic qualitative analysis of unknown organic compound (acid, base, phenol, aldehyde, ketone, ester, hydrocarbon, carbohydrate)
2. Single step preparations.
 - 1) preparation of p-nitro acetanilide,
 - 2) Preparation of p-bromo acetanilide
 - 3) Preparation of acetyl salicylic acid (Aspirin)
 - 4) cannizaro reaction
 - 5) preparation of p-Nitro aniline
- 3) systematic qualitative analysis of unknown organic mixture containing two components.
 - 1) Acid + Neutral. 2) Base + Neutral. 3) phenol + neutral, 4) Neutral + Neutral

CHE-207: PHYSICAL CHEMISTRY PRACTICALS

1. Calibration of volumetric apparatus and statistical analysis of the data.
2. Determination of critical solution temperature of phenol-water system and study the effect of electrolyte on C.S.T.
3. Determination of Eutectic composition and temperature of binary system.
4. Determination of distribution coefficient of benzoic acid between water and benzene.
5. Study the adsorption of acetic acid on charcoal and analysis of the data on the basis of Langmuir and Freundlich adsorption isotherms.
6. Determination of rate constant of acid hydrolysis of an ester and investigate the effect of catalyst concentration, reactant concentration and temperature.
7. Determination rate constant of oxidation of iodide ion by persulphate ion.

8. Conductometry:

- a) Determination of cell constant.
- b) verification of onsagar equation
- c) Determination of dissociation constant of a weak acid
- d) Titration of a strong acid with a strong base
- e) Titration of a weak acid with a strong base

9. Potentiometry:

- a) Titration of a strong acid with a strong base
- b) Titration of weak acid with a strong base
- c) Titration of ammonium ferrous sulphate with potassium dichromate
- d) Titration of KCl with AgNO_3

III-SEMESTER AND IV –SEMESTER PRACTICALS

(For the students admitted from 2010-11)

(NOTE: practical examinations at the end of the IV semester)

ORGANIC CHEMISTRY PRACTICALS

CHEOC-405: PRACTICAL-I

Preparations

- 1) preparation of benzilic acid
- 2) preparation of benzanilide
- 3) preparation o-chloro benzoic acid
- 4) preparation of symmetric tri bromo benzene
- 5) preparation of anthrone

Isolation of caffeine in tea leaves . β - carotin in carrots,Eugenol in cloves analysis by chromatography techniques.

CHE OC-406: PRACTICAL-II

Estimations

- 1) Estimation of phenol
- 2) Estimation of glucose
- 3) Estimation of primary amine
- 4) Estimation of hydroxyl group
- 5) Estimation of aspirin
- 6) Estimation of Acetone by iodine method.
- 7) Estimation of ketone by oxime method.
- 8) Estimation of % purity of a paracetamol.

CHE OC-407: PRACTICAL-III

Spectral identification organic compounds UV, IR, NMR, and MASS