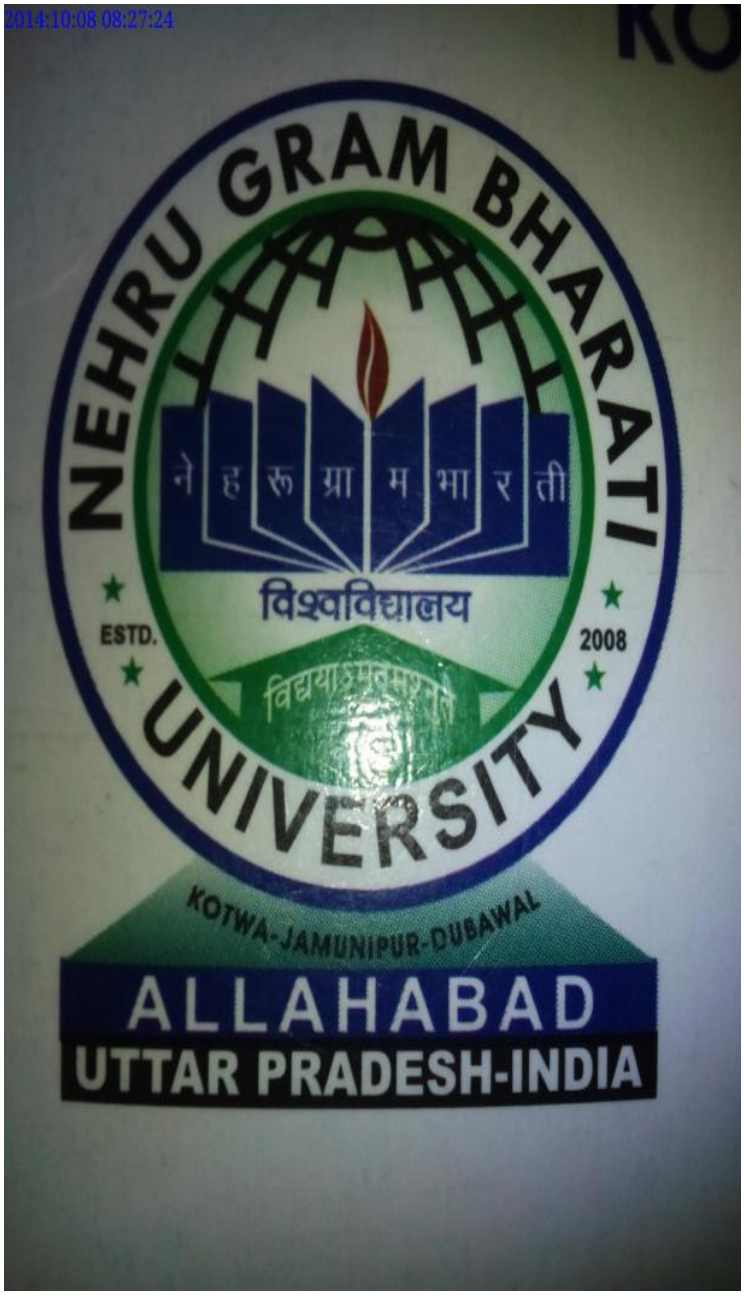
CHEMISTRY SYLLABUS (2016)



CHEMISTRY SEMESTER I

Course	Max Marks	Title	Total lectures/Periods	No of periods per weeks	Credits
CHE101C	100	Core paper	40	3	3
CHE102C	100	Core paper	40	3	3
CHE103C	100	Core paper	40	3	3
CHE104C	100	Core paper	40	3	3
CHE105L	100	Chemistry lab1		6	6

CHEMISTRY SEMESTER II

Course	Max Marks	Title	Total lectures/ Periods	No of periods per weeks	Credits
CHE201C	100	Core paper	40	3	3
CHE202C	100	Core paper	40	3	3
CHE203C	100	Core paper	40	3	3
CHE204C	100	Core paper	40	3	3
CHE205L	100	Chemistry lab2		6	6

CHEMISTRY SEMESTER III

Course	Max Marks	Title	Total lectures/ Periods	No of periods per weeks	Credits
CHE301C	100	Special paper	40	3	3
CHE302C	100	Special paper	40	3	3
CHE303C	100	Special paper	40	3	3
CHE304S	100	Elective Paper	40	3	3
CHE305L	100	Chemistry lab		6	6

CHEMISTRY SEMESTER IV

Course	Max Marks	Title	Total lectures/ periods	No of periods per weeks	Credits
CHE401C	100	Special paper	40	3	3
CHE402C	100	Special paper	40	3	3
CHE403C	100	Special paper	40	3	3
CHE404P	100	PROJECT	40	3	3
CHE405L	100	Chemistry lab		6	6

CHEMISTRY SYLLABUS

Course Code-CHEM 101 **Credit - 3**

SEMESTER-1

CHEMISTRY PAPER-1

INORGANIC CHEMISTRY

Unit 1. Chemical Bonding- Molecular orbital theory for polyatomic molecules multicenter bonding, bonding in election deficient molecules. Weak interactions-hydrogen bonding, van-der Waals forces: dipole, dipole induced dipole and London dispersion forces.

Unit 2. Metal-Ligand Bonding- Limitation of crystal field theory, molecular orbital theory, octahedral, tetrahedral and square planar complexes, -bonding and molecular orbital theory.

Unit3.Molecular Symmetry- Symmetry elements and operations, multiplication of symmetry operations, symmetry groups, symmetry considerations in H_2O,CO_2, NH_3, H_2O_2,BCl_3,SiF_4,XeF_4, PCl_5.

Unit 4.Solid State- Theory of metals-free electron, valence bond and molecular orbital theories. Conductors, insulators and semi-conductors. Super conductivity. Alloys and intermetallic compounds. Hume-Rothery rules. Lattice defects in ionic crystals-stoichiometric and non-stoichiometric defects.

Unit 5.Coordination Chemistry- Theories of the co-ordinate linkage: Valence bond, crystal field, ligand field and molecular orbital theories. Crystal field splitting of d-orbitals in octahedral, trigonal bipyramidal, sqarue pyramidal, tetragonal and square planar fileds. Crystal field stabilization energy (CFSE). M.O. energy level diagram for octabedral and tetrahedral complexes (with s bonding only). Spectrochmical series. Electronic absorption spectra of transition metal complexes. Orgel diagrams for d^1,d^4, d^5, d^6, and d^9 configuration with D group state. Jhn-Teller effect. Stabilization of less familiar oxidation states of transition metals via coordination.

Book Recommended

1. **F.A. Cotton and G. Wilkinson Advanced Inorganic Chemistry, 6th Edn. (1999), John Wiley & Sons, New York.**

2. **J.E. Huheey, E.A. Keiter and R.L. Keiter, Inorganic Chemistry, 4th Edn. (1993), Addison-Wesley Pub. Co., New York.**

3. **R. S. Drago, Physical Methods in Inorganic Chemistry, International Edn. (1971),Affiliated East-West Press, New Delhi.**

4. **Keith F. Purcell and John C. Kotz, Inorganic Chemistry, W. B. Sauders Com. (1987), HongKong.**

5. **K. Veera Reddy, Symmetry and Spectroscopy of Molecules, New Age International Pvt.Ltd., New Delhi (1999).**

6. **B.N. Figgis, Introduction to Ligand Fields, Wiley Eastern Ltd. New Delhi (1976).**

Course Code-CHM 102 **Credit - 3**

SEMESTER-1

CHEMISTRY PAPER-2

ORGANIC CHEMISTRY

Unit 1. NATURE OF BONDING IN ORGANIC MOLECULES

cross conjugatiopn,Steric inhibtio nf resonance ,bonding in fullerence.Aromaticity in *Benzenoid and non benzenzoid compounds , alternant non-alternant hydrocarbons, huckle rule ,energy level of p-molecular orbitals , annulenes, anti-aromaticity,homo-aromaticity,PMO approach.*

Unit 2 ***Reaction mechanism : structure and reactivity***

Types of mechanisms types of reactions thetmodynamic and kinetic requirements kinetic and thermodynamic control hammond's postulate curtin-hammett principle potential energy diagrams transition states and intermediates methods if determining mechanisms isotope effects (product analysis : kinetic and stereo chemical studies).

Generation structure stability and reactivity of carbocations carbanions free radicals carbenes and nitrenes

Effect of structuew on reactivity-reasonance and field effects steric effect quantitative treatment the hammett equation and linear free energy relationhip substituent and reaction constants taft equation

Unit *3*.*Stereochemistry*

Conformational analysis of cycloalkanes-disubstituted cyclohexanes decalins effect of conformation on reactivity conformation of sugars

Elements of symmetry chirality molecules with more than one chiral center threo amd erythro isomers methods of resolution optical purity enantiotopic and diasterotopic atoms group and faces stereosepecific and stereoselective synthesis asymmetric synthesis optical activity in the absence of chiral carbon (biphenyls allenes and spiranes) chirality due to helical shape

Unit *4. Aliphatic nueleophilic substitution*

The sn2,sni and sn2 and set mechanisms.

The neighbouring group mechanism neighbouring group participation by P and S bonds anchimeric assistance.

Classical and nonclassical carbocations, phenonium ions norgornyl system common carbocation rearrangement. The S_ni mechanism.

Nucleophilic substitution at an allylic aliphatic trigonal and vinylic carbon Reacivity effects of substrate structure attacking nucleophile leaving group and reaction medium phase transfer catalysis ambident nucleophile and regioselectivity.

Unit 5. Aliphatic Electrophilic Substitution

Bimolecular mechanisms,-S_e2 and S_e1. The S_e1 mechanism, electrophilic substitution accompanied by double bond shifts. Effect of substrates, leaving group and the solvent polarity on the reactivity.

Aromatic Electrophilic Substitution

The arenium ion mechanism, orientation and reactivity energy profile diagrams The orthi/para ratio ipso attack Diazonium coupling Vilsmeier reaction Gatterman-Koch reaction.

Practical

1.Identification of various compounds with different functional groups
-Acids, carbohydrates, phenols, aldehyde, ketones, amides and hydrocarbons

Books Recommended

1. Organic chemistry by Morrison and Boyd
2. A logical approach to modern organic chemistry-Jagdamba Singh and Anand Vardhan
3. Advanced Organic Chemistry Reaction, Mechanism and structure – Jerry March
4.Advanced organic chemistry by Jagdamba Singh and L.D.S Yadav Pragati Publication

5. A Guidebook to mechanism in Organic Chemistry-Peter Sykes

Course Code-CHM 103 **Credit - 3**

SEMESTER-1

CHEMISTRY PAPER-III

PHYSICAL CHEMISTRY

Unit 1.Molecular Spectra- Basic concepts of molecular spectroscopy Classification of spectra. Characterization of electromagnetic radiations Regions of the Sectrum.

Rotation Spectra- Rigid and non-rigid rotation spectra-selection rule Centrifugal distortion. Isotopic Shift. Spectra of polyatomic molecules. Selection rule. Effect of nuclear spin. Group frequency. Experimental techniques.

Unit 2. Vibration Rotation Spectra -

Simple harmonic oscillator. Vibrational energy. Anharmonicity. Principle of vibration-rotation spectra. Selection rule. PQR branches. Vibration in polyatomic molecules. Effect of nuclear spin. Isotopic shift. Group frequency. Experimental techniques.

Unit 3.Quantum Chemistry

Origin of quantum theory Black body radiation. Wien and Rayleigh Jeans laws. Planck's law and energy of harmonic oscillator. Postulates of quantum mechanics. Three dimensional time independent schrodinger wave equation Eigen functions and eigen values particle. Normalization and orthogonality conditions. One dimendional harmonic oscillator. Tunnel effect. Eigen function and eigen value of H-atom.(Solutions not required). Shapes of s, p and d orbitals.

Unit 4.Approximate Methods- Variation principle and its applications to ground state H-atom Radial and angular distribution curves for H-atom.

Unit 5.Thermodynamics

Nernst heat theorem and its application to non-condensed systems. Statements of the third law of thermodynamics. Derivation of unattainability of absolute zero. The relationship between entropy constant and Nerst chemical constant. Determination of entropy from the third law using the correction due to gas imperfections. Consequences of the third law (o- p-hydrogen and liquid He-ll) Verification of the third law. Applications of the third law.

Practical:-

1. To study the kinetics of decomposition of sodium thiosulphate by mineral acids
2. To study the kinetics of dissolution of Mg in dilute HCl
3. To determine the velocity constant for the hydrolysis of Methyl acetate, catalysed by hydrogen ions.
4. Determination of concentration of unknown solution using drop weight method.
5. Determination of λ **max** of $KMnO_4$ solution and findings the concentration of unknowns solutions by using absorptions photometer.
6. Determine the comparative viscosity of different liquids.
7. Determination of iron with $KMnO_4$
8. Determination of iron by $K_2Cr_2O_7$ (using external indicators)

Books Recommended:-

1. Bahel, Dubey, Nath
2. P.c. Kamboj
3. Pandey, Bajpai, Giri
4. Puri, Sharma, Pathania
5. Bahel and Tuli
6. Gurdeep Raj
7. K.L. Kapoor

Course Code-CHM 104 **Credit - 3**

SEMESTER-1

CHEMISTRY PAPER-IV

ANALYTICAL CHEMISTRY

Unit 1.Principles of volumetric methods: Acid-base redox, precipitation, compledxometric and chelatometric titrations. Theory of indictors.

Principles and scope of gravimetric methods: Precipitation equilibria, condition for analytical precipitation-co precipitation and post precipitation.

Unit 2.Data Handling:- Significant Figures, Rounding off figures. Accuracy and Precision; Standard Deviation; Fitting data to a straight line. Errors Determinate and indeterminate errors, error curves, propagation of errors.

Hydrogen ion exponent, Buffer solutions; Pseudo buffers.

Unit 3.Organic reagents in inorganic analysis: Dimethylgyoxime, Cupferron, Cupron, Salicylandoxime, a-nitroso, b-hapthol, Anthranilic acid, Acetyle acetone. Spot tests for common cations; Ringoven method.

Unit 4.Principles and scope of gravimetric methods: Precipitation equilibria, condition for analytical precipitation-co precipitation and post precipitation.

Unit 5.Chromatography: Adsorption, Partition and lon-exchange chromatography-theory and application in analytical chemistry. Measurements and significance of dissolved oxygen (DO). Biological oxygen Demand (BOD) and Chemical

Course Code-CHM 201 **Credit - 3**

SEMESTER-2

CHEMISTRY PAPER-1

INORGANIC CHEMISTRY

Unit 1Chemistry of f-Block Elements- Comparative study of lanthanides and actinides with special reference to electronic structure. Oxidatin state, coordination number, structure, stereochemistry and magnetic and spectral properties. General chemistry of actinides including E.M.F. diagrams. Extraction and metallurgy of thorium and uranium. Technical production of plutonium. Separation of transmercium elements.

Unit 2.Stability of Metal Complexes in Solution- Stepwise and overall stability constants. Thermodynamic correlations. Determination of stability constants job's method of continuous variation and mole ratio method. Factors affecting the stability constants-Chelation and its importance.

Unit 3.Inorganic Spectroscopy- (i) Number of microstates and terms symbols for gaseous free atoms and ions. Spin-orbit coupling in free ion terms. Hunds rules. Splitting of spectroscopic terms of p^2 and d^2 configurations.

(ii) Principles of Electronic Spectroscopy-Frank-Condon principle, selection rules, band intensities and vibronic coupling Bank width. Different types of electronic transitions and molar absorption coefficient.

Unit 4Soft and Hard Acids and Bases- Pearson's concept. SHAB principle and its applications. Classification f acids and bases as hard and soft; HSAB Principle, theoretical bas is of hardness and softness; Lewis-acid base

reactivity approximation; donor and acceptor number, E and E equation; application of HSAB concept

Unit 5.Metal Corbonyls and Nitrosyls Mononuclear and polynuclear corbonyls and their structures. Nature of M-C-O bonding. Preparation of metal corbonyls and their reactions. Metal nitrosyls-bonding and structure. Metal carbonyl-complexes.

Book Reconmmended

1. F.A Cotton and G Wilkinson, Advanced Inorganic Chemistry, 6th Edn. (1999), John Wiley & Sons New York.

2. James E Huheey, Inorganic Chemistry, 4th Edn. (1993) Addison-Wesley Pub. Co, New York.

3. R.S. Drago, Physical Methods in Inorganic Chemistry, International Edn. (1971), Affiliated East-West Press, New Delhi.

4. D.F. Shriver and P.W. Atkins, Inorganic Chemistry, 3rd Edn. (1999), ELBS, London.

5. D.N. Sathyanarayana, Electronic Absorption Spectroscopy and Related Techniques (2001), University Press (India) Ltd Hyderabad

Course Code-CHM 202 **Credit - 3**

SEMESTER-2

CHEMISTRY PAPER-2

ORGANIC CHEMISTRY

Unit 1- Aromatic Nucleophilic Substitution The S_nAr, S_nl benzyne and $S_{RN}l$ mechanisms Reactivity-effect of substrate structure, leaving group and attacking nucleophile. The von Richter Sommelet-Hauser and Smiles rearrangements.

Unit 2. Free Radical Reactions

Types of free radical reactions, free radical ssubstitution mechanism mechanism at an aromatic substrate neighboring group assistance, reactivity for aliphatic and aromatic substrates at a bridgehead, Reactivity in the attacking radicals. The effect of solvent on rwactivity.

Allyloc halogenations (NBS), oxidation of aldehydes to carboxylic acids, auto oxidation, couping of alkynes and arylation on aromatic compounds by diazonium salts. Sandmeyer reation. Free radical rearrangement. Hunsdiecker reaction.

Unit 3. Addition to carbon-carbon Multiple Bonds

Mechanisitc and sterochemical aspects of addition reaction involving electrophiles, nucleophies and free radicals, ragio and chemoselectivity, orientation and reactivity Addtiion to cycloprpance ring. Hydrogenation of double and triple bods, hydrogenation of aromatic rigns, Hydroboration, Michael reaction, Sharpless asymmetric epoxidation.

Unit 4. Addition to Carbon-Hetero Multiple Bonds

Mechanism of metal hydride reduction of saturated and unasaturated carbonyl compounds, acids, esters and nitriles. Addition of Grignard reagents, organozinc and organolithium ewagents to carbonyl and unsaturated carbonyl compounds Witting reaction. Mechanism of condensation reactiosn involving

enolates-Aldol, Knoevenagel Claisen, Mannich, Benzoin, Perkin and Stobbe reactions. Hydrolysis of esters and amides, ammonolysis of estters.

Unit 5. Elimination Reactions

The E_2, E_1 and E_1cB mechanisms and their spectrum, orientation of the double bond. Reactivity-effects of substrate structures, attacking base, the leaving group and the medium.Mechanism and orientation in pyrolytic elimination.Pericyclic Reactions Molecular orbital symmetry, Frontier orbitals of etyhylene, 1,3-butadiene,1,3,5-hexatriene and allyl system. Classification of pericyclic reactions, Woodwaard-Hoffmann correlation diagrams. FMO and PMO approach. Electrocyclic reactions-conrotatory and disrotatory motions, 4n,4n+2 and allyl systems. Cycloadditions-antrafacial and suprafacial additions. 4n and 4n+2systems, 2+2 addition of ketenes, 1, 3 dipolor cycloadditions and cheleotropic reactions.

1.Advaced organic Chemistry by Jagdamba Singh and L.D.S Yadav by Pragati Publication.

2.Pericycle reactions and photochemistry by Jagdamba Singh and jaya singh

New age Publication.

Course Code-CHM 203 **Credit - 3**

SEMESTER-2

CHEMISTRY PAPER-III

PHYSICAL CHEMISTRY

Unit 1.Statistical Mechanics

Quantum states and complexions. The combinatory rule. System with definite total energy. Dfegeneracy of energy levels Probability and most probable distribution. Lndistinguishability. Maxwell-Boltzmann statistics, partition function. Translational. Rotational, vibrational and elecstronic partition functions. Lnternal energy and heat capacity in terms of partition function.

Unit 2.Chemical Kinetics

Thermodynamic formulation of rate constant. Comparison of collision of absolute reaction rate theories. Calculations of transmission coefficient. Transition srtate theory in solution. Primary and secondary salt effects in the light of mechanistic tests. The theoty of absolute reactions between atoms and reactions between molecules in terms of partion function. Lnfluence of ionic strength and deielectric constant. Explosive reactions. Acid-base catalysis with special reference to protolytic and prototropic mechanisms.

Unit 3.Chemistry of Macromolecules

Lntroduction to type of polymers. Step polymerization. Kinetics of step polymerization. Statistical approach to Gelation. Molecular weight averages. Methods of determining the molecular weight by osmotic pressure, light scattering, sedimentation and viscosity methods.

Unit 4.Electrolytes

Limitation of Arrhenius theory of electrolytic dissociation. Role of solvent and inter-Huckel theory of the structure of dilute ionic solution. Charge density and electrical potential. Properties of ionic cloud. Activity coefficient from Debye-Hyclel theory. Weak electrolytes and Debye-Huckel theory to more

concentrated solutions. Partial molar quantities of electrolytic solutions. Determination of partial molar volume.

Unit 5.Solid State

The Crystal system. Properties of Crystals. Basic laws regarding the forms of crystals. The structure of crystal. Crystal lattices. Symmetry. Lattices and unit cells. Miller indices. X-ray diffraction studies of crystals. The Laue and Bragg methods of ctystal analysis. X-ray amalysos of NaCl. Determination of Avogadrao number from X-ray analysis.

Practical:-

1. Preparation of standard solutions and standardization of unknown solutions

2. Volumetric and Gravimetric estimation of organic and inorganic compounds.

3. Verification of Beer's law and colorimetric determinations.

4. Turbiditometric determinations

5. Instrumentation of Spectrophotometer

Books Recommended:-

1. Analytical Chemistry by Gary Christian (Wiley)
2. Quantitative Analysis by Day and Underwood
3. Instrumental Methods of Chemical Analysis by B. K. Sharma
4. Instrumental methods of Analysis by Willard, Merritt, Dean, Settle (CBS).
5.Physical Chemistry by Atkins.

Course Code-CHM 204 **Creit -3**

SEMESTER-II

CHEMISTRY PAPER-IV

ANALYTICAL CHEMISTRY

Unit 1.Principles of spectrochemical analysis:- Beer-Lambert's law, deviation from law and its applications. Photoelectric colorimeters and spectrophotmeters: Instrumentation and applications.

Potentiometric, Conductometric, Amperometric titrations and Coulometric titrations and their applications.

Unit 2.Gas Analysis: Sampling, gas volumetric methods of analysis determination of H_2O_2, evaluation of pyrolusite determination of available chlorine in bleaching powder. Sources and sampling of polluted water and air.

Unit 3.Methods of determination of functional groups: Carboxyl including amides and esters, O- acetly, N-acetly, C-methyl, N-methly, alkoxyl and hydroxy. Distribution law Principles and applications of solvent extraction technique.

Unit 4.Spot test identification of functional group: Hydroxyl, carboxylic, nitro, nitroso, azo and amino.

Unit 5. Semimicro determination of carbon, hydrogen, sulphur and nitrogen in organic compounds

Practical:-

1. Preparation of standard solutions and standardization of unknown solutions.
2. Volumetric and Gravimetric estimation of organic and inorganic compounds.
3. Verification of Beer's law and colorimetric determinations.
4. Turbiditometric determinations
5. Instrumentation of Spectrophotometer

Books Recommended:-

1. Analytical Chemistry by Gary Christian (Wiley)
2. Quantitative Analysis by Day and Underwood
3. Instrumental Methods of Chemical Analysis by B. K. Sharma
4. Instrumental methods of Analysis by Willard, Merritt, Dean, Settle (CBS).

CHEMISTRY PRACTICAL I and II Semester Credit 6

Time: 18 Hrs. (3 Days) Max Marks: 100

1. Qualitative analysis of inorganic mixture for even radicals only including interfering radicals, insolubles, and two rare elements. **21 Marks**

2. Quantitative sepration and estimation of individual metal component from binary mixture solution (either both component gravimetricassly or one component gravimetrically and other one volumetrically). **(15+14)=29 marks**

1. Qualitative Analysis **25 Marks**

Separation, purifiction and identification of compounds of binary mixture. (two solids or one liquid and one solid) using TLC, the column chromatography and chemical tests. I.R. spectra to be used or functional group identification.

2.Organic synthesis

Acylation: Acetylation of cholestral and separation of cholestral and sepration of cholesterely acetate by column chromatography,

Oxidation: Adipic acid by chromic acid, oxidation of cyclohexanol

Aldol condensation: Dibenzal acetone from benzaldehyde.

Sandmeyer reaction: *p*-Chloro toluene from *p*toluidine.

Cannizzaro reaction: *p*-Chlorobenzaldehyde as substrate.

Friedel Craft Reaction: B-Benzoyl propionic acid from succinic anhydride and benzene.

Aromatic electrophilie substitutions: Synihesis of pbromoanline.

Rearrangement: Synthesis of benzilc acid by benzil-benzilic acid rearrangement.

Pinacol-pinacolone rearrangement in Benzpinacol.

The product may be characterized by spectral technique.
Recommended :
1. Text book Quantitative Inorganic Analysis by A.I. Vogel
2. Experimental Inorganic Chemistry by W.G. Parmer.

3.Advanced Practical Chemistry By Jagdamba Singh , L.D.S Yadav ,Jaya Singh ,I.R Siddiqui ,Jaya Srivastava and R.K Singh .Pragati Publication.

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CHEMISTRY

M.Sc Syllabus for III and IV Semester

There are following two specialized courses.
1.Inorganic Chemistry
2.Organic Chemistry
A Student can opt for one of the above courses and has to study all the three theory papers of the opted course along with the project which is compulsory. Three Core theory papers of 300 marks (100+100+100=300).Each 100 marks marks include 20 marks mid semester and 80 marks semester exam)and IV Elective Paper 100Marks Project in IV semester(100 Marks).Each Specialised course has practical of 200 Marks. 100 in III semester and 100 in IV semester. A Student is required to get atleast 36 percent marks in theory ad 36 percent marks in practicals in order to get declared as passed and 40 percent in project.In each paper unit VI will be of only 5 marks.Its course content will be "importace of above course contents with respect to rural development".

Syllabus for M. Sc. Chemistry

Course CodeI 301 **Credit 3**

SEMESTER - III

INORGANIC CHEMISTRY

FIRST PAPER

Structural Methods In Inorganic Chemistry

UNIT 1.GROUP THEORY AND MOLECULAR SYMMETRY.— Definitions and theorems of group theory. Symmetry point groups, multiplication tables of simple point groups. Systematic identification of point groups of inorganic molecules, representation of groups, character tables and its applications. Symmetry consideration in coordination compounds. Symmetry aspects of molecular orbital theory and ligand field theory.

UNIT 2. QUANTUM MECHANICAL TREATMENT OF ODD ELECTRON SYSTEMS.—Hydrogen molecule ion. Method of Directed Valence Bond-Hybridized bond eigen functions-sp, sp^2 and sp^3, molecular orbital equivalent of hybridization, derealization, resonance, molecular orbital equivalent of resonance.

UNIT 3. **MAGNETOCHEMISTRY.—**Types of magnetic behaviour. Van Vleck equation and its application. Temperature dependence of magnetic susceptibility, Temperature independent paramagnetism (T.I.P.). Anisotropy in magnetic susceptibility. Pascal constants, diamagnetic correction and calculation of effective magnetic moment. Orbital contribution to the magnetic moment, spin-orbit coupling. Methods for magnetic susceptibility measurement.

UNIT 4**.MAGNETIC PROPERTIES** : mononuclear weak field 3d metal complexes with A,E and T crystal field terms and spin-paired complexes of cubic field symmetry, complexes of heavier metal ions, binuclear metal complexes involving ant ferromagnetic exchange interaction. High spin-low spin cross-over. Temperature dependence of magnetic moment.

UNIT 5. **N.M.R. SPECTROSCOPY.—**Basic principles of nuclear magnetic resonance. Bloch equations. Line width and relaxation processes. Chemical shift. Nuclear spin-spin splitting. Factors affecting chemical shift and spin-spin coupling constant, and its applications in structural determination of inorganic molecules. Contact shift, pseudo contact shift and their applications in structural studies of paramagnetic complexes. Shift reagents. NMR studies of fluxional molecules. FT NMR Spectroscopy.

BOOKS Recommeded

1. Theoretical Inorganic Chemistry by M.C. Day and J. Selbin,
2. Modern Aspects of Inorganic Chemistry by H.J. Emelens and A.G. Sharp.. (Van).
3. Text book of Inorganic Chemistry by P.L. Soni (S. Chand)
4. Inorganic Chemistry by Shriver & Atkins
5. F.A Cotton and G Wilkinson, Advanced Inorganic Chemistry, 6th Edn. (1999), John Wiley & Sons New York.
7. James E Huheey, Inorganic Chemistry, 4th Edn. (1993) Addison-Wesley Pub. Co, New York.
8. R.S. Drago, Physical Methods in Inorganic Chemistry, International Edn. (1971), Affiliated East-West Press, New Delhi.
9. D.F. Shriver and P.W. Atkins, Inorganic Chemistry, 3rd Edn. (1999), ELBS, London.
10. D.N. Sathyanarayana, Electronic Absorption Spectroscopy and Related Techniques (2001), University Press (India) Ltd Hyderabad

Course CodeI 302 **(Credit 3)**

INORGANIC CHEMISTRY

SECOND PAPER

(Reaction Mechanism)

UNIT **1.MECHANISM OF INORGANIC REACTIONS.—**Inert and labile complexes. Possible mechanism of ligand replacement reactions -SN^1, SN^2 and SN^1 CB mechanisms. Ligand displacement reactions in octahedral complexes-Acid and base hydrolysis. Mechanism of ligand displacement reactions in squre planar complexes. Trans effect. Mechanism of isomerization and racemization reactions.

UNIT 2.ELECTRON TRANSFER AND METAL ION CATALYSIS.—Mechanism of electron transfer reactions (outer sphere and inner sphere mechanisms). Two electron transfers. Electron exchange reactions. Metal ion catalysis. Palladium catalyzed reactions. Photochemical reactions. Solar energy conversion and storage through coordination compounds.

UNIT 3.**ORGANOMETALLIC COMPOUNDS.—**Major types of transition metal-to-carbon bonds excluding *n* complexes. Classification of organometallic compounds based on hapticity and polarity of M-C bond, nomenclature and general characteristic

UNIT 4. General methods of preparation and important reactions of transition metal π complexes of unsaturated hydrocarbons such as alkenes, alkynes, allyl, cyclopentadiene and arene. Structure and bonding in Zeise's salt, ferrocene and dibenzene chromium Fluxional molecules.

UNIT 5. **TRANSITION METAL COMPLEXES AS CATALYST .—** General idea of important catalytic steps Coordinative unsaturation. Reactions of coordinated ligands and coordinated molecular oxygen, template synthesis. Oxidative addition, reductive-elimination and migration (insertion) reactions.

BOOKS RECOMMENDED

1. F.A Cotton and G Wilkinson, Advanced Inorganic Chemistry, 6th Edn. (1999), John Wiley & Sons New York.

2. James E Huheey, Inorganic Chemistry, 4th Edn. (1993) Addison-Wesley Pub. Co, New York.

3. R.S. Drago, Physical Methods in Inorganic Chemistry, International Edn. (1971), Affiliated East-West Press, New Delhi.

4. D.F. Shriver and P.W. Atkins, Inorganic Chemistry, 3rd Edn. (1999), ELBS, London.

5. D.N. Sathyanarayana, Electronic Absorption Spectroscopy and Related Techniques (2001), University Press (India) Ltd Hyderabad

Course CodeI 303 **SEMESTER III**

INORGANIC CHEMISTRY **(Credit 3)**

THIRD PAPER

(Coordination Chemistry)

UNIT 1TYPICAL COMPLEXES.—Acquaintance with different types of ligands and their Complexes containing N, P, As, O, S and halogens as donors. Polydeniate **ligands,** macrocyelic ligands. Ambidentate ligands, tripod ligands. Dioxygen, superoxo. peroxo **and** dinitrogen as ligands. Cyanide, isocyanide. hipyridinc **and** o phcnanlhroline and polyamincs. Inophores **and** their ion-eomplexcs-Valmomycin **and** Nigerein groups. Crown ethers **and** cryptates.

UNIT 2METAL COMPLEXES IN SOLUTION.—Determination of stability constant by (a) polenliomcty-pH titration technique (Bjerrum's **and** Irving-Rossott's methods) **and ion** selective electrode methods, (b) spectrophotometry, (c) polarography, (d) solvent extraction, and (c) **ion**-exchange methods. Mixed ligand. mixed-metal and polynuclcar complexes.

UNIT 3.**ELECTROCHEMICAL STUDIES OF METAL COMPLEXES.** — Principles of differential pulse polarography. cyclic voltammctryy, anodic **and** cathodic Strippings **and** their applications in the study of metal complexes.

UNIT 4LIGAND FIELD AND MOLECULAR ORBITAL THEORIES.— M.O. energy level diagrams of octahedral, tetradral **and** square plannar complexes. Effect of ***pi*** bonding on the energy of t_2g orbitals **and** on Dq. Experimental evidences for metal-ligand orbital overlap.

UNIT 5ELECTRONIC SPECTRA OF COORDINATION COMPOUNDS.— Orgcl diagrams for high spin d^2, $\mathbf{d^3}$, d^7 and $\mathbf{d^8}$ configurations and assignments of **electronic** transitions. Tanabe-Sugano diagrams. Effect of distortions (Jahn-

Tcller effect **and** spin-orbit coupling) upon d-d transitions. Racah parameters (B and C) and Cordon-Shortley parameters **(F_0F_2** and **F_4) and** Calculation of **10** Dq. β **and** β° (for high-spin octahedral Cr (III) and Ni (II) and tetrahedral V (III) and Co (II) complexes). Nephelauxetic effect and Nephelauxetic serics. Charge transfer spectra.

BOOKS RECOMMENDED

1. F.A Cotton and G Wilkinson, Advanced Inorganic Chemistry, 6th Edn. (1999), John Wiley & Sons New York.

2. James E Huheey, Inorganic Chemistry, 4th Edn. (1993) Addison-Wesley Pub. Co, New York.

3. R.S. Drago, Physical Methods in Inorganic Chemistry, International Edn. (1971), Affiliated East-West Press, New Delhi.

4. D.F. Shriver and P.W. Atkins, Inorganic Chemistry, 3rd Edn. (1999), ELBS, London.

5. D.N. Sathyanarayana, Electronic Absorption **Spectroscopy and Related Techniques (2001), University Press (India) Ltd Hyderabad .**

Course code 305 CHEMISTRY PRACTICAL III SEM Credit 6

M. Sc. (Semester III)

Inorganic Chemistry

1. Preparations (Complex compounds):
   (a) Ferric alum (ferric ammonium sulphate)
   (b) Tetraammine copper (II) sulphate
   (c) Potassium trioxalatochromate (III)/aluminate (III)/ferrate (III)
   (d) Silver/copper tetraiodomercurate (II)
   (e) Sodium hexanitritocobaltate (III)
   (f) Prussian blue
   (g) Ammonium diamminetetrathiocyanato-chromate (III)
   (h) Pentammine chloro-nitritocobalt (III) chloride
   (i) Hexaureachromium (III) chloride trihydrate

2. Instrumentation :
   (a) Colorimetry and spectrophotometry
   (b) Potcntiomctry
   (c) Conductometric titrations
   (d) Flame photometry
   (e) Ring oven technique

Course CodeO 301 **SEMESTER III** **(Credit 3)**

ORGANIC CHEMISTRY

FIRST PAPER

(Reaction Mechanism,Molecular Rearangement and Photochemistry)

UNIT-1 **Migration to electron deficient carbon atom**- Pinacole-Pinacolone rearrangement, Wagner -Meerwein rearrangement, Tiffenev - Demjanov ring expansion, Dienone-Phenol rearrangement, Benzil-Benzilic acid rearrangement, Favorski rearrangement.

UNIT-2**Migration to electron deficient nitrogen atom** - Wolf, Hofmann, Cuitius, Losen, Schmidt, Beckmann rearrangement.

Migration to electron deficient oxygen atom- Baeyer-Villiger rearrangement. Stevens, Wittig, Neber rearrangements & rearrangement of amino ketones.

UNIT-3**Sigmatropic rearrangement-** Suprafacial & antarafacial shift of H, sigmatropic shifts involving carbon moieties, retention & inversion of configuration, (3, 3) & (5, 5) - sigmatropic rearrangements, detailed treatment of Claisen & Cope-rearrangements. Fluxionai tautomerism, Aza-Cope rearrangements. Introduction to Ene-reactions. Simple problems on pericyclic reactions.

UNIT-4 **Photochemistry of Carbonyl Compounds-** Photochemistry of enones, hydrogen abstraction, rearrangements of ά, β, unsaturated ketones & cyclohexadienones, photochemistry of p-benzoquniones.

(b) **Photochemistry of unsaturated system-** Olefins, *cis-trans* isomerisation, dimerisation, hydrogen abstraction and additions. Acetylenes-dimerisation, Dienes-photochemistry of 1,3-butadiene, (2+2)-additions leading to cage structures,

photochemistry of cyclohexadienes. Photochemistry of aromatic compounds-exited state of benzene & its- 1,2- and 1,3-shifts, Photo-Fries rearrangement, Photo-Fries reaction of anilides, photo substitution reaction of benzene derivatives. Photolysis of nitride esters & Barton reaction.

UNIT-5 Redox process- (a) Oxidation-: Introduction, Different oxidative processes. Hydrocarbons- alkenes, aromatic rings, saturated C-H groups (activated and unactivated). Alcohols, diols, aldehydes, ketones and carboxylic acids. Amines, hydrazines, and sulphides. Oxidations with ruthenium tetraoxide, iodobenzene diacetate and thallium (III) nitrate.

(b) Reduction-: Introduction. Different reductive process

Books Recommended

1Organic Synthesis By Jagdamba Singh and L.D.S Yadav Pragati Prakashan

2.Pericyclic Reactions and photochemistry by Jagdamba singh and Jaya singh,New Age Publication.

3.Protective groups in organic synthesis Elias James Core Wiley interscience 4th edition 2007 SBN 0-471-69754-0.

4.The logic of chemical synthesis Elias James corey,Wiley Interscience 1995 ISBN -0471-11594-0 .

SEMESTER III (Credit 3)

Course CodeO 302

ORGANIC CHEMISTRY

SECOND PAPER

(Spectroscopy)

UNIT-1Nuclear Magnetic Resonance Spectroscopy-: PMR Spectroscopy 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, solvent effects. Fourier transform technique, Nuclear Overhauser Effect (NOE). Resonance of other nuclei: F and P.

UNIT-2**Carbon-13 NMR Spectroscopy-:** General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), coupling constants.Two dimension NMR spectroscopy : COSY, NOESY, DEPT. INEPT, APT and INADEQUATE techniques.

UNIT-3 **Mass Spectrometry-:** Introduction, ion production - El, CI, FD and FAB, factors affecting fragmentation, ion analysis, ion abundance. Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, Mc-Lafferty rearrangement. Nitrogen rule. High resolution. mass spectrometery. Examples of mass spectral fragmentation of organic compounds with respect to their structure determination.

Solution of Structural problems by joint application of UV, IR, NMR (^{1}H & ^{13}C) and mass spectroscopy.

UNIT-4**Optical Rotary Dispersion (ORD) and Circular Dichroism (CD)-: Definition, deduction *o f* absolute configuration, octant rule for ketones**

UNIT-5HIGH PERFORMANCE LIQUID CHROMATOGRAPHY(HPLC):

Principal,Structure and Application.Preparation and identification of organic compounds.

Books

1.Organic Spectroscopy: Principles ,Problems and their solutions by Jagadama Singh and Jaya Singh.Pragati Prakashan.

SEMESTER III

Course CodeO 303 **ORGANIC CHEMISTRY** **(Credit 3)**

THIRD PAPER

(Medicinal Chemistry)

UNIT-1Drugs- : Relationship of chemical structure and biological activities and theories of drug action. **Antineoplastic Agents-:** Introduction, cancer chemotherapy, role of alkylating agents and antimetabolites in treatment of cancer. Mention of carcinolytic antibiotics and mitotic inhibitors. Synthesis of mechlorethamine, cyclophosphamide, melphalan, uracil, mustards, and 6-mercaptopurine products.

UNIT-2**Cardiovascular Drugs-:** Cardiovascular diseases, drug inhibition of peripheral sympathetic function. Direct acting arteriolar dilators. Synthesis of amyl nitrate, hydrolaxine, verapamil, methyldopa and diazoxide propanolol.

UNIT-3**Local Anti-infective Drugs-:** Antitubercular drugs and Antimalerial drugs : Introduction and general mode of action. Synthesis of sulphonamides, ciprofloxacin, norfloxacin, dapsone, amino salicylic acid, ethionamide, ethambutal, griseofulvin, chloroquin and primaquin.

UNIT-4 Psychoactive Drugs-: CNS depressants, general anaesthetics, hypnotics, sedatives, anti-anxiety drugs, benzodiazipies, mental diseases. Antipsychotic drugs. Synthesis of diazepam, alprazolam, trimethadione, barbiturates and glutethimide.

UNIT-5Antihistaminic Agents-: Antazotine diphenhydramins.

Antibiotics-: Synthesis of penicillin G, chloramphenicol, cephalosporin, tetracyclin and streptomycin.

Course Code 304 M.SC. III SEM Credit 6

ELECTIVE PAPER

Nuclear Chemistry

(Theoretical Aspects and General Procedure)

Time : 3 Hrs. Max. Marks : 100

1. Interaction of Radiation with matter-Effect of radiation on matter-energy transfer and radiation dose,

measurement of radiation dose including chemical dosimetry. Radiation effects on metals, inorganic nonmetallic

compounds and covalent compounds. Radiolysis of water and aueous solutins. Effect of

radioactive pollutants. Radiation hazards-protection and waste management.

2. Counting Technique-Geiger-Muller, ionization, proportional and scintillatioan counters.

3. Nuclear Reactions :

(i) Energetics-mechanics of induced nuclear reaction mass energy, dissecting and nuclear

reaction, columb barrier, inelastic and elastic scatterings.

(ii) Mechanics and models-reaction cross-section, resonance and tunneling, neutron capture and

scattering neutron-diffraction, models for nuclear reactins, nuclear fission, neuclar fusion and photonlear

reactions.

(iii) Production and applications of radioisotopes.

4. Nuclear Energy.

(i) Energy release in fission, chain reactions, controlled release of fission energy, use of

moderators. Nuclear reactors including breeder reactors.

(ii) Energy release in fusion reactions. Principle of atom and hydrogen bombs.

5. Accelerators :

(i) Principles of van de graph generator, Linear accelerators, Cyclotron and synchrotron.

(ii) Nuclear chemistry with accelerators inclidng synthesis of superheavy elements.

6. Chemistry of Nuclear Fuels :

(i) Uranium and thorium-distribution in nature production as nuclear fuels, Enrichment of uranium.

Fuel cycles. Fuel reprocessing.

(ii) Peaceful use of nuclear programme of India-Nuclear Reactors in India.

7. Radiochemical analysis :

(i) Activiation analysis

(ii) Radiometric and radio-release methods.

8. Environmental radioactivity and safety : Fall out from nauclear weapons testing and nuclear power

production, other sources of radioactive contamination, protective actions.

Elective B

III SEM

(Synthetic Organic Chemistry & Organic Solids)

Time : 3 Hrs. Max Marks : 100

1. Organic Synthesis

(i) Disconnection Approach 10 Hrs.

General introduction to synthons and Synthetic equivalents, Disconnections, (C-C, C-S, C-O, bonds),

Functional group interconversion, chemoselectivity, cyclisation reaction choosing, synthetic route for small

and large scale synthesis.

(ii) Synthetic Strategies 5 Hrs.

(i) For formation of carbon-carbon bond.

(ii) For formation of carbon-nitrogen bond.

(iii) Formation of carbon-halogen bond.

(iv) Ring Synthesis.

(v) Multistep Synthesis.

(III) Protecting Groups 5 Hrs.

Principle of protection of alcoholic, amino, carbonyl and carboxylic groups.

(iv) Stereochemistry in Organic Synthesis 10 Hrs.

Stereoselectivity and stereospecificity. Regioselectivity and regiospecificity :

Assymmetric synthesis-

Sharpless asymmetric epoxidation.

An introduction to computer aided designing of organic synthesis.

II. Reagents in Organic Synthesis 20 Hrs.

Use of following reagents in organic shythesis and function group transformation (including

stereochemistry where possible)

(i) Complex metal hydrides. (ii) Gilman.s reagent.

(iii) Lithium disopropyl amide (LDA). (iv) Dicyclohexylcarbodimide (DCC).

(v) 1,3-Dithiane (Reactivity Umpolung). (vi) Trimethylsily iodide.

(vii) Tri n-butyltin hydride. (viii) Crown ethers.

(ix) Merrifield resin. (x) Wilkinson.s Reagent.

(xi) Peterson.s Synthesis (xii) Organic per acids.

(xiii) Baker.s yeast

III. Selective Organic name reaction and their

Synthetic Application 10 Hrs.

(i) Stork Enamine reaction. (ii) Favorskii reaction.

(iii) Ene Reaction. (iv) Barton Reaction.

(v) Hofmann-Loffler-Freytag Reaction. (vi) Shapiro Reaction.

(vii) Chichibabin Reaction. (viii) Robinson annulation.

IV. Nitrogen, Sulphur and Phosphorus Ylides 5 Hrs.

Preparation and their synthetic applications.

V. Green Chemistry 5 Hrs.

Introduction of green chemistry basic principles of green chemistry, principles of microwave induced

organic synthesis and combinational chemistry.

VI. Organic Solids 5 Hrs.

Electrically conducting solids, organic charge transfer complex organic super-cunductors-Fullerenes and

doped fullerenes as superconductor.

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Elective - C

(Environmenal Chemistry And Monitoring)

Time : 3 Hrs. Max. Marks100

1. Atmosphere Structure, Particles, the ions and Readicals in the atmosphere, chemical process for

the formation of inorganic and organic particulate matters and their effects, Chemical and

photochemical reactions in the Atmosphere, Oxygen, Ozone chemistry, Ozone hole, Greenhouse

gases and their effects.

2. Air Pollution : primary air-pollutants, hydrocarbons and photochemical smog, Radioactivity.

3. Air quality standards, air quality monitoring and measurements, air pollution control and

equipments.

4. Hydrosphere : Chemistry of Sea water, complex ion in natural and waste water.

5. Water pollution: Classification of water pollutants and impact of each type of water pollutants,

pathways of various pollutants in water.

6. Water quality standards : Sampling and measurements of various parameters; DO, BOD, COD,

TOC, pH, total suspended solids, total dissolved solids, hardness, amount of organic matters and

inorganic ions.

7. Sewage and Fertilizers: Sewage treatment, sewage farms, microbiology and biochemistry of

sewage Fertilizers-nitrogen, ammonification, nitrification, denitrification, biochemistry and ecology

of nitrogen fixation, Entrophication, hdrocarbons and surfactants.

8. Pollution of metals and metalloids : Lead, Mercury, Zinc, Cadmium, Nickel, Chromium, and

Arsenic.

9. Instrumental methods in environmental chemical analysis: Neutron activation analysis Anodic

stripping Valtammetry Atamic absorption, spectrometry, X-ray fluorescence, Faurier Transform

Infrared Spectroscopy, Gas chromatography, Ion Selective Electrodes.

Elective . D

(Biotechnology)

Time : 3Hrs. Max. Marks :100

Section . A

(i) Chemistry of biomolecules, proteins, nucleic acids, carbohydrates, lipids and enzymes.

(ii) Cell chemistry, structure of cell and its organelles, their functions, constituents of nucleus and

cytoplasm, structure of chromosomes. mitosis and meiosis, cell membrane, its constituents

and functions.

(iii) Basic concepts of bacteria and viruses.

Section . B

(i) Biophysical techniques, HPLC, electrophoresis (paper & gel) ion exchange chromatography

and autoradiography.

(ii) Genetic Engineering (Recombinant DNA technology), sequencing of biopolymers, (oligonucleotides & peptides) site directed mutagenesis and southern transfer.

(iii) Biosensors and bio-electromics (concept only)

Section . C

(i) Application of genetic engineering for producing chemicals and pharmaceuticals, food

industry, beverages and dairy products, environmental pollution, bioenergy and fuels, agriculture and veterinary science.

(ii) Immunology (antibodies, defensive proteins), theories of drug action and quantitative

structure activity relationship (QSAR)

(iii) Application of thermodynamic principles to simple bio-systems.

(iv) Application of enzymes and other biocatalysts.

Syllabus for M. Sc IV Chemistry

Course CodeI 401

SEMESTER - IV

INORGANIC CHEMISTRY

FIRST PAPER (Credit 3)

STRUCTURAL METHODS IN INORGANIC CHEMISTRY

UNIT 1 E.S.R. SPECTROSCOPY.—Basic principles of electron spin resonance. Line width and relaxation mechanisms. Electron spin-nuclear spin hyperfine splitting. Isotropy and anisotrpy in g and A values. Covalent bonding and ligand nuclear superhypcrfine splitting. Zero field splitting and Kramer's degeneracy. ESR applications to electronic and structural studies of simple inorganic species and transition metal complexes (31 and 3d9 systems) including single crystals and excited triplet states.

UNIT 2MOSSBAUER SPECTROSCOPY.—The Mossbauer effect. Isomer shifts, quadrupole and magnetic interacions. Applications of Mossbauer spectroscopy to Fe and Sn compounds.

UNIT 3VIBRATION AND ROTATION SPECTROSCOPY.— Principles and applications of I.R. and Raman spectroscopy in structural elucidation of simple inorganic and coordination compounds. Comparison of Raman and I.R. spectroscopy. FT-I.R. spectroscopy. Laser-Raman spectroscopy. Microwave spectrscopy. Determination of bond lengths. Dipole moment-its theory and application to molecular structure.

UNIT 4Extended X-Ray Absorption Fine Structure (EXAFS) And PHOTOELECTRON SPECTROSOCOPY (PES).—Basic principles of EXAFS and XPS, spectral featurs XPS and UPS and their applications to simple inorganic molecules and transition metal complexes.

UNIT 5THERMAL ANALYSIS.— Fundamentals of thermogravimetry (TGA).Differential thermal analysis (DTA) and their applications. Derivatography.

Course CodeI 402 SEMESTER IV

INORGANIC CHEMISTRY (Credit 3)

SECOND PAPER

Reaction Mechanism

UNIT 1REACTIONS IN NONAQUEOUS SOLVENTS.—Classification of solvents. Characteristic properties of an ionising solvent. Reactions in liquid ammonia, liquid sulphurdioxide, liquid hydrogen fluoride, dimethyl formamide (DMF), dimethyl sulphoxide (DMSO) and dioxane. Chemistry of fused salt systems.

UNIT 2 INORGANIC FREE RADICALS.—Free radicals and intermediate species in inorganic reactions. Detection of free radicals. Free radicals induced reactions. General chemistry of OH, OH2, Br+ and I+.

UNIT 3Catalytic reactions Hydrogenation of alkenes using Wilkinson's catalyst, hydroformylation of unsaturated compounds using cobalt and rhodium catalysts, carbonylation of methanol to acetic acid (Monsanto process), palladium catalyzed oxidation of ethylene (Wacker process). Polymerization of alkenes (Ziegler-Natta synthesis).

UNIT 4 METAL CLUSTERS, POLYANIONS AND METAL ALKOXIDES.—(a) Metal-metal multiple bonds in binuclear compounds. Trinuclear, teranuclear and octahedral clusters. Synthesis and bonding in metal clusters, (b) Polymolybdates and polytungstates, (c) Metal alkoxides-Preparalion. Properties structural characteristics and industrial applications.

UNIT 5INORGANIC POLYMERS.—Classification, general properties. Inorganic polymers based on Boron, Silicon, Phophorus and Sulfur. Coordination polymers.

Course CodeI 403 SEMESTER IV

INORGANIC CHEMISTRY (Credit 3)

THIRD PAPER

BIO-INORGANIC CHEMISTRY

UNIT 1 .COMPLEXES OF BIOLOGICAL IGNIFICANCE.-

Metalcomplcxcs of aminoacids and peptides. Metal complexes of nucleic acid bases, nucleosides and nucleotides. Metal complexes of porphyrins and phthalocyanins. Synthetic model oxygen carrier complexes and model dinitrogen complexes.Bioenergitics high energy compounds ATP and hydrolysis of ADP.

UNIT 2 Phophates and Bioenergetics. Phosphorylation and phosphorolysis. Adenine nucleotides in metabolic energy transfer. Oxidation of glucose and the role of phosphate.

UNIT 3 ROLE OF METAL IONS IN BIOLOGICAL SYSTEMS.—

Essential and trace metal ions. Metal ions storage and transport (Na. K, Ca, Mg, Fc, Cu, and Zn)-Ferritin and Transferrin. Metal ion toxicity and its cure by chelating agents. Pharmacological activity and metal chelates. Carcinogenic metals, carcinogenic and carcinostatic ligands.

UNIT 4 METALLO PROTEINS AND METALLO ENZYMES.—

Function, Electronic Structure, Bonding and Sterochemistry of the Active Site. (1) Natural Oxygen Carrying Proteins-Haemoglobin, Myoglobin.

(2) Electron Transport Proteins-(a) Iron-Sulfur Proteins-Rubrcdoxin and Fcrridoxins, (b) Cytochromes (types a b and c).

UNIT 5 RedoxEnzymes. (a) Iron-Containing Enzymes-Cytochrome-c oxidase, Catalascs, Peroxidases, (b) Copper-Containing Enzymes-Super oxide Dismutase (SOD) Bovine Superoxide dismutase (BOD), ascorbic acid oxidase, and (c)Zinc-Containing Enzymes-Carboxy-peptidaseA and B, Carbonic anhydrase and Urease. Vitamines B12 and B6 Chlorophills.

Course CodeI 405 M. Sc.

(Semester IV)

Inorganic Chemistry

Practical

1. Chromatography :

Paper chromatography

Adsorption chromatography

Thin layer chromatography

Paper electrophoresis

Solvent extraction

Ion exchange

2∗Exercises involving principles and procedures of qualitative and quantitative analyses.

3∗Application of statistical treatments and approaches in inorganic analysis

4. Records and viva-voce

Course CodeO 401 SEMESTER IV Credit 3

ORGANIC CHEMISTRY

FIRST PAPER

(Reagents)

UNIT 1Hydrocarbons : Oxidation of alkanes, alkenes, alkenes ,alcohols,aldehydes and Ketons

Reduction of alkenes,alkynes,aromatic compounds,alcohols,aldehydes,ketons and acids and their derivatives.

Carbonyl compounds : aldehydes, ketones, acids and their derivatives..

UNIT 2Metalloceries, Non-benzenoid Aromatics and Polycyclic Aromatic CompoundS.General considerations, synthesis and reactions of some representative compounds.

UNIT 3 Organometallic ReagentsPrinciple, preparations, properties and applications of the following, in organic synthesis with mechanistic details.

Li,Mg,Zn,Cu

UNIT 4Group I and II metal organic compounds

Hg, Cd, and Ce,Rh and Cr compounds.

UNIT 5Transition metals: General reactions given by transition metals with ligands.

Organometallic Compounds of Pd, Ni, Fe, Co, and Ti compounds.

Book

Organic Synthesis by Jagdamba singh and L.D.S yadav ,Pragati Prakhashan

SEMESTER IV

Course CodeO 402 ORGANIC CHEMISTRY Credit 3

SECOND PAPER

Natural Products

UNIT 1. Terpenoids and Carotenoias:Classification, general methods of structure determination, isoprene rule. Structure determination, stereochemistry, synthesis of the following representative molecules : citral, a-terpeneol, farnesol, santonin, abietic acid, β-carotene, sqauralenes, β-amyrin and menthol. For structure elucidation emphasis is to be placed on the use of spectral data wherever possible.

UNIT 2 Alkaloids:Definition and physiological action, general methods ofstructure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure, stereochemistry and synthesis of the following: Ephedrine, (+)-nicotine, atropine, quinine and morphine. For structure elucidation emphasis is to be placed on the use of spectral data wherever possible.

UNIT 3 Steroids:Basic skeleton, Diel's hydrocarbon and stereochemistry, structure determination and synthesis of cholesterol, bile acids, and rosterone, testosterone, estrone, progestrone, aldosterone.Biosynthesis of steroids. For structure elucidation emphasis is to be placed on the use of spectral data wherever possible.

UNIT4Prostaglandins Occurrence, nomenclature, classification and physiological effects. Synthesis of PGE2 and PGF2a.

UNIT 5 Plant PigmentsGeneral methods of structure determination, synthesis of Apigenin, Quercetin, Cyanidin, Hirsutidin. Quercetin-3-glucoside, Diazein cyanidine-7-arabinoside and Emodine. For structure elucidation emphasis is to be placed on the use of spectral data wherever possible.

Book

Chemistry of Natural Products by Jagdamba Singh,M,Masood and JayaSingh ,Pragati Prakashan

Course CodeO 403

SEMESTER IV

ORGANIC CHEMISTRY Credit 3

THIRD PAPER

(Biomolecules)

UNIT 1. Enzymes:Introduction and historical perspective, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification, extraction and purification. Fisher's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labeling and enzyme modification by site-directed mutagenesis. Enzyme kinetics, Michaelis-Menten and Lineweaver-Burk plots, reversible and irreversible inhibition.

UNIT 2. Mechanism of Enzyme Action:Transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms for chymotrypsin, ribonuclease, iysozyme and carboxypeptidase A.

UNIT 3 Biotechnological Applications of Enzymes:Large-scale production and purification of enzymes, techniques and methods of immobilization of enzymes, effect of immobilization on enzyme activity, application of immobilized enzymes, use of enzymes in food and drink industry-brewing and cheese-making, syrups of com starch, enzymes as targets for drug design. Clinical uses of enzymes, enzymes therapy, enzyme and recombinant DNA technology.

UNIT 4 Vitamins:Detailed study of chemistry of Vit. Br Vit C, Pantothenic acid, Biotin (Vitamin H) and a-tocopherol (Vitamin E). Biological action of vitamins.

UNIT 5. Harmones Insect harmones : Pheromones and Juvenile harmones Plant harmones : Gibbrellins Pyrethroids and Rotenones Synthesis and reactions of Pyrethroids and Rotenones. (For structure elucidation, emphasis is to be placed on the use of parameters wherever possible).

Course CodeO 305 M.SC. III Credit 6

ORGANIC CHEMISTRY

PRACTICAL

1. Qualitative Analysis

Separation purification and identification of the components of a mixture of three organic compounds

(three solids or two liquids and one solid, two solids and one liquid). Using TLC for checking the purity of

the separated compound, chemical analysis, IR, PMR and mass spectra.

2. Multi-step synthesis of Organic Compounds

The exercises should illustrate the use of organic reagents and may invlve purificatioan of the products by

chromatographic techniques.

Photochemical reaction: Benzophenon_ Benzpinacol_ Benzpinacolone.

Beckmann Rarrangement : Benzanilide from benzene Benzene _ Benzophenone _ _Benzophenone

oxime _ benzarrlide

Benzilic acid rearrangement : Benzilic acid from benzoin

Benzoin_ Benzil_ Benzilic acid

Synthesis of heterocyclic compounds.

Skraup synthesis : Preparation of quinoline from aniline.

Fischer-Indole synthesis : Preparation of 2 phenylindole from phenylhydrazine

Enzymatic synthesis :

Enzymatic reduction : Reduction of ethylacetoacetate using Baker.s yeast to yield enantiomeric excess of

S (+)ethytl-3-hydryybutanoate and determine its optical purity.

Biosynthesis of ethanol from sucrose.

Synthesis using microwaves : Alkylation of diethyl malonate with benzyl chloride.

Synthesis using phase transfer catalyst : Alkylation of diethyl malonate or ethyl acetoacctate with an alkyl

halide.

Course CodeO 405 M.SC. III Credit 6

ORGANIC CHEMISTRY

PRACTICAL

1. Extraction of Organic Compounds from Natural Sources

1. Isolation of caffeine from tea leaves. 2. Isolation of nicotine dipcirate from tobacco.

3. Isolation of lycopene from tomatoes. 4. Isolation of b-carotene from carrots.

5. Isolation of eugenol from cloves. 6. Islation of (+) limonine from citrus rinds.

2. Paper Chromatography

Separation and identification of the components present in the given organic mixture by chromatographic

methods.

3. Spectroscopy

Identification of organic compound by the analysis of their spectral data (UV, IR, PMR, CMR and MS).

4. Spectrophotometric (UV/VIS) Estimations

1. Amino acids 2. Proteins 3. Carbohydrates 4.

Cholesterol 5. Ascorbic acid 6. Aspirin

7. Caffeine.

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CHEMISTRY SYLLABUS (2016)