

Government College Bhattu Kalan, Fatehabad

Department Of Chemistry

Session: 2025-26 - Lesson Plan

BSc Physical Sciences

Semester- I to VI

B. Sc. 1st Year (1st Semester)

BSc/Chem/MD/1/DSC/101 Chemistry-I

Teacher name: Mr Amit Kumar, Assistant Professor Chemistry.

July 24-31 Week 3,4 :

Theory: Atomic Structure- Dual behaviour of matter and radiation, de Broglie's relation, Heisenberg's uncertainty principle, concept of atomic orbitals. Significance of quantum numbers,

Practical: 1. Titrimetric Analysis: (i) Calibration and use of apparatus (ii) Preparation of solutions of different concentration

Aug Week 1,2 : Theory: radial and angular wave functions, normal and orthogonal wave functions, significance of ψ and ψ^2 , shapes of s, p, d and f orbitals, rules for filling electrons in various orbitals, effective nuclear charge, Slater's rules

Practical: 2. Standardization of different solution.

Aug Week 3,4:

Theory: Periodic Table and Atomic Properties: Classification of periodic table, definition of atomic and ionic radii, ionization energy, electron affinity and electronegativity, trends in periodic table (in s and p block elements), Pauling, Mulliken, Allred Rachow and Mulliken Jaffe's electronegativity scale.

Practical: 3. Redox titrations: Determination of Fe^{2+} , $\text{C}_2\text{O}_4^{2-}$ (Using KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$)

Class Test 1: Unit-I Atomic Structure, Periodic Table and Atomic Properties.

Sept Week 1,2:

Theory: Gaseous State Kinetic theory of gases, Maxwell's distribution of velocities and energies (derivation excluded), Calculation of root mean square velocity, average velocity and most probable velocity. Collision diameter, collision frequency and mean free path (derivation excluded), Deviation of real gases from ideal gas behaviour, derivation of van der Waal's equation of state, its applications in the calculation of Boyle's temperature (compression factor), Explanation of behaviour of real gases using van der Waal's equation

Practical: 4. To determine the surface tension of a given liquid by drop number method using stalagmometer.

Sept Week 3,4:

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Prepared By:-

Mr. AMIT KUMAR

Asstt. Prof. Chemistry.

Theory: Classification of solids, Elements of symmetry and symmetry elements of crystals, definition of unit cell and space lattice, bravais lattices, crystal system, Laws of crystallography – Law of constancy of interfacial angles, law of rationality of indices and law of symmetry, Miller Indices X-ray diffraction by crystals, derivation of Bragg's law and Bragg's equation, Determination of crystal structure of NaCl and KCl

Practical: 5. To prepare m-dinitrobenzene from nitrobenzene using nitrating mixture

Class Test: Unit-II Gaseous State, Solid State.

Oct Week 1,2:

Theory: General Organic Chemistry: Localized and Delocalized chemical bond, van der Waal's interactions, resonance and its conditions and applications, hyperconjugation, inductive effect, electromeric effect and their comparison

Practical: 6. To prepare Iodoform from acetone/ ethyl alcohol

Oct Week 3,4:

Theory: Stereochemistry of Organic Compounds: Types of isomerism, optical isomerism - elements of symmetry, molecular chirality, chiral and achiral molecules with two stereogenic centres, enantiomers and their properties, diastereomers and their properties, erythro and threo diastereomers, meso compounds, Difference between conformations and configurations, Newmann and Sawhorse projections, Fischer and Flying wedge configurations.

Practical: Revise Practice Experiment No. 1-3

Nov week 1,2:

Theory: Stereochemistry of Organic Compounds: Conformational isomerism – conformational analysis of ethane and n-butane, conformations of cyclohexane Relative and absolute configurations, sequence rules, R & S systems of nomenclature Geometric isomerism – cis, trans isomerism, E & Z system of nomenclature.

Class Test: Unit-III- General Organic Chemistry, Stereochemistry of Organic Compounds

Practical: Revise Practice Experiment No. 4-6

Nov week 3: Theory: Revision & Remedial Classes.

End of teaching term Semester-I.

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Lesson Plan

B. Sc. Ist Year (IInd Semester)

BSC/CHEM/MD/2/DSC/102: Chemistry-II

Teacher name: Mr Amit Kumar, Assistant Professor Chemistry

Jan 2026 Week 1,2 :

Theory: Covalent Bond: Valence bond theory and its limitations, types of bonds like covalent, ionic bond and dative bonds with examples, various types of hybridization and shapes of simple inorganic molecules and ions , .

Practical: 1. Iodometric titrations.

Jan Week 3,4 :

Theory: Valence Shell Electron Pair Repulsion theory to MO theory of homonuclear and heteronuclear molecules , and calculate their bond order, magnetic character. Concept of dipole moment and % ionic character in covalent bond. Ionic Solids Ionic structures (NaCl, CsCl etc). Radius ratio rule and its limitations, coordination number,

Practical: 2. To determine any one of the cations and anions by paper chromatography

Feb Week 1,2:

Theory: Concept of lattice energy and Born Haber cycle, solvation energy and its relation with solubility of ionic solids, polarizing power and polarizability of ions, Fajan's rule. Hydrogen Bonding & van der Waal's forces Hydrogen Bonding - Definition, types, effects of hydrogen bonding on properties of substances, applications Discussion of various types of van der Waals interactions

Practical: 3. To determine the viscosity of a given liquid using Ostwald's viscometer.

Class Test 1: Unit-I

Feb Week 3,4:

Theory Acid and Base Definition of pH and pKa , Buffer solution, Buffer action, Handerson-Hazel equation, Buffer mechanism of buffer action Chemical Kinetics Rate of Reaction, rate equation, factors affecting the rate of reaction – concentration, temperature, light, catalyst

Practical: 4. To determine the specific refractivity of a liquid by refractometer.

March Week 1,2:

Theory: Order and molecularity of a reaction, Integrated rate expressions for zero, first order, second order, half-life period of reactions, their graphical representations also, Methods of determination of order of reaction, Effect of temperature on the rate of a reaction – Arrhenius equation. Theories of

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reaction rate – Simple collision theory for unimolecular and bimolecular collision, transition state theory for bimolecular reactions

Practical: 5. To prepare S-Benzyl isothiuronium chloride from thiourea.

Class Test: Unit-II

March Week 3- Holi Vacation

March Week 4:

Theory: Mechanism of Organic Reactions Curved arrow notation, drawing electron movements with arrows, homolytic and heterolytic bond fissions, types of reagents – electrophiles and nucleophiles.

Practical: 6. To separate mixture of organic compounds using common organic solvents by using TLC and determine R_f values.

April Week 1,2:

Theory: Types of organic reactions - addition, substitution, condensation, elimination and rearrangement, pericyclic reactions. Reaction intermediates – carbocations, carbanions, free radicals (preparation, structure and stability and reactions)

Practical: Revise Practice Experiment

April Week 3,4:

Theory: Alkanes Classification of carbon atoms in alkanes, isomerism in alkanes, methods of preparation (with special reference to Wurtz reaction, Kolbe's electrolytic method, Corey-House reaction and decarboxylation of carboxylic acids, Sabatier and Sendern's reaction), physical properties.

Practical: Revise Practice Experiment

Class Test: Unit-III

May Week 1,2:

Theory: mechanism of halogenation of alkanes – reactivity and selectivity. Cycloalkanes Baeyer's ring strain theory and its limitations, theory of strainless rings.

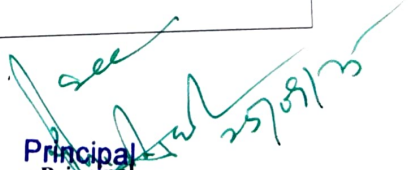
Practical: Revise Practice Experiment

May week 3: Theory: Revision & Remedial Classes.

Practical: Revise Practice Experiment

End of teaching term Semester-II.


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Lesson Plan

B. Sc. II Year (IIIrd Semester)

BSC/CHEM/MD/3/DSC/201

Paper- Chemistry-III

Teacher name: Mr Amit Kumar

July 22-31 Week 3,4 :

Theory: p-block elements

Electronic configuration, atomic and ionic size, metallic character, melting point, ionization energy, electron affinity, oxidation states, electronegativity, inert pair effect and diagonal relationship of 13, 14, 15, 16 & 17 group

Boron family (13th group):

Diborane: Preparation, properties, and structure (as an example of electron deficient compound and multicentre bonding), Borazine- chemical properties and structure, relative strength of Trihalides of Boron as Lewis acids, structure of aluminium (III) chloride

Practical: 1. Colorimetry: To verify Beer - Lambert law for $[\text{KMnO}_4]$ and $[\text{Cr}_2\text{O}_7^{2-}]$ and determine the concentration of the given $[\text{KMnO}_4]$ and $[\text{Cr}_2\text{O}_7^{2-}]$ solution.

Aug Week 1,2 :

Theory: Carbon family (14th): Catenation, Carbides, silicates (structural aspects) **Nitrogen family (15th group):** Oxides: Structure of oxides of nitrogen and phosphorus, Oxyacid: Structure and relative acidic strength of oxyacids of nitrogen and phosphorus, structure of white, black and red phosphorus **Oxygen family (16th group):** Oxy acids of sulphur – structure and acidic strength, Hydrogen Peroxide – properties and uses **Halogen family (17th group):** Interhalogen compounds (their properties and structures), oxy acids of chlorine – structure and comparison of acidic strength

Practical: 2. Preparations: Preparation of Cuprous chloride, tetra ammine cupric sulphate, chrome alum, potassium trioxalatochromate (III) and Nickel Hexamine chloride.

3. To determine the Critical Solution Temperature of phenol – water system.

Aug Week 3,4:

Theory: Electrolytic conduction, factors affecting electrolytic conduction, specific conductance, molar conductance, equivalent conductance and relation among them, their variation with concentration, Arrhenius theory of ionization, Ostwald's dilution law, Kohlrausch's law and its applications in calculation of conductance of weak electrolytes at infinite dilution (numerical),

Practical: 4. To determine the solubility of benzoic acid at various temperatures and to determine the ΔH of the dissolution process.

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Class Test 1: Unit-I

Sept Week 1,2:

Theory: Applications of conductivity measurements : determination of degree of dissociation, determination of solubility product of sparingly soluble salts.

Definition of pH and pK_a , Buffer solution, Buffer action, Handerson-Hazel equation, Buffer mechanism of buffer action

Practical: 5. To determine the enthalpy of neutralisation of a weak acid/weak base vs. strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weak base.

Sept Week 3,4:

Theory: Thermodynamics-I

Definition of thermodynamic terms: system, surroundings. Types of system, intensive and extensive properties, state and path functions and their differentials, Thermodynamic process, concept of heat and work. Zeroth law of thermodynamics, First law of thermodynamics, concepts of internal energy and enthalpy, heat capacity, heat capacities at constant volume and pressure and their relationship.

Practical: 6. To determine the enthalpy of solution of solid calcium chloride.

Class Test: Unit-II

Oct Week 1,2:

Theory: Calculation of w , q , dU and dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process. Temperature dependence of enthalpy, Bond energies and applications of bond energies, Carnot cycle and its efficiency, Carnot's theorem.

Practical: 7. To study the distribution of Benzoic Acid between Benzene and water.

8. Determine rate constant of hydrolysis of ethyl acetate.

Oct Week 3,4:

Theory: Alkenes

Structure and bonding in alkenes, Methods of preparation – 1. dehydration of alcohols (with mechanism), Regioselectivity in dehydration: Saytzeff's rule and Hoffmann rule 2. dehydrohalogenation of alkyl halides. Physical properties and relative stabilities of alkenes, Chemical Reactions: hydrogenation (without mechanism), electrophilic addition reactions with examples (with mechanism), Markownikoff's rule, oxymercuration-demercuration, hydroboration oxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$

Practical: Revise Practice Experiment No. 1-4

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Nov week 1,2:

Theory: Arenes & Aromaticity

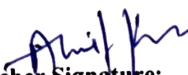
Aromaticity: Huckel's rule, concept of Aromatic, non-aromatic and antiaromatic compounds, Applications of Huckel's rule in Aromatic ions and compounds. Structure of Benzene, Aromatic electrophilic substitution- general pattern of the mechanism, Mechanism of nitration, sulphonation, Friedel-Crafts reaction, Activating and deactivating substituents and orientation. **Alkyl Halides:** Methods of preparation- from alkenes and alcohols, physical properties, nucleophilic substitution reactions of alkyl halides, SN_1 and SN_2 reactions (mechanism) with energy profile diagrams. Concept of racemisation, inversion and retention.

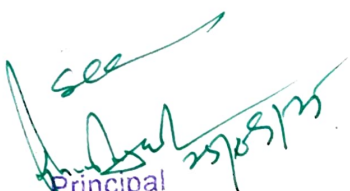
Class Test: Unit-III

Practical: Revise Practice Experiment No. 5-8

Nov week 3: Theory: Revision & Remedial Classes.

End of teaching term Semester-III.


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Lesson Plan
B. Sc. II Year (IVth Semester)
BSC/CHEM/MD/4/DSC/251: Chemistry -IV

Teacher name: Mr Amit Kumar

Jan 2026 Week 1,2 :

Theory: Chemistry of d-block elements

Definition of transition elements, position in the periodic table, General characteristic properties of d-Block elements. Comparison of properties of 3d elements with 4d and 5d elements with reference only to ionic radii, oxidation state, magnetic and spectral properties, and stereochemistry.

Practical: 1. To prepare m-nitroaniline from m-dinitrobenzene.

Jan Week 3,4 :

Theory: Stability of various oxidation states, Structure and properties of some compounds of transition elements- $Ni(CO)_4$, $CuCl_2$, $VOCl_2$, TiO_2 , $FeCl_3$ **Coordination Compounds:** Werner's theory of coordination compounds, effective atomic number, chelates, nomenclature of coordination compounds, Isomerism in coordination compounds, valence bond theory of transition metal complexes.

Practical: 2. To prepare p-nitroacetanilide from acetanilide.

Feb Week 1,2:

Theory: Thermodynamics-II

Second law of thermodynamics, concept of entropy, entropy as a function of Volume & Temperature, entropy as a function of Pressure & Temperature, entropy as a criterion of spontaneity and equilibrium. Entropy changes in ideal gases and mixing of gases.

Practical: 3. Semimicro qualitative analysis of mixture containing not more than four radicals (excluding interfering. Combinations and insoluble)

Class Test 1: Unit-I

Feb Week 3,4:

Theory: Gibbs and Helmholtz functions: Gibbs function (G), and Helmholtz function (A) as a thermodynamic quantity, G & A as criteria for thermodynamic equilibrium and spontaneity, variation of G and A with P & V, Van't Hoff reaction isotherm. **Electrochemistry-II** :Conventional representation of electrochemical cells, EMF of a cell and its measurement, Weston standard cell, activity, Calculation of thermodynamic quantities of cell reaction (ΔG , ΔH , K)

Practical: 4. Semimicro qualitative analysis of mixture containing not more than four radicals (excluding interfering. Combinations and insoluble)

March Week 1,2:

Theory: Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential, Standard Hydrogen Electrode, reference electrodes, standard electrode potentials, sign

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conventions, electrochemical series and its applications. **Alcohols:** Monohydric alcohols: methods of formation: by reduction of aldehydes, ketones, carboxylic acids, and esters. Hydrogen bonding, Acidic nature, Reactions of alcohols.

Practical: 5. Semimicro qualitative analysis of mixture containing not more than four radicals (excluding interfering, Combinations and insoluble)

Class Test: Unit-II

March Week 3,4:

Theory: Dihydric alcohols —methods of formation, chemical reactions of vicinal glycols, oxidative cleavage by using $[Pb(OAc)_4]$ and HIO_4 and pinacol-pinacolone rearrangement.

Practical: 6. Semimicro qualitative analysis of mixture containing not more than four radicals (excluding interfering, Combinations and insoluble)

April Week 1,2:

Theory: Phenols: Structure and bonding, Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols — electrophilic aromatic substitution Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction

Practical: Revise Practice Experiment

April Week 3,4:

Theory: Aldehydes and Ketones: Structure of aldehydes and ketones, Methods of preparation: aldehydes from acid chlorides and from nitriles, advantage of oxidation of alcohols, comparison of reactivity of aldehydes and ketones.

Practical: Revise Practice Experiment

Class Test: Unit-III

May Week 1,2: Theory: Mechanism of nucleophilic additions to carbonyl compounds with particular emphasis on Aldol, Benzoin, Perkin condensations. Wittig reaction, Mannich Reaction, MPV, Clemmensen and Wolff-Kishner reductions

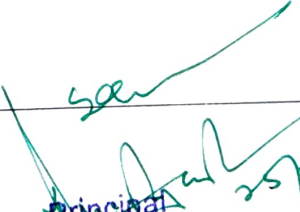
Practical: Revise Practice Experiment

May week 3: Theory: Revision & Remedial Classes.

Practical: Revise Practice Experiment

End of teaching term Semester-IV.


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Lesson Plan
 B. Sc. III Year (Vth Semester)
 Paper-XV (CH-301) Inorganic Chemistry
 Teacher name: Mr. Amit Kumar

July Week 3,4 : Metal- Ligand Bonding in Transition Metal complexes Limitations of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in Octahedral, tetrahedral and square planer complexes

Aug Week 1,2: Factors affecting the crystal field parameters. Thermodynamics and Kinetic Aspects of metal complexes

Aug Week 3,4 : A brief outline of thermodynamic stability of metal complexes and factors affecting the stability

Sept. Week 1,2 : Irving William Series, substitution reactions of square planer complexes of Pt[II], Trans effect.

Sept. Week 3,4 : Magnetic properties of Transition metal complexes Types of magnetic materials, magnetic susceptibility, method of determining magnetic susceptibility, spin only formula

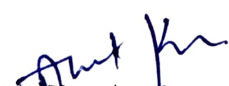
Oct. Week 1,2 : L-S coupling, correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes

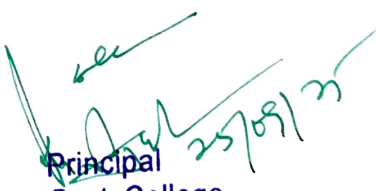
Oct. Week 3,4 : Electronic spectra of Transition metal complexes Selection rules for d-d transition, spectroscopic ground states, spectrochemical series, Orgel energy level diagram for d1 and d9 states, discussion of electronic spectrum of $[Ti(H_2O)_6]^{+3}$ complex ion.

Nov. week 1,2 : Theory: Revision & Remedial Classes.

Nov. Week 3: Theory: Revision & Remedial Classes.

End of teaching term Semester-V.

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Lesson Plan
B. Sc. IIIrd Year (Vth Semester)
Paper-XVII (CH-303) Organic Chemistry
Teacher name: Mr. Amit Kumar

July Week 3,4 : NMR Spectroscopy Principle of nuclear magnetic resonance, the PMR spectrum, number of signals, peak areas, equivalent and nonequivalent protons positions of signals and chemical shift, shielding and deshielding of protons, proton counting, splitting of signals and coupling constants, magnetic equivalence of protons.

Aug Week 1,2: Discussion of PMR spectra of the molecules: ethyl bromide, n-propyl bromide, isopropyl bromide, 1,1-dibromoethane, ethanol, acetaldehyde, ethyl acetate, toluene, benzaldehyde and acetophenone.

Aug Week 3,4 : Simple problems on PMR spectroscopy for structure determination of organic compounds. Carbohydrates Classification and nomenclature of Monosaccharides

Sept. Week 1,2 : Mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers.

Sept. Week 3,4 : Conversion of glucose into mannose. Formation of glycosides. Determination of ring size of glucose and fructose. Open chain and cyclic structure of D(+)-glucose & D(-) fructose. Mechanism of mutarotation.

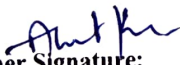
Oct. Week 1,2 : Structures of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

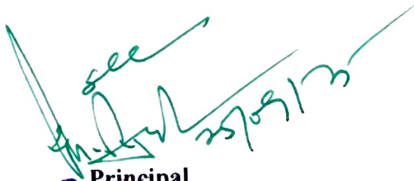
Oct. Week 3,4 : Organometallic Compounds Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.

Nov. week 1,2 : Theory: Revision & Remedial Classes.

Nov. Week 3: Theory: Revision & Remedial Classes.

End of teaching term Semester-V.


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Lesson Plan

B. Sc. III Year (Vth Semester)

Paper-XVI (CH-302) Physical Chemistry

Teacher name: Mr. Amit Kumar

July Week 3,4 : Quantum Mechanics-I Black-body radiation, Plank's radiation law, photoelectric effect, postulates of quantum mechanics, quantum mechanical operators, commutation relations, Hamiltonian operator, Hermitian operator, average value of square of Hermitian as a positive quantity, Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously

Aug Week 1,2: Determination of wave function & energy of a particle in one dimensional box. Physical Properties and Molecular Structure Optical activity, polarization.

Aug Week 3,4 : Orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules

Sept. Week 1,2 : Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility, magnetic properties – paramagnetism, diamagnetism and ferromagnetism. Spectroscopy Introduction: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy.

Sept. Week 3,4 : statement of Born-oppenheimer approximation, Degrees of freedom. 25 Rotational Spectrum Selection rules. Energy levels of rigid rotator (semi-classical principles), rotational spectra of diatomic molecules ,

Oct. Week 1,2 : Spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length and isotopic effect. Vibrational spectrum Selection rules. Energy levels of simple harmonic oscillator, pure vibrational spectrum of diatomic molecules, determination of force constant and qualitative relation of force constant and bond energy.

Oct. Week 3,4 : Idea of vibrational frequencies of different functional groups. Raman Spectrum Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra.

Nov. week 1,2 : Theory: Revision & Remedial Classes.

Nov. Week 3: Theory: Revision & Remedial Classes.

End of teaching term Semester-V.

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Lesson Plan

B. Sc. III Year (VIth Semester)

Paper-XVIII (CH-304) Inorganic Chemistry

Teacher name: Mr. Amit Kumar

January – February 2026

January week 3,4 : Acids and Bases Arrhenius, Bronsted-lowry, Lux-flood, solvent system and Lewis concept of acids and bases.

February Week 1,2 : relative strength of acids and bases, levelling solvents, hard and soft acids and bases(HSAB), Applications of HSAB principle.

February Week 3,4 : Organometallic chemistry Definition, classification and nomenclature of

March 2026

March Week 1,2 : organometallic compounds, preparation, properties and bonding of alkyls of Li, Al, Hg and Sn, concept of hapticity of organic ligand.

March Week 3,4 : Structure and bonding in metal-ethylenic complexes, Structure of Ferrocene, classification in metal carbonyls, preparation, properties and bonding in mononuclear carbonyls.

April 2026

April week 1,2 : Bio inorganic chemistry Metal ions present in biological system, classification on the basis of action (essential, non essential, trace, toxic), Metalloporphyrins with special reference to haemoglobin and myoglobin.

April week 3,4 : Biological role of Na^+ , K^+ , Ca^{+2} , Mg^{+2} , Fe^{+2} ions, Cooperative effect, Bohr effect. Silicones and Phosphazenes Nomenclature, classification,

May 2026

May week 1,2 : Preparation and uses of silicones, elastomers, polysiloxane copolymers, poly phosphazenes and bonding in triphosphazene.

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Lesson Plan
B. Sc. IIIrd Year (VIth Semester)
Paper-XX (CH-306) Organic Chemistry

Teacher name: Mr. Amit Kumar

January – February 2026

January Week 3,4 : Organosulphur Compounds Nomenclature" structural features. Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine.

February Week 1,2 : Synthetic detergents alkyl and aryl sulphonates. Heterocyclic Compounds Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution.

February week 3,4 : Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.

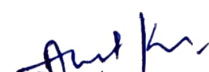
March Week 1,2 : Introduction to condensed five and six- membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis,

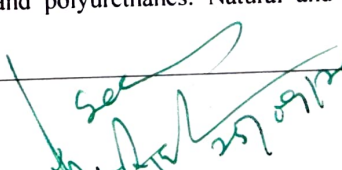
March Week 3,4 : Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of, quinoline and isoquinoline

April Week 1,2 : Organic Synthesis via Enolates Acidity of α -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.

April Week 3,4 : Amino Acids, Peptides & Proteins Classification, of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation of α -amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins.

May week 1,2 : Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solidphase peptide synthesis. Structures of peptides and proteins: Primary & Secondary structure. Synthetic Polymers Addition or chain-growth polymerization' Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.

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Lesson Plan

B. Sc. IIIrd Year (VIth Semester)
Paper-XIX (CH-305) Physical Chemistry

Teacher name: Mr. Amit Kumar

January – February 2026

January Week 3,4 : Introduction to statistical mechanics Need for statistical thermodynamics, thermodynamic probability, Maxwell Boltzmann distribution statistics, Born oppenheimer approximation, partition function and its physical significance.

February Week 1,2 : Factorization of partition function. Photochemistry Interaction of radiation with matter, difference between thermal and photochemical processes.

February Week 3,4 : Laws of photochemistry: Grotthus-Draper law, StarkEinstein law (law of photochemical equivalence), Jablonski diagram depicting various processes occurring in the excited state..

March Week 1,2 : Qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).

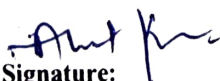
March Week 3,4 : Solutions, Dilute Solutions and Colligative Properties Ideal and non-ideal solutions, methods of expressing concentrations of solutions, Dilute solutions, Raoult's law. Colligative properties: (i) relative lowering of vapour pressure (ii) Elevation in boiling point (iii) depression in freezing point (iv) osmotic pressure

April week 1,2 : Thermodynamic derivation of relation between amount of solute and elevation in boiling point and depression in freezing point.. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.

April Week 3,4 : Phase Equilibrium Statement and meaning of the terms – phase, component and degree of freedom, thermodynamic derivation of Gibbs phase rule,

May Week 1,2 : Phase equilibria of one component system –Example – water system. Phase equilibria of two component systems solid-liquid equilibria, simple eutectic Example Pb-Ag system, desilverisation of lead.

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