Lesson Plan [Academic Session 2026-2027] [ODD SEM]

Class: B. Sc First Year [I semester]

Subject: Chemistry Core Course-1 [B23-CHE-101]

Dr. Amit Kumar, Assistant Professor of Chemistry

Month	Topic	Academic Activities
August, 2026	UNIT-I **Atomic Structure:** Dual behaviour of matter and radiation, de Broglie's relation, Heisenberg's uncertainty principle, concept of atomic orbitals, significance of quantum numbers, radial and angular wave functions, normal and orthogonal wave functions, significance of Ψ and Ψ^2, shapes of s, p, d, f orbitals, Rules for filling electrons in various orbitals, effective nuclear charge, Slater's rules. **Periodic table and Atomic Properties:** Classification of periodic table, definition of atomic and ionic radii, ionisation energy, electron affinity and electronegativity, trend in periodic table (in s and p-block elements), Pauling, Mulliken, Allred Rachow and Mulliken Jaffe's electronegativity scale, Sanderson's electron density ratio.	Introduction of Syllabus and Course Learning outcomes Discussion of Previous Years Questions Doubt solving sessions
September, 2026	UNIT-II **Gaseous States:** 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 number, collision frequency and mean free path (Derivations excluded), Deviation of Real gases from ideal behaviour, Derivation of Van der Waal's Equation of State, its application in the calculation of Boyle's temperature (Compression factor) **Critical Phenomenon:** Concept of Critical temperature, critical pressure, critical volume, relationship between critical constants and Van der Waal's constants (Derivation excluded).	Doubt solving sessions Assignment Discussion on Assignment Discussion of Previous Years Questions
October, 2026	UNIT-III **Structure and Bonding:** Localized and delocalized chemical bond, Van der Waal's interactions, Concept of resonance and its applications,	Mid Term Exam Discussion on Mid Term Exam

	hyperconjugation, inductive effect, Electrometric effect and their comparison. **Mechanism of Organic Reactions:** Curved arrow notation, homolytic and heterolytic bond fission. Types of reagents: electrophiles and nucleophiles. Types of organic reactions: Substitution, Addition, Condensation, Elimination, Rearrangement, Isomerisation and Pericyclic reactions, Reactive intermediates: Carbocations, carbanions, free radicals, carbenes, (structure & stability).	Doubt solving sessions Discussion of Previous Years Questions
November, 2026	UNIT-IV **Liquid States:** Structure of liquids, Properties of liquids: surface tension, refractive index, viscosity, vapour pressure and optical rotation. **Solid State:** Classification of solids, Law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry and symmetry elements, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of Laue method, rotating crystal method and powder pattern method. **Revision of syllabus**	Doubt solving sessions Discussion of Previous Years Questions

Lesson Plan [Academic Session 2026-2027] [ODD SEM]

Subject: MDC-I [Introductory Chemistry-I] [B23-CHE-104]

Dr. Amit Kumar, Assistant Professor of Chemistry

Month	Topic	Academic Activities
August, 2026	UNIT-I **Atomic Structure and Bonding** Introduction, Elementary introduction of atomic structure and chemical bonding, Representation of elements/ atoms, Lewis structure, electronic configurations (1-30)	Introduction of Syllabus and Course outcomes
September, 2026	UNIT-II **Carbon and Its Compounds** Introduction, Tetravalency of Carbon, allotropes of carbon and their properties, hydrocarbons (1-5), nomenclature (linear compounds), Applications of hydrocarbons.	Assignment on various topics of Atomic Structure Discussion on Assignment Doubt solving sessions
October, 2026	UNIT-III **Polymers** Introduction, elementary idea of synthetic and natural polymers, Homo polymers and copolymers, uses and properties (Natural rubber, Vulcanized rubber, Polyethene, PVC, Styrene, Teflon, PAN, Nylon-66)	Mid Term Exam Discussion on Mid Term Exam Doubt solving sessions
November, 2026	UNIT-IV **Food Preservatives** Elementary idea of natural and synthetic food preservatives, rancidity, uses and properties, different food preservation processes (pickle, Jam), artificial sweeteners, uses and properties	Doubt solving sessions Discussion of Previous Years Questions

Lesson Plan [Academic Session 2026-27]

Class: B. Sc First Year [II semester]

Subject: Chemistry Core Course-II (B23-CHE-201)

Dr. Amit Kumar, Assistant Professor of Chemistry

Month	Topic	Academic Activities
January, 2027	**UNIT-I** **Covalent Bond:** VBT approach, shapes of simple inorganic molecules and ions based on VSEPR theory and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Molecular orbital theory of homonuclear (N_2, O_2) and heteronuclear (CO and NO) diatomic molecules, dipole moment and percentage ionic character in covalent bond. **Ionic Solids:** Ionic structures (NaCl, CsCl, ZnS, CaF_2) size effects, radius ratio rule and its limitations, Concept of Lattice energy, Born-Haber cycle, Solvation energy and its relationship with solubility of Ionic solids, Polarizing power and Polarisability of ions, Fajan's rule.	Introduction of Syllabus and Course Learning Outcomes Discussion of Previous Years Questions
February, 2027	**UNIT-II** **Chemical Kinetics**: Concept of reaction rates, rate equation, factors influencing the rate of reaction, Order and molecularity of a reaction, Integrated rate expression for zero, first, Half-life period of a reaction, Arrhenius equation. **Distribution Law**: Nerst distribution law-its thermodynamic derivation, Nerst distribution law after association and dissociation of solute in one of the phases, of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride	Discussion of Previous Years Questions
March, 2027	**UNIT-III** **Alkanes and Cycloalkanes**: Nomenclature, classification of carbon atoms in alkanes and its structure. Isomerism in alkanes, sources. Methods of formation: Wurtz reaction, Kolbe reaction, Corey- House reaction and decarboxylation of carboxylic acids, physical properties.	Mid Term Exam Discussion on Exam

	Mechanism of free radical halogenation of alkanes: reactivity and selectivity. Nomenclature of Cycloalkanes, Baeyer's strain theory and its limitations, theory of strainless rings. **Alkenes:** Nomenclature of alkenes and its structure. Methods of formation: dehydration of alcohols, dehydrohalogenation of alkyl halide, Hofmann elimination and their mechanism. The Saytzeff rule and relative stabilities of alkenes. Chemical reactions: electrophilic and free radical additions, addition of halogens, halogen acids, hydroboration-oxidation, oxymercuration-reduction, ozonolysis and hydration. Markownikoff's rule of addition.	Assignment Discussion on Assignment Doubt solving sessions
April, 2027	**UNIT-IV** **Hydrogen Bonding and Van der Waals forces:** Hydrogen Bonding- Definition, types, effects of hydrogen bonding on properties of substances, application. Brief discussion of various types of Van der Waals forces. **Metallic Bond and semiconductors:** Metallic bond - Qualitative idea of valence bond and Band theories of metallic bond (conductors, semiconductors, insulators). Semiconductors - Introduction, types, and applications. **Revision of Syllabus**	Discussion of Previous Years Questions

Lesson Plan [Academic Session 2026-27]

Multi-Disciplinary Course

Subject: Introductory Chemistry-II [B23-CHE-204]

Dr. Amit Kumar, Assistant Professor of Chemistry

Month	Topic	Academic Activities
January, 2027	**UNIT-I** **Renowned Indian Scientists:** Brief Biography of Renowned Indian Scientists (Hargobind Khurana, Dr. P.C. Ray, Sir C.V. Raman, Dr. A.P.J. Abdul Kalam, C. N. R. Rao, Dr. Vikram Sara Bhai, Dr. Homi Jahangir Bhabha, Dr. J.C. Bose, Dr. S. N. Bose).	Introduction of Syllabus; and Course Learning outcomes Doubt solving sessions
February, 2027	**UNIT-II** **Metal and Non-Metals:** Periodic table, classification of elements, physical and chemical aspects of metals and non-metals, Ore and Minerals of Iron, Copper, Aluminum alloys.	Assignment submission Doubt solving sessions
March, 2027	**UNIT-III** **Physical Properties of Matter:** Classification of matter, properties, uses, ideal gas equation, real gas equation, some important compounds (baking soda, washing soda, plaster of Paris, gypsum,, glass).	Mid Term Exam Discussion on Mid Term Exam Doubt solving sessions
April, 2027	**UNIT-IV** **Soil and fertilizers:** Green revolution, soil: types of soil and their components for fertility, grow condition, pH, irrigation, biofertilizers, chemical fertilizers and their uses, acid rain. Revision of Syllabus	Doubt solving sessions

Lesson Plan [Academic Session 2025-2026] [ODD SEM]

Class: B. Sc Third Year [V semester]

Subject: Chemistry Core Course-V [B-23-CHE-501]

Dr. Amit Kumar, Assistant Professor of Chemistry

Month	Topic	Academic Activities
August, 2026	UNIT-I **Coordination Compounds:** Werner's theory of coordination compounds, EAN, chelates, nomenclature of coordination compounds, isomerism in coordination compounds. **Metal Ligand Bonding in Transition** Metal **Complexes:** Valence bond theory, applications and their Limitation, Elementary idea of CFT (Only structural aspects), Crystal field splitting in octahedral, tetrahedral and square planer complexes. **Magnetic properties of transition metal complexes:** Types of magnetic materials, magnetic susceptibility, method of determination, spin only formula, basic idea of L-S coupling.	Introduction of Syllabus and Course outcomes Discussion of Previous Years Questions Doubt solving sessions
September, 2026	UNIT-II **Thermodynamics-II:** Third Law of Thermodynamics, Nernst Heat Theorem, Statement of concept of residual entropy, evaluation absolute entropy from heat capacity data. Gibbs function and Helmholtz Function as thermodynamic quantities. Criteria for thermodynamic equilibrium and spontaneity. Variation of G with P, V and T, Partial molar properties, concept of chemical potential (numerical included) **Phase Equilibria:** Statement and the meaning of terms-phase component and degree of freedom, Thermodynamic derivation of Gibbs phase rule, Phase equilibria of one component system-water system, phase equilibria of two component systems solid-liquid equilibria, simple Eutectic Pb-Ag system.	Doubt solving sessions Discussion of Previous Years Questions

October, 2026	UNIT-III **Quantum Mechanics-I:** Black body radiation, plank's radiation law, Explanation of spectral distribution of black body radiation on the basis of classical mechanics and quantum mechanics, Heat capacity of solids, Need of quantum mechanics, postulates of quantum mechanics, quantum mechanical operator, Commutation relations, Hamiltonian operator, Role of operators to derive Schrodinger wave equation, Application Schrodinger wave equation in determination of wave function and energy of a particle in one dimensional box **Spectroscopy-I:** Electromagnetic radiations, reasons of electromagnetic spectrum, basic features of spectroscopy, introduction to molecular spectroscopy and its difference from atomic spectroscopy, signal to noise ratio, resolving power of spectrophotometer, Born- Oppenheimer approximation, Concept of degree of freedom. **Rotational** Spectrum: Energy levels of rigid rotator of diatomic molecules, selection rules, spectral intensity distribution using Maxwell-Boltzmann distribution, Determination of bond length and concept of isotopic effect.	Assignment Discussion on Assignment Mid Term Exam Discussion on Mid Term Exam Doubt solving sessions Discussion of Previous Years Questions
November, 2026	UNIT-IV **Organic Synthesis via Enolates** Acidity of a-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. **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. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. **Revision of syllabus**	Doubt solving sessions Discussion of Previous Years Questions

Lesson Plan [Academic session 2026-2027]

Class: B. Sc Third Year [VI semester]

Subject: Chemistry Core Course-VI (B23-CHE-601)

Dr. Amit Kumar, Assistant Professor of Chemistry

Month	Topic	Academic Activities
January, 2027	**UNIT-I** **Bioinorganic Chemistry:** Metal ions present in biological system, classification based on action (essential, non-essential, trace, toxic), Metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of Na^{+}, K^{+}, Ca^{+2}, Mg^{+2}, Fe^{+2} ions, Cooperativity effect, Bohr effect.	Introduction of Syllabus and Course Learning outcomes Discussion of Previous Years Questions
February, 2027	**UNIT-II** **Photochemistry:** Interaction of radiation with matter, difference between thermal and photochemical process, Law of photochemistry: Lambert-Beer Law, Grotthus-Drapper Law, Stark Einstein Law (Law of photochemical equivalence), calculation of integrated absorption coefficient from electronic spectra, oscillator strength, concept of singlet and triplet states, Jablonski diagram - depicting various process occurring in excited states including fluorescence, phosphorescence and non-radiative processes (internal conversion, intersystem crossing). Calculation of lifetime of excited states. Quantum Yield, Photosensitized reaction-energy transfer process (Simple example).	Doubt solving sessions Discussion of Previous Years Questions
March, 2027	**UNIT-III** **IR Spectroscopy:** Infrared (IR) absorption spectroscopy Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region,	

	characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. **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. Discussion of PMR spectra of the molecules: ethyl bromide, n-propyl bromide, isopropyl bromide and 1,1-dibromoethane.	Mid Term Exam Discussion on Mid Term Exam Assignment Discussion on Assignment
April, 2027	**UNIT-IV** **Amino Acids, Peptides:** Amino acids, Peptides, and their classification. a-Amino Acids-Synthesis, ionic properties, and reactions. Zwitterions, pKa values, isoelectric point, and electrophoresis; Study of peptides: Synthesis of peptides using N-protecting, C-protecting, and C- activating groups. **Carbohydrates:** Occurrence, classification, and their biological importance. Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projection and conformational structures; Interconversion of aldoses and ketoses; Killiani-Fischer synthesis and Ruff degradation. **Revision of syllabus**	Doubt solving sessions Discussion of Previous Years Questions