Govt. College, Aharwala (Bilaspur) -Yamuna Nagar LessonPlan (2025-26) [Odd Semester]

Name of Teacher	**Pooja Sharma**
Department	**Chemistry**
Class	**B.Sc 1st Sem**
Subject	**Chemistry Major**
Semester Duration	**July –November**

Topics

Month of July and August

Atomic Structure

Dual behaviour of matter and radiat ion, de Broglie's relat ion,Heinsenberg's uncertaint y 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 nuclearcharge, 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 electronegativit y scale, Sanderson's electron densit y Ratio.

Month of September

Gaseous State

Kinet ic 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)

Month of October

Structure and Bonding

Localized and delocalized chemical bond, Van der Waals interactions. Concept of resonance and its applications,hyperconjugation, inductive effect, Electromeric 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, Isomerization and Pericyclic reactions. Reactive intermediates: Carbocations, carbanions,free radicals, carbenes (structure & stability)

Month of November

Liquid State

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 diffract ion, Bragg's law, a simple account of Laue method, rotating crystal method and powder pattern method.

Govt. College, Aharwala (Bilaspur) -Yamuna Nagar LessonPlan (2025-26) [Odd Semester]

Name of Teacher	**Pooja Sharma**
Department	**Chemistry**
Class	**B.Sc 1st Sem**
Subject	**Chemistry Minor**
Semester Duration	**July –November**

Topics

Month of July and August

Covalent Bond

Valence bond theory approach, shapes of simple inorganic molecules and ions based on valence shell electron pair
repulsion (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) diatomicmolecules, dipole moment and percentage ionic character in covalent bond

Month of September

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

Month of October

Alkanes (upto 5 carbon atoms)

Alkanes, nomenclature, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation:Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids, physical properties.Mechanism of free radical halogenation of alkanes: reactivity and selectivity.

Month of November

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.

Govt. College, Aharwala (Bilaspur) -Yamuna Nagar LessonPlan (2025-26) [Odd Semester]

Name of Teacher	**Pooja Sharma**
Department	**Chemistry**
Class	**B.Sc 1IIrd Sem**
Subject	**Chemistry M**
Semester Duration	**July –November**

Topics

Month of July and August

s and p-Block Elements

Salient features of hydrides, oxides, halides, hydroxides of s-block elements (methods of preparation excluded). Structure, preparation and properties of Diborane and Borazine.Catenation, carbides, fluorocarbons, silicates (structural aspects), structure of oxides of Nitrogen and Phosphorous,structure of white and red phosphorus.

Structure of oxyacids of Nitrogen, phosphorous, sulphur and chlorine and comparison of acidic strength of oxyacids.low chemical reactivity of noble gases, chemistry of xenon,structure and bonding in fluorides, oxides and oxyfluorides of xenon.

Month of September

lectrochemistry-I

Electrolytic conduction, factors affecting electrolytic conduction, specific conductance, molar conductance, equivalent conductance and relation among them, their variat ion with concentration. Applicat ion of Kohlrausch' s Law in calculation of conductance of weak electrolytes at infinite dilution (Numericals)Concepts of pH and pK

Buffer solution, Buffer action,Henderson – Hazel equation, Buffer mechanism of buffer action.

Electrochemistry-II

Reversible & irreversible cells, Calculation of thermodynamic quant it ies of cell react ion (▲G, ▲H & K).

Types of reversible electrodes – metal- metal ion, gas electrode, metal – insoluble salt- anion and redox electrodes.

Nernst equation, Standard Hydrogen electrode, reference electrodes, Applications of EMF measurement in Solubility product and potentiometric titrations using glass electrode.

Month of October

Alkynes

Nomenclature and its structure. Methods of formation: using Calcium carbide, dehydrohalogenation, Kolbe's electrolysis.Chemical reactions: Mechanism of electrophilic and nucleophilic addition reactions, formation of metal acetylides,addition of bromine and alkaline KMnO4, ozonolysis. Acidity of alkynes.

Stereochemistry of Organic Compounds

Concept of isomerism: Structural and Stereoisomerism. Symmetry elements, enantiomers, optical activity, propertiesof enantiomers, chiral and achiral molecules (up-to 2 asymmetric centres), diastereomers, threo- and erythro-nomenclature, meso-compounds, Relative and absolute configuration, sequence rules, R and S system of

nomenclature. Cis- Trans isomerism, E & Z system of nomenclature, Conformational analysis of ethane and n-butane,conformations of cyclohexane, axial and equatorial bonds.Newman and Sawhorse projection formulae

Month of November

Benzene and its derivatives:

Nomenclature, Aromat ic nucleus and side chain, Huckels' rule of aromaticity.Aromatic electrophilic substitution, mechanism of nitration,halogenation, sulphonation, and Friedel- Crafts reaction.Energy profile diagrams. Activating, deactivating substituents and orientation.

Alkyl halides: Nomenclature, methods of formation: from alkenes and alcohol, nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions with energy profile diagrams.

Aryl halides: Methods of formation: halogenation, Sandmeyer reaction. The addition-elimination, and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.Relative reactivities of alkyl halides vs allyl, vinyl, and aryl halides

Govt. College, Aharwala (Bilaspur) -Yamuna Nagar Lesson Plan (2025-26) [Odd Semester]

Name of Teacher	**Pooja Sharma**
Department	**Chemistry**
Class	**B.Sc Vth Sem**
Subject and Paper	Chemistry VOC (Chemistry of Fertilizers and Pesticides)
Semester Duration	**July –November**

Topics

Month of July and August

Methods and time of fertilizer applications, tips to get best efficiency of Applied fertilizers, Integrated nutrient management,fertilizers and its relations to plant nutrients, Factors effecting optimum fertilizer dose.

Month of September

Classification and types of fertilizers, Nitrogenous fertilizers: Ammonium nitrate, Urea, Calcium Cyanamide, Calcium Ammonium Nitrate, Sodium Nitrate, Ammonium Chloride:Introduction, Raw materials, Action of as a fertilizers

Month of October

Phosphate fertilizers: Normal super phosphate, Triple Super Phosphate, Ammonium Phosphate. Potassic fertilizers (Types and optimum doses)

Month of November

pesticides: Classification, synthesis, structure activity relationship (SAR), mode of action, uses and adverse effects of representative pesticides in the following classes: Organochlorines (DDT,Gammaxene); Organophosphates (Malathion, Parathion);Carbamates (Carbofuran and Carbaryl); Quinones (Chloranil),Anilides (Alachlor and Butachlor).

Govt. College, Aharwala (Bilaspur) -Yamuna Nagar LessonPlan (2025-26) [Odd Semester]

Name of Teacher	**Pooja Sharma**
Department	**Chemistry**
Class	**B.Sc Vth Sem**
Subject and Paper	Chemistry
Semester Duration	**Aug –November**

Topics

Month of August

Coordination Compounds

Werner's theory of coordination compounds, effective atomic number, chelates, nomenclature of coordination compounds, Isomerism in coordination compounds

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, factors affecting the crystal field parameters.

Magnetic properties of Transition metal complexes

Types of magnetic materials, magnetic susceptibility, method of determining magnetic susceptibility, spin only formula, L-S coupling,

Month of September

Thermodynamics

Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gi bbs function (G) and Helmholtz function (A)

as thermodynamic quantities, G as criteria of or thermodynamic

equilibrium and spontaneity, its advantage over entropy change.

Variation of G with P, V and T

Phase Equillibrium

Statement and meaning of the terms – phase, component and degree of freedom,

thermodynamic derivation of Gibbs phase rule, 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.

Month of October

Organic Synthesis *via* Enolates

Aciditiy of α-hydrogens,alkylation of diethylmalonate and ethyl acetoacetate.Synthesis of ethylacetoacetate:the Claisen condensation.Keto-enol tautomerism of ethylacetoacetate.

Heterocyclic Compounds

Int roduction: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 pyridine derivatives.Comparison of basicity of pyridine, piperidine and pyrrole.

Month of November

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 equantity, Role Of operators in quantum mechanics, To show quantum mechanically t hat position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box.

Spectroscopy

Introduction: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Born- oppenheimer approximation, Degrees of freedom.

Rotational Spectrum

Selection rules, Energy levels of rigid rotator (semi-classical principles), rotational spectra of diatomic molecules , spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length and isotopic effect .