

Government College, Chhachhrauli

Summary of Lesson Plan

Name of Teacher: *Ms. Meenu Rani*

Academic Session : 2023-2024

Class : B.Sc. I

Semester : I

Subject : Chemistry Major

Unit	Topic/Chapters to be covered	Duration	Assignment and Tests
1.	Atomic Structure Idea of de Broglie matter waves, Heisenberg's uncertainty principle, atomic orbitals, quantum numbers, radial and angular wave functions, normal and orthogonal wave functions, significance of Ψ and Ψ^2 , probability distribution curves, shapes of s, p, d, f orbitals, Aufbau and Pauli exclusion principles.	24 th July to 31 st July	-
2.	Hund's multiplicity rules, Electronic configuration of elements, effective nuclear charge, Slater's rules. Periodic table and atomic properties Classification of periodic table into s, p, d, f blocks, atomic and ionic radii, ionisation energy, electron affinity and electronegativity definition, methods of determination or evaluation, 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.	01 Aug to 15 Aug	Assignment
3.	Gaseous States Kinetic Molecular 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).	16 th Aug to 31 st Aug	-
4.	Deviation of Real gases from ideal behavior, Derivation of Van der Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor) Critical Phenomenon Critical temperature, critical pressure, critical volume and their determination.	1 st Sept to 15 th Sept.	Test

5.	Structure and Bonding Localized and delocalized chemical bond, Van der Waal's interactions, resonance: conditions, resonance effect and its applications, hyperconjugation, inductive effect, Electromeric effect & their comparison.	16 th Sept to 30 th Sept.	-
6.	Structure and Bonding Localized and delocalized chemical bond, Van der Waal's interactions, resonance: conditions, resonance effect and its applications, hyperconjugation, inductive effect, Electromeric effect & their comparison. Mechanism of Organic Reactions Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Reactive intermediates — carbocations, carbanions, free radicals, carbenes,(formation, structure & stability).	01 Oct to 15 th Oct.	Assignment
7.	Liquid States Structure of liquids, Properties of liquids – surface tension, refractive index, viscosity, vapour pressure and optical rotation.	15 th Oct. to 31 st Oct.	Test
8.	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	1 st Nov to 15 th Nov	-
9.	Revision and test	16 th Nov. onwards	-

Government College, Chhachhrauli

Summary of Lesson Plan

Name of Teacher: *Ms. Meenu Rani*

Academic Session : 2023-2024

Class : B.Sc. I

Semester : I

Subject : Chemistry Minor

Unit	Topic/Chapters to be covered	Duration	Assignment and Tests
1.	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	24 th July to 31 st July	-
2.	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.	01 Aug to 15 Aug	Assignment
3.	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	16 th Aug to 31 st Aug	-
4.	first, second order reactions (for equal conc. of reactants), Half-life period of a reaction.	1 st Sept to 15 th Sept.	Test
5.	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	16 th Sept to 30 th Sept.	-
6.	physical properties. Mechanism of free radical halogenation of alkanes: reactivity and selectivity.	01 Oct to 15 th Oct.	Assignment

7.	Metallic Bond and semiconductors Metallic bond – Qualitative idea of valence bond and Band theories of metallic bond (conductors, semiconductors, insulators)	15 th Oct. to 31 st Oct.	Test
8.	Semiconductors – Introduction, types, and applications.	1 st Nov to 15 th Nov	-
9.	Revision and test	16 th Nov. onwards	-

Government College, Chhachhrauli

Summary of Lesson Plan

Name of Teacher: *Ms. Meenu Rani*

Academic Session : 2023-2024

Class : B.Sc. II

Semester : III

Subject : Inorganic Chemistry.

Unit	Topic/Chapters to be covered	Duration	Assignment and Tests
10.	Chemistry of d-Block elements Definition of transition elements, position in the periodic table, General characteristic properties of d-Block elements,	24 th July to 31 st July	-

11.	Comparison of properties of 3d elements with 4d and 5d elements with reference only to ionic radii, oxidation state, magnetic and spectral properties and stereo chemistry.	01 Aug to 15 Aug	Assignment
12.	Stability of various oxidation states and e.m.f (Latimer and Frost diagrams), Structure and properties of some compounds of transition elements- TiO_2 , VOCl_2 , FeCl_3 , CuCl_2 and $\text{Ni}(\text{CO})_4$	16 th Aug to 31 st Aug	-
13.	Stability of various oxidation states and e.m.f (Latimer and Frost diagrams), Structure and properties of some compounds of transition elements- TiO_2 , VOCl_2 , FeCl_3 , CuCl_2 and $\text{Ni}(\text{CO})_4$	1 st Sept to 15 th Sept.	Test
14.	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	16 th Sept to 30 th Sept.	-
15.	Isomerism in coordination compounds, valence bond theory of transition metal complexes	01 Oct to 15 th Oct.	Assignment
16.	Non-aqueous solvents Physical properties of solvents, types of solvents and their general characteristics,.	15 th Oct. to 31 st Oct.	Test
17.	reactions in non aqueous solvents with reference to liquid NH_3 and liquid SO_2	1 st Nov to 15 th Nov	-
18.	Revision and test	16 th Nov. onwards	-

Government College, Chhachhrauli

Summary of Lesson Plan

Name of Teacher: *Ms. Meenu Rani*

Academic Session : 2023-2024

Class : B.Sc. II

Semester : III

Subject : Physical Chemistry.

Unit	Topic/Chapters to be covered	Duration	Assignment and Tests
1.	Thermodynamics Definition of thermodynamic terms: system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Thermodynamic equilibrium, Concept of heat and work.	24 th July to 31 st July	-
2.	First law of thermodynamics: statement, concepts of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship.	01 Aug to 15 Aug	Assignment

3.	Joule–Thomson coefficient for ideal gas and real gas and inversion temperature. Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.	16 th Aug to 31 st Aug	-
4.	Chemical Equilibrium Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium.	1 st Sept to 15 th Sept.	Test
5.	Temperature dependence of equilibrium constant. Clausius–Clapeyron equation and its applications	16 th Sept to 30 th Sept.	-
6.	Distribution Law Nernst distribution law – its thermodynamic derivation, Applications of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride	01 Oct to 15 th Oct.	Assignment
7.	(ii) Determination of equilibrium constant of potassium triiodide complex and (iii) Process of extraction. More stress on numerical problems.	15 th Oct. to 31 st Oct.	Test
8.	Revision	1 st Nov to 15 th Nov	-
9.	Revision	16 th Nov. onwards	-

Summary of Lesson Plan

Name of Teacher: *Ms. Meenu Rani*

Academic Session : 2023-2024

Class : B.Sc. II

Semester : III

Subject : Organic Chemistry.

Unit	Topic/Chapters to be covered	Duration	Assignment and Tests
1.	Alcohols Monohydric alcohols — nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols, Dihydric alcohols — nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [Pb(OAc) ₄ and HIO ₄] and pinacol-pinacolone rearrangement	24 th July to 31 st July	-
2.	Phenols Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion	01 Aug to 15 Aug	Assignment
3.	Reactions of phenols — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.	16 th Aug to 31 st Aug	-
4.	Epoxides Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.	1 st Sept to 15 th Sept.	Test
5.	Ultraviolet (UV) absorption spectroscopy Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome.	16 th Sept to 30 th Sept.	-
6.	Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones, Woodward-Fieser rules, calculation of λ_{max} of simple conjugated dienes and α,β -unsaturated ketones. Applications of UV Spectroscopy in structure elucidation of simple organic compounds.	01 Oct to 15 th Oct.	Assignment
7.	Carboxylic Acids & Acid Derivatives Nomenclature of Carboxylic acids, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction	15 th Oct. to 31 st Oct.	Test

8.	Reduction of carboxylic acids. Mechanism of decarboxylation. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic).	1 st Nov to 15 th Nov	-
9.	Revision	16 th Nov. onwards	-

Government College, Chhachhrauli

Summary of Lesson Plan

Name of Teacher: *Ms. Meenu Rani*

Academic Session : 2023-2024

Class : B.Sc. III

Semester : V

Subject : Inorganic Chemistry.

Unit	Topic/Chapters to be covered	Duration	Assignment and Tests
1.	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.	24 th July to 31 st July	-
2.	Thermodynamics and Kinetic Aspects of metal complexes A brief outline of thermodynamic stability of metal complexes and factors affecting the stability,	01 Aug to 15 Aug	Assignment
3.	Irving William Series, substitution reactions of square planer complexes of Pt[II], Trans effect	16 th Aug to 31 st Aug	-

4.	Magnetic properties of Transition metal complexes Types of magnetic materials, magnetic susceptibility, method of determining magnetic susceptibility, spin only formula,	1 st Sept to 15 th Sept.	Test
5.	, 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.	16 th Sept to 30 th Sept.	-
6.	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	01 Oct to 15 th Oct.	Assignment
7.	discussion of electronic spectrum of $[Ti(H_2O)_6]^{+3}$ complex ion.	15 th Oct. to 31 st Oct.	Test
8.	Revision	1 st Nov to 15 th Nov	-
9.	Revision	16 th Nov. onwards	-

Government College, Chhachhrauli

Summary of Lesson Plan

Name of Teacher: *Ms. Meenu Rani*

Academic Session : 2023-2024

Class : B.Sc. III

Semester : V

Subject : Physical Chemistry.

Unit	Topic/Chapters to be covered	Duration	Assignment and Tests
1.	Quantum Mechanics-I Black-body radiation, Plank's radiation law, photoelectric effect, postulates of quantum mechanics, quantum mechanical operators, commutation relations, Hamiltonian operator	24 th July to 31 st July	-
2.	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, Determination of wave function & energy of a particle in one dimensional box.	01 Aug to 15 Aug	Assignment
3.	Physical Properties and Molecular Structure Optical activity, polarization – (Clausius – Mossotti equation derivation excluded). Orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment-temperature method and refractivity method,	16 th Aug to 31 st Aug	-
4.	dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Application of magnetic susceptibility, magnetic properties – paramagnetism, diamagnetism and ferromagnetism.	1 st Sept to 15 th Sept.	Test
5.	Spectroscopy Introduction: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Born-oppenheimer approximation, Degrees of freedom.	16 th Sept to 30 th Sept.	-
6.	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.	01 Oct to 15 th Oct.	Assignment
7.	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, idea of vibrational frequencies of different functional groups.	15 th Oct. to 31 st Oct.	Test
8.	Raman Spectrum Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra. Give more stress on numerical problems of all spectroscopy.	1 st Nov to 15 th Nov	-

9.	Revision	16 th Nov. onwards	-
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Government College, Chhachhrauli

Summary of Lesson Plan

Name of Teacher: *Ms. Meenu Rani*

Academic Session : 2023-2024

Class : B.Sc. III

Semester : V

Subject : Organic Chemistry.

Unit	Topic/Chapters to be covered	Duration	Assignment and Tests
1.	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	24 th July to 31 st July	-
2.	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, 1,1-dibromoethane, ethanol, acetaldehyde	01 Aug to 15 Aug	Assignment
3.	ethyl acetate, toluene, benzaldehyde and acetophenone.. Simple problems on PMR spectroscopy for structure determination of organic compounds	16 th Aug to 31 st Aug	-
4.	Carbohydrates Classification and nomenclature of Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses.	1 st Sept to 15 th Sept.	Test

5.	Configuration of monosaccharides. Erythro and threo diastereomers. 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	16 th Sept to 30 th Sept.	-
6.	Structures of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.	01 Oct to 15 th Oct.	Assignment
7.	Organometallic Compounds Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions.	15 th Oct. to 31 st Oct.	Test
8.	Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.	1 st Nov to 15 th Nov	-
9.	Revision	16 th Nov. onwards	-