

LESSON PLAN

B.Sc I year

1. Outline learning objective
2. Develop the introduction
3. Plan the main body of the lesson
4. Plan to check for understanding
5. Develop a conclusion and a preview
6. Create realistic timeline

Chemistry

PAPER - I

Inorganic Chemistry M.M. 33 (60 Hrs each paper)

Period= 45 min

UNIT-1

S. No.	Topic	No. of periods needed	Teaching Method	Lesson plan
1.	Atomic structure	8	Lecture, black board, discussion	<p>General objective: to develop Chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry. Questions based on previous knowledge</p> <p>Synopsis: Bohr's theory, its limitation atomic spectrum of hydrogen atom. general idea of de-broglie matter waves Heisenberg uncertainty principal, Schrodinger wave equation, radial and angular wave functions and probability distribution curves, Quantum numbers, Atomic orbital and shape of s,p,d orbitals Aufbau and Pauli exclusion principles Hund's Multiplicity rule , electronic configuration of the elements</p> <p>Homework after each class</p>

2.	Periodic properties	8	Lecture, black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry</p> <p>Questions based on previous knowledge</p> <p>Synopsis:</p> <p>Discussion of the following periodic properties of the elements</p> <ul style="list-style-type: none"> • Atomic and ionic radii • Ionisation enthalpy • Electron gain enthalpy • Electronegativity • Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table. <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3. class room quiz competitions 				
UNIT-2				
	Chemical bonding-I	12	Lecture, black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry</p> <p>Questions based on previous knowledge</p> <p>Synopsis:</p> <p>Ionic bond</p> <p>radius ratio and coordination number limitation of radius ratio rule lattice defects, semiconductor, lattice energy, Born Haber cycle' solvation energy and solubility of ionic solids, Fajan's rule ionic character in covalent compounds dipole moment and bond moment percentage ionic character from dipole moment and electro negativity difference, Metallic bond-free electron, valence bond and band theories.</p> <p>Homework after each class</p>

	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
UNIT-3				
	Chemical bonding-II	16	Lecture black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge</p> <p>Synopsis: Covalent bond Lewis structure, VBT and its limitation, Concept of hybridisation , Energetics of hybridisation, equivalent and non-equivalent hybrid orbitals, VSPER theory, Shapes of some molecules, Molecular orbital theory' Bond order and bond strength, Molecular orbital diagram of diatomic and simple polyatomic molecules N₂, O₂ F₂, CO, NO.</p> <p>Homework after each class</p>
	Assessment of understanding: 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
UNIT-4				
1	s-block elements	10	Lecture black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis: General concepts on group relationships and gradation properties. Comparative study, silent features of hydrides, salvation and complexation tendencies including their function in biosystems and introduction to alkyl and aryls, derivatives of alkali and alkaline earth metals.</p> <p>Homework after each class</p>

2	p- block elements	10	Lecture black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry</p> <p>Questions based on previous knowledge</p> <p>Synopsis: General concepts on group relationships and gradation properties. halides, hydrides ,oxides and oxyacids of Boron, Aluminum,Nitrogen and Phosphorus, Boranes, Borazines, Fullerenes, Graphene and silicates, interhalogens and pseudohalogens</p> <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 				
Unit-5				
1	Chemistry of noble gases	8	Lecture, black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry .Questions based on previous knowledge</p> <p>Synopsis: Chemical properties of the noble gases, chemistry of Xenon, structure, bonding in Xenon compounds</p> <p>Homework after each class</p>
2	Theoretical principles in qualitative analysis (H ₂ S Scheme)	8	Lecture, black board, discussion	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge</p> <p>Synopsis: Basic principles involved in the analysis of cations and anions and solubility products,common ion effect,</p>

				<p>principles involved in the separation of cations into groups and choice of group reagents. Interfering anions and need to remove them after group II.</p> <p>Homework after each class</p>
	<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 			

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Chemistry

PAPER - II

Organic Chemistry M.M. 33 (60 Hrs each paper)

Period= 45 min

UNIT-1

S. N o.	Topic	No. of periods needed	Teaching Method	Lesson plan
1.	Basics of organic chemistry	16	Lecture, black board, discussion	<p>General objective: to develop Chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry. Questions based on previous knowledge</p> <p>Synopsis: hybridization, Shapes of molecules, Influence of hybridization on bond properties, Electronic displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications, Dipole moment, Electrophiles and nucleophiles, Nucleophilicity and basicity, Cleavage, Intermediates-generation ,shape and relative stability, Types of organic reactions</p> <p>Homework after each class</p>

	Assessment of understanding: 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
UNIT-2				
	Introduction to stereochemistry	14	Lecture, black board, PPT	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge Synopsis: Optical isomerism optical activity, specific rotation, Chirality/ Asymmetry, Enantiomers, Molecules with two or more chiral centres, Diastereoisomers, meso compounds, Relative and absolute configuration, Fisher, Newmann and sawhorse projection formulae and their interconversions; erythrose and threose, D/L, d/l system of nomenclature, Cahn-Ingold-Prelog system of nomenclature (C.I.P rules) R/S nomenclature, Geometrical isomerism: cis-trans, syn-anti and E/Z notation. Homework after each class
	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
UNIT-3				
	Conformational analysis of alkanes	16	Lecture black board, PPT	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge Synopsis: Conformational analysis of alkanes, ethane, butane, cyclohexane and sugars, relative stability and energy diagrams. Types of cycloalkanes and their relative stability, Baeyer strain theory, theory of

				<p>strainless rings, Chair, Boat and twist boat conformation of cyclohexane with energy diagrams; Relative stability of mono-substituted cycloalkanes and disubstituted cyclohexane.</p> <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 				
UNIT-4				
1	Carbon-Carbon sigma bonds	10	Lecture black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis:</p> <p>Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz-Fitting Reaction, Free radical substitutions: Halogenation-relative reactivity and selectivity</p> <p>Homework after each class</p>
2	Carbon-Carbon Pi bonds	10	Lecture black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis:</p> <p>Formation of alkenes and alkynes by elimination reactions, Mechanism of elimination reactions, Saytzeff and Hofmann eliminations.</p> <p>Reactions of alkenes: Electrophilic addition and mechanisms (Markownikoff/ Anti- Markownikoff addition), mechanism of oxymercuration-demercuration, hydroboration- oxydation, ozonolysis, reduction, syn and anti-hydroxylation, 1,2 and 1,4 addition reactions in conjugated dienes and Diels-Alder</p>

				<p>reaction; Allylic and benzylic bromination and mechanism, e.g. propane, 1-butene, toluene, ethyl benzene.</p> <p>Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds. Alkylation of terminal alkynes.</p> <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 				
Unit-5				
	Aromatic hydrocarbons	14	Lecture, black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry .Questions based on previous knowledge</p> <p>Synopsis: Aromaticity: Huckel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution, halogenations, nitration ,sulphonation and Friedel-Craft's alkylation/acylation with their mechanism, Directive effects of the groups.</p> <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 				

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Chemistry

PAPER - III

Physical Chemistry M.M. 34 (60 Hrs each paper)

Period= 45 min

UNIT-1

S. No	Topic	No. of periods needed	Teaching Method	Lesson plan
1.	Mathematical concepts for chemist	12	Lecture, black board, discussion	<p>General objective: to develop Chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry. Questions based on previous knowledge</p> <p>Synopsis: Basic Mathematical concepts: Logarithmic relations, curve sketching, linear graphs, Properties of straight line, slope and intercept, Functions, maxima and minima, integrals, ordinary differential equations, vectors and matrices, determinants, Permutation and combination and probability theory, significant figures and their applications.</p> <p>Homework after each class</p>
	Assessment of understanding: 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			

UNIT-2				
	Gaseous state chemistry	16	Lecture, black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis: Kinetic molecular model of a gas: postulates and derivation o the kinetic gas equation, collision frequency, collision diameter; mean free path, Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy, law of equipartition of energy, degrees of freedom and molecular basis of heat capacities, Joule Thompson effect, Liquification of gases. Behaviour of real gases; Deviations from ideal gas behaviour, compressibility factor(Z) and its variation with pressure and temperature for different gases, Causes of deviation from ideal behaviour, vander waals equation of state, its derivation and application in explaining real gas behaviour , calculation of Boyle temperature, Isotherms of real gases and their comparison with vander waals isotherms, continuity of states, critical stare, relation between critical constants and vander waals constants, Law of corresponding states.</p> <p>Homework after each class</p>
	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
UNIT-3				
1	Liquid state chemistry	8	Lecture black board, PPT	<p>General objective: to develop chemistry temperament</p>

				<p>Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge</p> <p>Synopsis: Intermolecular forces, magnitude of intermolecular force, structure of liquids, Properties of liquids, viscosity and surface tension.</p> <p>Homework after each class</p>
2	Colloids and surface chemistry	8	Lecture black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge</p> <p>Synopsis: Classification, Optical, Kinetic and electrical properties of colloids, Coagulation, Hardy Schulze law, flocculation value, Protection, Gold number, Emulsion, micelles and types, Gel, Syneresis and thixotrophy, Application of colloids.</p> <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 				
UNIT-4				
1	Solid state chemistry	14	Lecture black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis: Nature of solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry , symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices, X- ray diffraction, Bragg's law, a simple</p>

				account of rotating crystal method and powder pattern method, Crystal defects. Homework after each class
	Assessment of understanding: 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
	Unit-5			
1	Chemical Kinetics	12	Lecture, black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry .Questions based on previous knowledge</p> <p>Synopsis: Rate of reaction, Factor influencing rate of reaction, rate law, rate constant, order and molecularity of reactions, rate determining step, Zero, First and second order reactions, Rate and rate law, methods of determining order of reaction, Chain reactions. Temperature dependence of reaction rate, Arrhenius theory, Physical significance of activation energy. Collision theory, demerits of collision theory, non mathematical concept of transition state theory. Homework after each class</p>
2	Catalysis	10	Lecture, black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry .Questions based on previous knowledge</p> <p>Synopsis: Homogeneous and heterogeneous catalysis, types of catalyst, characteristic of catalyst, Enzyme catalysed reactions, Micellar catalysed reactions, Industrial application of catalysis Homework after each class</p>
	Assessment of understanding: 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			

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Chemistry PAPER - I

Inorganic Chemistry M.M. 33 (60 Hrs each paper)

Period= 45 min

UNIT-1

S. No.	Topic	No. of periods needed	Teaching Method	Lesson plan
	Chemistry of transition series elements	10	Lecture, black board, discussion	<p>General objective: to develop Chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry. Questions based on previous knowledge</p> <p>Synopsis:</p> <p>Transition elements: Position in periodic table, electronic configuration, General characteristics viz, atomic and ionic radii, variable oxidation states, ability to form complexes, formation of coloured ions, magnetic moment, General comparative treatment of 4d and 5d element.</p> <p>Homework after each class</p>
	Assessment of understanding: 1. Unit test for 30 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			

UNIT-2				
1	Oxidation and reduction	10	Lecture, black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis: Redox potential, electrochemical series and its applications, Principles involved in extraction of the elements.</p> <p>Homework after each class</p>
2	Coordination compounds	12	Lecture, black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis: Werner's theory, and it's experimental verification, IUPAC nomenclature of coordination compounds, Isomerism in coordination compounds, Stereochemistry of complexes with 4 and 6 coordination numbers, Chelates, polynuclear complexes.</p> <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3. class room quiz competitions 				
UNIT-3				
	Coordination chemistry	12	Lecture black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge</p> <p>Synopsis: VBT(inner and outer orbital complexes), electro neutrality principle and back bonding, Crystal field theory, Crystal field splitting and stabilization</p>

				energy, CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of $10 Dq$. Octahedral vs tetrahedral coordination. Homework after each class
Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions				
UNIT-4				
1	Chemistry of Lanthanide elements	10	Lecture black board	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge Synopsis: Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. Homework after each class
2	Chemistry of Actinides	8	Lecture black board	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge Synopsis: General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from Uranium, similarities between the later actinides and later lanthanides. Homework after each class
Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions				

Unit-5				
1	Acids and bases	8	Lecture, black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry .Questions based on previous knowledge</p> <p>Synopsis: Arrhenius, Bronsted-Lowry, Conjugate acids and bases, relative strengths of acids and bases, the Lux-flood, solvent system and Lewis concepts of acids and bases.</p> <p>Homework after each class</p>
2	Non- aqueous solvents	10	Lecture, black board, discussion	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge</p> <p>Synopsis: Physical properties of a solvent, types of solvents and their general characteristics, reaction in non aqueous solvents with reference to liquid ammonia and liquid sulphur dioxide, HF, H₂SO₄.</p> <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 				

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Chemistry

PAPER - II

Organic Chemistry M.M. 33 (60 Hrs each paper)

Period= 45 min

UNIT-1

S. No.	Topic	No. of periods needed	Teaching Method	Lesson plan
1	Chemistry of organic halides Alkyl halides	8	Lecture, black board, discussion	General objective: to develop Chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry. Questions based on previous knowledge Synopsis: Methods of preparation, Nucleophilic substitution reactions, mechanism with stereochemical aspects and effect of solvents etc; nucleophilic substitution , elimination reactions. Homework after each class
2	Aryl halides	8	Lecture, black board, discussion	General objective: to develop Chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry. Questions based on previous knowledge

				<p>Synopsis: Methods of preparation, including preparation from diazonium salts, Nucleophilic aromatic substitution; SN Ar, Benzyne mechanism. Relative activity of alkyl, allyl/benzyl, vinyl, aryl halides towards nucleophilic substitution reactions.</p> <p>Homework after each class</p>
	<p>Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions</p>			
	UNIT-2			
1	Alcohols	10	Lecture, black board, PPT	<p>General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge Synopsis: Nomenclature, preparation, properties and relative activity of alcohols. Dihydric alcohols-methods of formation, chemical reactions of vicinal glycols, oxidative cleavage and pinacol-pinacolone rearrangement. Trihydric alcohols-nomenclature, methods of formation, chemical reactions of glycerol. Homework after each class</p>
2	Phenols	8	Lecture, black board, PPT	<p>General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge Synopsis: Structure and bonding in phenols, physical properties and acidic character, comparative acidic strength of alcohols and phenols, acylation and carboxylation, Mechanism of various reactions. Homework after each class</p>

	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
	UNIT-3			
	Aldehydes and ketones	15	Lecture black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge</p> <p>Synopsis: Nomenclature, structure and reactivity of carbonyl group. General methods of preparation of aldehydes and ketones. Mechanism of nucleophilic addition to carbonyl groupsie Benzoin, Perkin, Aldol and Knoevengal condensation. Condensation with ammonia and its derivatives, Witing reaction, Mannich reaction, Beckmann and Benzil-Benzilic rearrangement.</p> <p>Use of acetate as protecting group, oxidation of aldehydes, Various reduction reactions, Halogenation of enolizable ketones, An introduction to α,β unsaturated aldehydes and ketones.</p> <p>Homework after each class</p>
	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
	UNIT-4			
1	Carboxylic acids	8	Lecture black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis: Structure and bonding, physical and chemical properties and acidity of carboxylic acids. Effect of substituents on acid strength. Mechanism of decarboxylation.</p>

				Dicarboxylic acids: Method of formation and effect of heat, Hydroxy acids. Homework after each class
2	Carboxylic acid derivatives	8	Lecture black board	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge Synopsis: structure of acid chlorides, esters, amides and acid anhydrides, relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution, Mechanism of acid and base catalyzed esterification and hydrolysis. Homework after each class
Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions				
Unit-5				
1	Organic compounds of Nitrogen	15	Lecture, black board	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry .Questions based on previous knowledge Synopsis: Preparation of nitroalkanes and nitroarenes, chemical reactions of nitroalkanes and nitroarenes, Mechanism of nucleophilic substitution in nitroarenes and their reduction in acidic, neutral and alkaline medium. Reactivity, structure and nomenclature of amines, physical properties, stereochemistry of amines. Separation of mixture of amines. basicity of amines, Preparation of alkyl and aryl

				<p>amines, Reactions of amines, electrophilic aromatic substitution of aryl amines, Reaction of amines with nitrous acid. Synthetic transformation of aryl diazonium salts, azo coupling.</p> <p>Homework after each class</p>
	<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 			

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Chemistry

PAPER - III

Physical Chemistry M.M. 34 (60 Hrs each paper)

Period= 45 min

UNIT-1

S. No	Topic	No. of periods needed	Teaching Method	Lesson plan
1.	Thermodynamics-1	10+10	Lecture, black board, discussion	<p>General objective: to develop Chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry. Questions based on previous knowledge</p> <p>Synopsis: Intensive and extensive variables, state and path function; isolated, closed and open systems; Zero law of thermodynamics, first law: concept of heat, work, internal energy and statement of first law, enthalpy, Relation between heat capacities, calculation of q, w, U and H for reversible, irreversible and free expansion, inversion temperature of gases, expansion of ideal gases under isothermal and adiabatic condition.</p> <p>Homework after each class</p>

2	Thermochemistry		Lecture, black board, discussion	<p>General objective: to develop Chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry. Questions based on previous knowledge</p> <p>Synopsis: Thermochemistry, Laws of thermochemistry, Heat of reactions, standard states, enthalpy of formation of molecules and ions and enthalpy of combustion and its applications, calculation of bond energy, bond dissociation energy and resonance energy from thermo-chemical data, effect of temperature and pressure on enthalpy of reactions, Adiabatic flame temperature, explosion temperature.</p> <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 				
UNIT-2				
	Thermodynamics-II	12	Lecture, black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis: Second law of thermodynamics: spontaneous process, second law, statement of carnot cycle and efficiency of heat engine, Carnot's theorem, thermodynamic state of temperature. Concept of entropy, entropy change in different reactions, physical significance of entropy, molecular and statistical interpretation of entropy. Gibbs and Helmholtz free energy, variation of G and A with pressure, volume, temperature, Gibbs-Helmholtz equation, Maxwell relations, elementary idea of third law of thermodynamics, concept of residual entropy, calculation of</p>

				absolute entropy of molecule. Homework after each class
	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
UNIT-3				
1	Chemical equilibrium	10	Lecture black board, PPT	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge Synopsis: Intermolecular forces, magnitude of Criteria of thermodynamic, degree of advancement of reaction, chemical equilibria in ideal gases, Concept of Fugacity, thermodynamic derivation of relation between Gibbs free energy of reaction and reaction quotient. Coupling of exergonic and endergonic reactions. Equilibrium constants and their quantitative dependence on temperature, pressure and concentration. Thermodynamic derivation of relation between the various equilibrium constants, K_p , K_c and K_x . Le Chatelier principal (quantitative treatment) Equilibrium between ideal gas and a pure condensed phase. Homework after each class
2	Ionic equilibrium	10	Lecture black board, PPT	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge Synopsis: Ionization of weak acids and bases, pH scale, common ion effect; dissociation constant of mono protic acids (exact

				<p>treatment). Salt hydrolysis- calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Hendersons equation and its applications, solubility and solubility product of sparingly soluble salts, application of solubility product principle.</p> <p>Homework after each class</p>
	<p>Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions</p>			
	UNIT-4			
1	Phase equilibrium	16	Lecture black board	<p>General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge Synopsis: Phase rule, component and degree of freedom, derivation of Gibbs phase rule, Clausius- Claperon equation and its application to Solid-Liquid, Liquid-Vapour and solid-Vapour, limitation of phase rule, application of phase rule to one component system: water system and sulphur system. Application of phase rule to two component system, Pb-Ag system, desilverization of lead, Zn-Mg system, Ferric chloride-water system, congruent and incongruent, melting point and eutectic point. Three component system: Solid solution liquid pairs. Nernst distribution law, Henry's law, application, solvent extraction.</p> <p>Homework after each class</p>
	<p>Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions</p>			

Unit-5				
1	Photochemistry	12	Lecture, black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry .Questions based on previous knowledge</p> <p>Synopsis: Characteristics of electromagnetic radiation, interaction of radiation with matter, difference between thermal and photochemical processes, Lambert-Beer's law and its limitations, Physical significance of absorption coefficients. Laws of photochemistry: Grothus-Draper law, Stark- Einstein law, quantum yield, actinometry, examples of low and high quantum yields, photochemical equilibrium and the differential rate of photochemical reactions, Quenching, Role of photochemical reaction in biochemical process.Jablonski diagram, fluorescence, phosphorescence, nonradiative process, photosensitization, energy transfer process, Photostationary states, Chemiluminescence.</p> <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 				

LESSON PLAN

B.Sc III year

1. Outline learning objective
2. Develop the introduction
3. Plan the main body of the lesson
4. Plan to check for understanding
5. Develop a conclusion and a preview
6. Create realistic timeline

Chemistry PAPER - I

Inorganic Chemistry M.M. 33 (60 Hrs each paper)

Period= 45 min

UNIT-1

S. No.	Topic	No. of periods needed	Teaching Method	Lesson plan
1	Metal- Ligand bonding in Transition metal complexes	16	Lecture, black board, discussion	<p>General objective: to develop Chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry. Questions based on previous knowledge</p> <p>Synopsis: Limitation of VBT. an elementary idea of crystal field theory, Crystal field splitting in octahedral, tetrahedral and square planner complexes, factors affecting the crystal field parameters. Thermodynamics and kinetic aspect of metal complexes A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reaction of square planner complexes.</p> <p>Homework after each class</p>
	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			

UNIT-2				
1	Magnetic properties of Transition metal complexes	18	Lecture, black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis: Types of magnetic behaviour, methods of determining magnetic susceptibility, spin only formula, 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, Electronic spectra of transition metal complexes. Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series, Orgal energy level diagram for d^1 and d^2 states, discussion of electronic spectra of $[Ti(H_2O)_6]^{3+}$ complex ion.</p> <p>Homework after each class</p>
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions 				
UNIT-3				
1	Organometallic chemistry	16	Lecture black board, PPT	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge</p> <p>Synopsis: Definition, nomenclature and classification of Organometallic compounds. Preparation, properties, bonding and applications of alkyls and aryls of Li,Al,Hg,Sn and Ti. A brief account of metal-ethylenic complexes and homhgeneous hydrogenation, mononuclear carbonyls and nature of bonding in metal carbonyls.</p>

				Homework after each class
Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions				
UNIT-4				
1	Bio-inorganic chemistry	14	Lecture black board	<p>objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge</p> <p>Synopsis: Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal with special reference to Ca^{2+}, nitrogen fixation.</p> <p>Homework after each class</p>
Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions				
Unit-5				
1	Hard and soft acids and bases	16	Lecture, black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry .Questions based on previous knowledge</p> <p>Synopsis: Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness, Symbiosis. Silicones and Phosphazenes, silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.</p> <p>Homework after each class</p>

	<p>Assessment of understanding:</p> <ol style="list-style-type: none">1. Unit test for 20 marks: subjective/objective/oral2. group discussions3.class room quiz competitions
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LESSON PLAN

B.Sc III year

1. Outline learning objective
2. Develop the introduction
3. Plan the main body of the lesson
4. Plan to check for understanding
5. Develop a conclusion and a preview
6. Create realistic timeline

Chemistry

PAPER - II (Old course)

Organic Chemistry M.M. 33 (60 Hrs each paper)

Period= 45 min

UNIT-1

S. N o.	Topic	No. of periods needed	Teaching Method	Lesson plan
A.	Organometallic Compounds Organomesium compounds:	6	Lecture, black board, discussion	General objective: to develop Chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry. Questions based on previous knowledge Synopsis: Grignard reagents- formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds : formation and chemical reactions.
B.	Organosulphur compounds	6		Nomenclature, structural features, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine.
C.	Organic synthesis via Enolates	4		Active methylene group, alkylation of diethylmalonate and ethylacetoacetate.

				Synthesis of ethyl acetoacetate: the claisen condensation, Keto-enol tautomerism of ethylacetoacetate. Homework after each class
Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions				
UNIT-2				
	Biomolecules			
A.	Carbohydrates	10	Lecture, black board, PPT	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge Synopsis: Configuration of monosaccharides, threo and erythro diastereomers. Formation of glycosides ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+) glucose, structure of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination. Classification and structure of protein levels of protein structure, Protein denaturation/ renaturation, constituents of amino acids, Ribonucleosides and ribonucleotides, double helical structure of DNA. Homework after each class
B.	Proteins and Nucleic acids	6		
Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions				
UNIT-3				
A.	Synthetic polymers	8	Lecture black board, PPT	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of

				<p>chemistry, Questions based on previous knowledge</p> <p>Synopsis: Addition or chain growth polymerization. Free radical vinyl polymerization, Ziegler-Natta polymerization, condensation or step growth polymerization, polyesters, polyamides, phenols-formaldehyde resins, urea-formaldehyde resins, epoxy resin and polyurethanes, natural and synthetic rubbers.</p> <p>Colour and constitution (Electronic Concept). Classification of dyes. Chemistry of dyes. Chemistry and synthesis of Methyl Orange, Congo Red, Malachite Green, Crystal Violet, Phenolphthalein, fluorescein, Alizarin and Indigo.</p> <p>Homework after each class</p>
B.	Synthetic Dyes	8		
<p>Assessment of understanding:</p> <ol style="list-style-type: none"> 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3. class room quiz competitions 				
UNIT-4				
A	Spectroscopy Mass spectroscopy	16	Lecture black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry</p> <p>Questions based on previous knowledge</p> <p>Synopsis: Mass spectrum fragmentation of functional groups. IR absorption band, their position and intensity, Identification of IR spectra. Beer Lambert's law, effect of conjugation, Visible spectrum and colour. Anthocyanin as natural colouring matter (Introduction only) Application of Mass, IR, UV Visible spectroscopy to organic molecules.</p> <p>Homework after each class</p>
B..	Infra-red spectroscopy			
C.	UV-Visible Spectroscopy			
D.				
E.				

	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
	Unit-5			
A.	NMR Spectroscopy	16	Lecture, black board	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry .Questions based on previous knowledge Synopsis: Introduction to NMR, Shielding and Number of signal in PMR, Chemical shift and characteristic values, splitting of signals and coupling constant, Application to organic molecules.
B. C.	¹³ CMR Spectroscopy MRI			Principal and application Magnetic Resonance Imaging (MRI) Introductory Idea. Homework after each class
	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			

LESSON PLAN

B.Sc III year

1. Outline learning objective
2. Develop the introduction
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Chemistry

PAPER - III (Old course)

Organic Chemistry M.M. 33 (60 Hrs each paper)

Period= 45 min

UNIT-1

S. N o.	Topic	No. of periods needed	Teaching Method	Lesson plan
1.	QUANTUM MECHANICS	16	Lecture, black board, discussion	General objective: to develop Chemistry to clear the concept of definition, scope and methodology of chemistry. Questions temperament Specific objective: based on previous knowledge Synopsis: Black body radiation, Plank's radiation law, photoelectric effect, Compton effect. DeBroglie's idea of matter waves, experimental verification Heisenberg's uncertainty principle, Sinosoidal wave equation, Operators : Hamiltonian operator, angular momentum operator, laplacian operators, postulate of quantum mechanics Eigen values, Eigen function. Schrodinger time independed wave equation physical significance of Eign value and function. Applications of schrodinger wave equation : particle in one dimensional box. Hydrogenation

				(separation into three equation's) radial wave function and angular wave function.
	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
	UNIT-2			
1	QUANTUM MECHANICS-II	16	Lecture, black board, PPT	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge Synopsis: Quantum mechanical approach of molecular orbit theory; basic idea criteria for forming M.O and A.O, LCAO approximation, formation of H_2^+ ion, calculation of energy levels from wave functions banding and antibonding wave functions concept of orbitals and their characteristics, Hybrid orbital : SP , SP^2 , SP^3 , Calculation of coefficients A_d^s used in these hybrid orbitals. Introduction to valence bond model of H_2 , Comparison of M.O. and V.B. model, Huckle theory, application of huckel theory to ethane. propene etc.
	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions			
	UNIT-3			
1 A.	SPECTROSCOPY – I	16	Lecture black board, PPT	General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry, Questions based on previous knowledge Synopsis: Introduction, characterization of electromagnetic radiation, regions of the spectrum, representation of spectra width and intensity of spectral transition, rotational spectra of calculated diatomic molecules, energy level of rigid rotator,

B.				<p>selection rule, determination of bond length qualitative description of non rigid rotator isotopic effect.</p> <p>Vibrational spectra - Fundamental vibrational and their symmetry, vibrating diatomic molecules, energy levels of simple harmonic oscillator. Selection Rule, Pure vibrational Spectrm, determination of force constant, diatomic vibrating operator. Anharmonic Oscillator.</p>
C.				<p>Raman Spectra :Conceptof polarizability, quantum theory of Raman spectra stokes and antistokes lines, pure rotational and vibrational Raman spectra, Application of Raman spectra stokes and anti stokes lines, Applications of Raman spectra.</p>
<p>Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3.class room quiz competitions</p>				
UNIT-4				
1	SPECTROSCOPY – II	16	Lecture black board	<p>General objective: to develop chemistry temperament Specific objective: to clear the concept of definition, scope and methodology of chemistry Questions based on previous knowledge Synopsis: Electronic Spectra : Electronic Spectra of diatomic molecule, Frank London Principle, types of electronic transitions. Applications of electronic spectra.</p> <p>Photo-chemistry : Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry. Grothus-Drapper law, Stark-Elinstein law, Jablonski diagram depicting various process occurring in the excited state, qualitative description of fluorescence, occurring in the excited state, qualitative descripton of fluorescence, phosphorescence, non-</p>
A.				
B.				

				radiative processes (internal conversion, intersystem crossing), quantum yield photosensitized reactions energy transfer processes (simple examples).
	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3. class room quiz competitions			
	Unit-5			
1	THEMODYNAMICS	16	Lecture, black board	<p>General objective: to develop chemistry temperament</p> <p>Specific objective: to clear the concept of definition, scope and methodology of chemistry .Questions based on previous knowledge</p> <p>Synopsis: Energy refered to absolute zero, third law of therodynamics Test of III law of Thermodynamics, Nerst heat theorem application and limitation of Nernst heat theorem.</p> <p>Physical properties and molecular structure, polarization of molecules, Classius-Masotti equation. orientation of dipoles in an electric field. Dipol moment, induced dipole moment, measurement of dipole moment. Temperature methods and refractivity methods. Dipole moment and molecular structure. Magnetic Properties : Parmagenetism diamagnetism, ferromagnetism. Determination of magnetic susceptibility, elucidation of molecular structure.</p>
A.				
B.				
C.				
	Assessment of understanding: 1. Unit test for 20 marks: subjective/objective/oral 2. group discussions 3. class room quiz competitions			

