

**BRS Govt College Dujana (Jhajjar)**

**Lesson Plan**

**B.Sc- 2<sup>nd</sup>Sem**

**Physical Chemistry**

Name of Teacher: Dr. Rajni/Dr. Sanjay Kumar

| <b>Time Period</b> | <b>Syllabus to be covered</b>  |
|--------------------|--|
| <b>January</b>     | <b>Kinetics-I</b><br>Rate of reaction, rate equation, factors influencing the rate of a reaction concentration, temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated rate expression for zero order, first order, second and third order reaction.<br>Half life period of a reaction. Methods of determination of order of reaction.   |
| <b>February</b>    | <b>Kinetics-II</b><br>Effect of temperature on the rate of reaction – Arrhenius equation. Theories of reaction rate – Simple collision theory for unimolecular and bimolecular collision.<br>Transition state theory of Bimolecular reactions.   |
| <b>March</b>       | <b>Electrochemistry-I</b><br>Electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance, equivalent conductance and relation among them, their variation with concentration. Arrhenius theory of ionization, Ostwald's Dilution Law. Debye-Huckel – Onsager's equation for strong electrolytes (elementary treatment only) Transport number, definition and determination by Hittorf's methods, (numerical included) |
| <b>April</b>       | <b>Electrochemistry-II</b><br>Kohlrausch's Law, calculation of molar ionic conductance and effect of viscosity temperature & pressure on it. Application of Kohlrausch's Law in calculation of conductance of weak electrolytes at infinite dilution. Applications of conductivity measurements: determination of degree of dissociation, determination of $K_a$ of acids, determination of solubility product of sparingly soluble salts,                             |
| <b>May</b>         | Conductometric titrations. Definition of pH and pKa, Buffer solution, Buffer action, Henderson-Hasselbalch equation, Buffer mechanism of buffer action.<br>Assignments Revisions and Test  |

## Organic Chemistry

Name of Teacher: Dr. Rajni/Dr. Sanjay Kumar

| Time Period | Syllabus to be covered  |
|-------------|---|
| January     | <b>Alkenes</b><br>Nomenclature of alkenes, , mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration reduction, ozonolysis, hydration, hydroxylation and oxidation with $\text{KMnO}_4$ ,   |
| February    | <b>Arenes and Aromaticity</b><br>Nomenclature of benzene derivatives: Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aromatic ions, annulenes up to 10 carbon atoms, aromatic, anti - aromatic and non - aromatic compounds. Aromatic electrophilic substitution general pattern of the mechanism, mechanism of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Energy profile diagrams. Activating , deactivating substituents and orientation.  |
| March       | <b>Dienes and Alkynes</b><br>Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of butadiene. Chemical reactions 1,2 and 1,4 additions (Electrophilic & free radical mechanism), Diels-Alder reaction, Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration oxidation of alkynes   |
| April       | <b>Alkyl and Aryl Halides</b><br>Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides , $\text{S}_{\text{N}}2$ and $\text{S}_{\text{N}}1$ reactions with energy profile diagrams. Methods of formation and reactions of aryl halides, The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides. |
| May         | Assignments, Revision and Tests   |

## Inorganic Chemistry

Name of Teacher: Dr. Rajni/Dr. Sanjay Kumar

| Time Period | Syllabus to be covered   |
|-------------|--|
| January     | <b>Hydrogen Bonding &amp; Vander Waals Forces</b><br>Hydrogen Bonding – Definition, Types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Vander Waals Forces<br><b>. Metallic Bond and Semiconductors</b><br>Metallic Bond- Brief introduction to metallic bond, band theory of metallic bond Semiconductors- Introduction, types and applications.  |
| February    | <b>s-Block Elements</b><br>Comparative study of the elements including , diagonal relationships, salient features of hydrides (methods of preparation excluded), solvation and complexation tendencies including their function in biosystems.<br><b>Chemistry of Noble Gases</b> Chemical properties of the noble gases with emphasis on their low chemical reactivity, chemistry of xenon, structure and bonding of fluorides, oxides & oxyfluorides of xenon. |
| March       | <b>p-Block Elements</b><br>Emphasis on comparative study of properties of p-block elements (including diagonal relationship and excluding methods of preparation).<br><b>Boron family (13th gp):-</b><br>Diborane – properties and structure (as an example of electron – deficient compound and multicentre bonding), Borazene – chemical properties and structure Trihalides of Boron – Trends in Lewis acid character structure of aluminium (III) chloride.  |
| April       | <b>Carbon Family (14th group)</b><br>Catenation, $p\pi-d\pi$ bonding (an idea), carbides, fluorocarbons, silicates structural aspects), silicons – general methods of preparations, properties and uses.<br><b>Nitrogen Family (15th group)</b><br>Oxides – structures of oxides of N,P. oxyacids – structure and relative acid strengths of oxyacids of Nitrogen and phosphorus. Structure of white, yellow and red phosphorus.                                 |
| May         | <b>Oxygen Family (16th group)</b><br>Oxyacids of sulphur – structures and acidic strength $H_2O_2$ – structure, properties and uses.<br><b>Halogen Family (17th group)</b><br>Basic properties of halogen, interhalogens types properties, hydro and oxyacids of chlorine – structure and comparison of acid strength .  |

**BRS Govt College Dujana (Jhajjar)**

**Lesson Plan**

**B.Sc- 4<sup>th</sup>Sem**

**Physical Chemistry**

Name of Teacher: Dr. Rajni/Dr. Sanjay Kumar

| Time Period | Syllabus to be covered  |
|-------------|---|
| January     | <b>Thermodynamics-III</b><br>Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycles and its efficiency, Carnot's theorem, Thermodynamics scale of temperature. Concept of entropy – entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.  |
| February    | <b>Thermodynamics-IV</b><br>Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.   |
| March       | <b>Electrochemistry-III</b><br>Electrolytic and Galvanic cells – reversible & Irreversible cells, conventional representation of electrochemical cells. EMF of cell and its measurement, Weston standard cell, activity and activity coefficients. Calculation of thermodynamic quantities of cell reaction (G, H & K). Types of reversible electrodes – metal-metal ion gas electrode, metal – insoluble salt- anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its applications. |
| April       | <b>Electrochemistry-IV</b><br>Concentration cells with and without transference, liquid junction potential, application of EMF measurement i.e. valency of ions, solubility product activity coefficient, potentiometric titration (acid- base and redox). Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.   |
| May         | <b>Assignments, Revisions, Tests</b>  |

## Organic Chemistry

Name of Teacher: Dr. Rajni/Dr. Sanjay Kumar

| Time Period | Syllabus to be covered   |
|-------------|--|
| January     | <b>Infrared (IR) absorption spectroscopy</b><br>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.<br>Applications of IR spectroscopy in structure elucidation of simple organic compounds.   |
| February    | <b>Amines</b><br>Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabriel phthalimide reaction, Hofmann bromamide reaction. Electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.                          |
| March       | <b>Diazonium Salts</b><br>Mechanism of diazotisation, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO <sub>2</sub> and CN groups, reduction of diazonium salt to hydrazines, coupling reaction and its synthetic application.<br><b>Nitro Compounds</b><br>Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanism of electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium. |
| April       | <b>Aldehydes and Ketones</b><br>Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, advantage of oxidation of alcohols with chromium trioxide (Sarett reagent) pyridinium chlorochromate (PCC) and pyridinium dichromate. Physical properties. Comparison of reactivities of aldehydes and ketones.  |
| May         | Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, LiAlH <sub>4</sub> and NaBH <sub>4</sub> reductions.<br>Assignments Revisions Tests   |

## Inorganic Chemistry

Name of Teacher: Dr. Rajni/Dr. Sanjay Kumar

| Time Period | Syllabus to be covered  |
|-------------|---|
| January     | <b>Chemistry of f - block elements</b><br><b>Lanthanides</b><br>Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.   |
| February    | <b>Chemistry of f - block elements</b><br><b>Actinides</b><br>General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements.   |
| March       | <b>Theory of Qualitative and Quantitative Inorganic Analysis-I</b><br>Chemistry of analysis of various acidic radicals, Chemistry of identification of acid radicals in typical combinations, Chemistry of interference of acid radicals including their removal in the analysis of basic radicals. |
| April       | <b>Theory of Qualitative and Quantitative Inorganic Analysis-II</b><br>Chemistry of analysis of various groups of basic radicals, Theory of precipitation, coprecipitation, Post-precipitation, purification of precipitates.   |
| May         | <b>Assignments, Revisions and Tests</b>   |

**BRS Govt College Dujana (Jhajjar)**

**Lesson Plan**

**B.Sc- 6<sup>th</sup>Sem**

**Physical Chemistry**

Name of Teacher: Dr. Rajni/Dr. Sanjay Kumar

| Time Period | Syllabus to be covered   |
|-------------|--|
| January     | <b>Spectroscopy-III</b><br><b>Electronic Spectrum</b><br>Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck-Condon principle.<br>Qualitative description of sigma and pi and n molecular orbital (MO) their energy level and respective transitions.   |
| February    | <b>Photochemistry</b><br>Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grotthus-Draper law, Stark- Einstein law (law of photochemical equivalence) Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).  |
| March       | <b>Dilute Solutions and Colligative Properties</b><br>Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, Colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination, Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes. |
| April       | <b>Phase Equilibrium</b><br>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 and Sulphur systems.<br>Phase equilibria of two component systems solid-liquid equilibria,  |

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|     | simple eutectic Example Pb-Ag system, desilverisation of lead |
| May | Assignments, Revisions, Tests                                 |

## Organic Chemistry

Name of Teacher: Dr. Rajni/Dr. Sanjay Kumar

| Time Period | Syllabus to be covered  |
|-------------|---|
| January     | <b>Heterocyclic Compounds-I</b><br>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    |
| February    | <b>Heterocyclic Compounds-II</b><br>Introduction to condensed five and six-membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of, quinoline and isoquinoline  |
| March       | <b>Organosulphur Compounds</b><br>Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine. Synthetic detergents alkyl and aryl sulphonates.  |
| April       | <b>Organic Synthesis via Enolates</b><br>Acidity of $\alpha$ -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.   |
| May         | <b>Synthetic Polymers</b><br>Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.<br>Assignments, Revisions, Tests |



## Inorganic Chemistry

Name of Teacher: Dr. Rajni/Dr. Sanjay Kumar

| Time Period | Syllabus to be covered   |
|-------------|--|
| January     | <b>Organometallic Chemistry</b><br>Definition, nomenclature and classification of organometallic compounds. Preparation, properties, and bonding of alkyls of Li, Al, Hg, and Sn a brief account of metal-ethylenic complexes, mononuclear carbonyls and the nature of bonding in metal carbonyls. |
| February    | <b>Acids and Bases, HSAB Concept</b><br>Arrhenius, Bronsted – Lowry, the Lux – Flood, Solvent system and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids & Bases. Symbiosis, electronegativity and hardness and softness                       |
| March       | <b>Bioinorganic Chemistry</b><br>Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca <sup>2+</sup> . Nitrogen fixation.              |
| April       | <b>Silicones and Phosphazenes</b><br>Silicones and phosphazenes, their preparation, properties, structure and uses   |
| May         | Assignments, Revisions, Tests  |