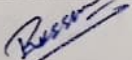
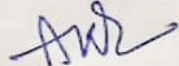


Name of Teacher: DR. RAKESH KUMAR SAHU  
 Department: CHEMISTRY  
 Class: B.Sc.-I year  
 Paper/subject: PAPER – I/Inorganic Chemistry

Month	Unit	Paper to be covered	Remark
July	Unit - I	Atomic structure: Bohr's theory, its limitation and atomic spectrum of hydrogen atom. General idea of de-Broglie matter waves, Heisenberg uncertainty principle, Schrodinger wave equation, significance of $\Psi$ and $\Psi^2$ , radial and angular wave functions and probability distribution curves, quantum numbers, atomic orbital and shapes of s, p, d orbitals, Aufbau and Pauli exclusion principles, Hund's multiplicity rule, electronic configuration of the elements.	Unit Test Exam
August		Periodic properties: detailed discussion of the following periodic properties of the elements, with reference to s- and p-block. Trends in periodic table and applications in predicting and explaining the chemical behavior. Atomic and ionic radii, ionization enthalpy, electron gain enthalpy, electronegativity, Pauling's, Mulliken's, Allred Rochow's scales. Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.	
September	Unit - II	Chemical bonding-I: Ionic bond: Ionic solids, ionic structure, radius ratio and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajans rule, ionic character in covalent compounds: bond moment and dipole moment, percentage ionic character from dipole moment and electro-negativity difference, metallic bond: free electron, valence bond and band theories.	Unit Test Exam
October	Unit - III	Chemical bonding-II: Covalent bond: Lewis structure, valence bond theory and its limitations, concept of hybridization, energetic of hybridization, equivalent and non-equivalent hybrid orbitals, valence shell electron pair repulsion theory (VSEPR), shapes of the following simple molecules and ions containing lone pairs and bond pairs of electrons: $H_2O$ , $NH_3$ , $PCl_3$ , $SF_6$ , $H_3O^+$ , $SF_4$ , $ClF_3$ and $ICl_2^-$ molecular orbital theory, bond order and bond strength, molecular orbital diagrams of diatomic and simple polyatomic molecules $N_2$ , $O_2$ , $F_2$ , $CO$ , $NO$ .	Unit Test Exam
November	Unit - IV	s-block elements: general concepts of group relationships and gradation properties, comparative study, salient features of hybrids, solvation and complexation tendencies including their function in biosystems and introduction to alkyl and aryls, derivatives of alkali and alkaline earth metals.	Unit Test Exam
December		p-block elements: general concepts of group relationships and gradation properties, halides, hydrides, oxides and oxyacids of boron, aluminium, nitrogen and phosphorus. Boranes, borazines, fullerenes, graphene and silicates, interhalogens and pseudohalogens.	Unit Test Exam
January	Unit - V	Chemistry of noble gases: Chemical properties of the noble gases, chemistry of xenon, structure, bonding in xenon compounds. Theoretical principles in qualitative analysis ( $H_2S$ scheme): Basic principle involved in the analysis of cations and anions and solubility products, common ion effect.	Model Test
February		Principle involved in separation of cations into groups and choice of group reagents. Interfering anions (fluoride, borate, oxalate and phosphate) and need to remove them after group II.	

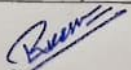
  
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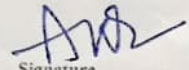
  
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Name of Teacher: DR. RAKESH KUMAR SAHU  
 Department: CHEMISTRY  
 Class: M.Sc.-I SEM.  
 Paper/subject: PAPER – IV/Theory and applications of spectroscopy-I

Month	Unit	Paper to be covered	
July		-	
August	Unit -I	Electromagnetic radiation, interaction of electromagnetic radiation with matter-absorption, emission, transmission, reflection, dispersion, polarization and scattering, uncertainty relation and natural line width and natural line broadening, transition probability, selection rule, intensity of spectral lines, Born-Oppenheimer approximation, rotational, vibrational and electronic energy levels. Region of spectrum, representation of spectra, FT spectroscopy, computer averaging, lasers.	Unit Test Exam
September	Unit -II	Classification of molecules in term of their internal rotation mechanism, determination of rotation energy of diatomic and polyatomic molecules, intensities of rotational spectral lines, effect of isotopic substitution on diatomic and polyatomic molecules, intensities of rotational spectral lines and parameters of rotational energy of linear and the transition frequencies, non rigid rotators, spectral lines and parameters of rotational energy of linear and symmetric top polyatomic molecules. Application in determination of bond length.	Unit Test Exam
October	Unit -III	Introduction, simple and anharmonic oscillators in vibrational spectroscopy, diatomic vibrating rotator, modes of vibration in polyatomic molecules, vibration coupling, fourier transform IR spectroscopy: instrumentation, interferometric spectrophotometer, sample handling, factors influencing vibrational frequencies, application of IR spectroscopy: interpretation of IR spectra of normal alkanes, aromatic hydrocarbons, alcohols, phenols, aldehydes, ketones, ethers, esters, carboxylic acids, amines and amides.	Unit Test Exam
November	Unit -IV	Classical and quantum theories of Raman effect, pure rotational, vibrational and vibrational-rotational Raman spectra, selection rules, mutual exclusion principle, resonance Raman spectroscopy, coherent anti Stokes Raman spectroscopy (CARS), instrumentation, application of Raman effect in molecular structures,  Raman activity of molecular vibration, structure of $\text{CO}_2$ , $\text{H}_2\text{O}$ , $\text{N}_2\text{O}$ , $\text{SO}_2$ , $\text{NO}_3^-$ , $\text{ClF}_3$ .	Unit Test Exam
December			Model Test

  
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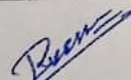
  
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**TEACHING PLAN 2021-2022**

**Name of Teacher:** DR. RAKESH KUMAR SAHU  
**Department:** CHEMISTRY  
**Class:** M.Sc.-II SEM. (PAPER - II)  
**Paper/subject:** PAPER – II/Reaction mechanisms

Month	Unit	Paper to be covered	Remark
JANUARY	Unit -I	Aliphatic nucleophilic substitution: The $S_N1$ , $S_N2$ mechanisms, the neighboring group mechanism,	
FABUARY	Unit -I	neighboring group participation by $\pi$ and $\sigma$ bonds, anchimeric assistance. Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium, Phase transfer catalysis, ambident nucleophile and regioselectivity.	Unit Test Exam
MARCH	Unit -II	Aromatic nucleophilic substitution- the $S_NAr$ , $S_N1$ , and benzyne mechanisms. Reactivity effect of substrate structure, leaving group and attacking nucleophile. The Von- Richer, Sommet-Hauser, and smile rearrangements.	Unit Test Exam
APRIL	Unit -II	Aliphatic electrophilic substitution- mechanism of $S_E1$ , $S_E2$ , electrophilic substitution accompanied by double bond shifts. Effect of substrate, leaving group and the solvent polarity on the reactivity.	Unit Test Exam
MAY	Unit -II	Aromatic electrophilic substitution- An arenium ion mechanism, orientation and reactivity. The ortho/para ratio, ipso attack, orientation in other ring system. Reactivity effects of substrates and electrophiles.	Unit Test Exam
JUNE	Unit -II	Vilsmeier reaction and Gattermann-Koch reaction.	Model Test Exam

  
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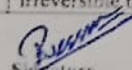
  
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**TEACHING PLAN 2021-2022**

Name of Teacher: DR. RAKESH KUMAR SAHU  
 Department: CHEMISTRY  
 Class: M.Sc.-III SEM.  
 Paper/subject: PAPER – II/Chemistry of Biomolecules

Month	Unit	Paper to be covered	Remark
July		-	
August	Unit -I	Bioenergetics: standard free energy change in biochemical reactions, exergonic, endergonic hydrolysis of ATP, synthesis of ATP from ADP. Electron transfer in biology: structure and function of metalloprotein in electron transport processes- cytochromes and ion-sulphur proteins, synthetic models. Transport and storage of dioxygen: heme proteins and oxygen uptake, structure and function of haemoglobin, myoglobin, haemocyanins and haemerythrin, model synthetic complexes of iron, cobalt and copper.	Unit Test Exam
September	Unit -II	Metalloenzymes: zinc enzymes- carboxypeptidase and carbonic anhydrase. Iron enzymes- catalase, peroxidase and cytochrome p-450. Copper enzymes- superoxide dismutase. Molybdenum oxatransferase enzymes- xanthine oxidase. Enzyme models: host-guest chemistry, chiral recognition and catalysis, molecular recognition, molecular asymmetry and prochirality. Biomimetic chemistry, cyclodextrin based enzyme models, calixarenes, ionophores, synthetic enzymes or synzymes.	Unit Test Exam
October	Unit -III	Enzymes: nomenclature and classification of enzyme. Induced fit hypothesis, concept and identification of active site by the use of inhibitors. Co-enzyme chemistry: structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD <sup>+</sup> , NADP <sup>+</sup> , FMN, FAD, lipoic acid, vitamin B <sub>12</sub> . Biotechnological applications of enzymes: techniques and methods of immobilization of enzymes, effect of immobilization on enzyme activity, application of immobilization enzymes in medicine and industry. Enzymes and recombinant DNA technology.	Unit Test Exam
November	Unit -IV	Biopolymer interactions: forces involved in biopolymer interaction. Electrostatic charges and molecular expansion, hydrophobic forces, dispersion force interactions. Multiple equilibria and various types of binding processes in biological systems. Hydrogen ion titration curves.	Unit Test Exam
December		Thermodynamics of biopolymer solutions: thermodynamics of biopolymer solution, osmotic pressure, membrane equilibrium, muscular contraction and energy generation in mechanochemical system. Cell membrane and transport of ions: structure and function of cell membrane, ion transport through cell membrane, irreversible thermodynamic treatment of membrane transport and nerve conduction.	Model Test

  
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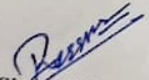
  
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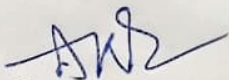
  
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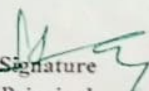
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**TEACHING PLAN 2021-2022**

**Name of Teacher:** DR. RAKESH KUMAR SAHU  
**Department:** CHEMISTRY  
**Class:** M.Sc.-IV SEM.  
**Paper/subject:** PAPER – II/Natural Product and Medicinal Chemistry

Month	Unit	Paper to be covered	Remark
JANUARY	Unit -I	Terpenoids and Carotenoids: Classification, nomenclature, occurrence, isolation,	
FABUARY	Unit – I	general methods of structure determination of citral, geraniol, $\alpha$ -terpeneol, menthol, farnesol, zingiberene, santonin, phytol, abietic acid and $\beta$ -carotene. Alkaloids: definition, nomenclature and physiological action, occurrence, isolation,	Unit Test Exam
MARCH	Unit – I	general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plant. Synthesis and biosynthesis of the following: ephedrine, (+)-coline, nicotine, atropine, quinine and morphine.	Unit Test Exam
APTIL	Unit – II	Steroids: isolation, structure determination and synthesis of cholesterol, bile acids, androsterone, testosterone, esterone, progesterone, aldosterone and biosynthesis of cholesterol.	Unit Test Exam
MAY	Unit – II	Plant pigments: occurrence, nomenclature and general method of structure determination, isolation and synthesis of apigenin, luteolin, quercetin, myrcetin, quercetin-3-glucoside, vitexin, diadazine, butein aureusin, cyaniding-7-arebinoside, cyaniding, hirsutidin.	Unit Test Exam
JUNE	Unit – II	Pyrethroids and rotenones: synthesis and reaction of pyrethroids and rotenones.	Model Test Exam

  
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