



K.C.E.Society's
MOOLJI JAITHA COLLEGE, JALGAON

“An Autonomous College Affiliated to K.B.C., North Maharashtra University, Jalgaon”
NAAC Reaccredited “A” Grade (CGPA: 3.15) (3rd Cycle)| UGC honoured “College of Excellence”
Tel.: 0257 – 2234281, 2237363, Fax: 2237363, e-mail: mjcollege@kces.in

TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. Jayashri D. Bhirud**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **S.Y. B.Sc**

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: **CH- 232: Organic Chemistry Chemistry-III**

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
June			
July			
August			
September	UNIT III: Heterocyclic Compound Classification and nomenclature, Structure, aromaticity in 5-numbered rings containing one heteroatom (Furan, Pyrrole, Thiophene). Synthesis: Paal-Knorr furan synthesis, Knorr pyrrole synthesis, Paal-Knorr Thiophene Synthesis.	5h	
October	Reactions with Mechanism: nitration sulphonation, Friedel-Crafts Acylation of Furan, Pyrrole, Thiophene and UNIT II: Stereochemistry conformational and configurational isomers Geometrical isomerism: cis-trans and, syn-anti isomerism E/Z notations, with Cahn-Ingold-Prelog priority rules.	5h	

November	<p>UNIT II: Stereochemistry</p> <p>Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral centres, diastereomers, meso structures, Racemic mixture and methods of resolution. Absolute configuration, R/S designations with Cahn–Ingold–Prelog priority rules.</p> <p>Conformational isomerism: Factor affecting on stability of Conformation, conformational structure and stability of ethane, butane, cyclohexane, chair and boat forms, axial and equatorial bonds in cyclohexane, factors affecting stability of conformations. Baeyer’s angle strain theory.</p> <p>Internal Examination</p>	5h	
December			

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TEACHING PLAN

ACADEMIC YEAR: 2020-21

NAME OF TEACHER: **Dr. Jayashri D. Bhirud**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **S.Y. B.Sc**

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: **CH- 242 Inorganic Chemistry-II**

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
February	Unit I Basic Concept of Coordination Chemistry A) Introduction, Double salt's and coordination compounds, coordination complexes and complex ions, coordination number, Unidentate, bidentate and poly-dentate ligands, chelating ligands and chelates, charge on complex or complex ion, physical methods use in the study of complexes, Nomenclature of coordination compound.	8h	
March	B) Werners Theory – Assumptions, Isomerism, EAN rule, stability of complexes ion and Factors affecting stability of complex ion, stereochemistry of coordination compound with coordination Number 4 and 6, Isomerism in coordination compounds. UNIT II: d-block Elements and Their Properties Elements of first, second and third transition series, General characteristics of d-block elements a) Metallic character b) Molar volume and densities c) Atomic radii d) Ionic Radii	8h	
April	UNIT II: d-block Elements and Their Properties Melting and boiling points f) Ionization Energies g) Reactivity h) Oxidation states i) Standard electrode potential j) Reducing Properties k) Colour l) Magnetic properties m) Catalytic Properties n) Tendency to form Complexes UNIT III: Acids, Bases and Solvent Chemistry A) Introduction, Terms- Solvent, Solute, Solution, Solvation & Hydration, Dielectric Constant, Non-aqueous solvents, classification, chemistry of liquid	8h	

	ammonia, N ₂ O ₄ and BrF ₃ .		
May	<p>UNIT III: Acids, Bases and Solvent Chemistry</p> <p>B) Donor and acceptor properties of solvent, Levelling & Differentiating Solvents, Co-Solvating Agents.</p> <p>C) Molten salts & their classification, Uses, solvents for electrochemical reactions, purity of solvents.</p> <p>D) Definition and approaches- i) solvent system concept – Merits/Advantages, Limitations ii) Lux-flood concept & its application iii) Lewis concept-Limitations, Merits etc. iv) Generalized Acid-base concepts, Advantages, Limitations.</p> <p>E) Hard and soft acids and bases: definitions, Pearson HSAB concept.</p> <p>Internal Examination</p>	6h	
March			

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TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. Jayashri D. Bhirud**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **M.Sc. II**

SUBJECT: M.Sc II Organic Chemistry

PAPER CODE and TITLE OF PAPER: **CHO-302: Stereochemistry**

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
June	--		
July	--		
August	Unit I: Fundamentals in Stereochemistry Measurement of optical activity, optical activity due to stereoplane, helicity, enantiomeric excess, determination of optical purity, Absolute and relative stereochemistry, Investigating the stereochemistry of a compound, Chiral compounds with no stereogenic centres. Conformations of Ethane and n-butane: Restricted rotation about single bond. Origin of conformational energy, Angle and Pitzer Strain.	09	
September	Unit III: Stereochemistry of six membered rings Conformational analysis of cyclohexane (structure associated with energy), Monosubstituted cyclohexane, 1, 2-disubstituted with same substituent (e.g. 1, 2-Dimethylcyclohexane), with two different substituents (e.g. 1-isopropyl-2-dimethyl cyclohexane), 1, 2-disubstituted cyclohexane (e.g. 1, 3-Dimethylcyclohexane). Conformations of heterocycles. Conformations of common sugars. Anomeric effect.	16	
October	Stereochemistry of polycyclic compounds Norboranes (<i>exo</i> , <i>endo</i> , <i>syn</i> and <i>anti</i> nomenclature), NGP reactions in Norbornane, Hydrindanes (Bicyclo [4.3.0] Nonane, fused rings in steroids nucleus, and bridge alkaloids). Unit II: Asymmetric synthesis and its applications Asymmetric synthesis with chiral substrates - Cram's rule, Felkin-Anh rule, Cram's chelate model, use of chiral auxiliaries, First Internal Examination Seminar	16	

November	<p>chiral reagents and catalysts in asymmetric synthesis. Enantiomeric Excess and Optical Purity. Stereoselective Reactions: aldol reactions (Zimmermann-Traxler model), asymmetric hydrogenation (BINAP), asymmetric epoxidation (+DET/-DET) and asymmetric dihydroxylation (DHQD) 2PHAL/(DHQ) 2PHAL.</p> <p>Second Internal Examination Assingment</p>	08	
December	<p>Unit IV: ORD and CD Linearly and circularly polarized light, Circular birefringence and circular dichroism, ORD and CD curves, Cotton effect and its applications, The Octant rule and the axial α-haloketone rule with applications.</p> <p>Assignment</p>	11	

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TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. Jayashri D. Bhirud**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **M.Sc. II**

SUBJECT: M.Sc II Organic Chemistry

PAPER CODE and TITLE OF PAPER: **CHO-305A: A) Physical methods in structure determination**

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
June	--		
July	--		
August	Unit I: ¹H-NMR Spectroscopy Principle of NMR, spin-spin coupling, (n+1) rule, coupling constant, vicinal and germinal coupling, long range coupling, factors affecting coupling constant, first order spectra, More complex spin-spin system like AB, AX, AX ₂ , ABX, AMX, ABC. Proton exchange reaction and hydrogen bonding, chemical exchange, rotation about single bond with partial double bond character, simplification of complex spectra-double resonance, shift reagents, Nuclear Over- Hauser effect (NOE), Deuterium exchange, solvent effects, Detection of solvent peaks in ¹ H NMR spectra, NMR of intra and intermolecular hydrogen bond, C-H-N, C-H-O, Ar-HO=C. Applications of ¹H NMR: Magnetic Resonance Imaging (MRI). Problems Based on ¹ H NMR spectroscopy. MCQ based test	16	
September	Unit II: ¹³C NMR spectroscopy Elementary ideas, Instrumental difficulties, Proton decoupled spectra, off-resonance technique, Chemical shifts of solvents, chemical shift of carbons, factors affecting on chemical shifts, calculations of chemical shifts of alkane, olefin, alkyne, aromatic, Heteroaromatic, carbonyl carbons, oxime carbon and nitrile carbon, chemical shift features of hydrocarbons, effect of substituents on chemical shifts. Problems based on ¹³ C NMR spectroscopy. NMR spectroscopy of Nuclei other ¹ H and ¹³ C. Assignment	16	

October	<p>Two dimensional NMR spectroscopy (2D NMR) ^1H-^1H COSY, ^{13}C-^1H (HETCOR, HMQC, HMBC), ^{13}C-^{13}C INADEQUATE, Interpretation of 2D spectra and examples.</p> <p>Unit III: Electron Spin Resonance Spectroscopy Introduction, basic principle, zero field splitting and kramers degeneracy, factors effecting the “g” values, hyperfine splitting, determination of “g” values. Instrumentation, working of instruments, sensitivity, concentration, choice of solvent. Presentation of ESR spectra, application of ESR to study the free radicals, structure determination, reaction velocities.</p> <p>First Internal Examination</p>	09	
November	<p>Unit IV: Mass Spectrometry Instrumentation, various methods of ionization (field ionization, field desorption, ESI, FAB, MALDI), different detectors [magnetic analyzer, ion cyclotron analyzer, Quadrupole mass filter, time of flight (TOF)]. Mass Spectral fragmentation of Organic compounds containing common functional groups, Nitrogen rule, McLafferty rearrangement, Molecular Ion peak.</p> <p>Second Internal Examination</p>	09	
December	<p>Metastable peak, isotope peaks, Mass spectral fragmentation of organic compounds with respect of their structure determination. Problem based on Mass Spectrometry.</p> <p>Unit V: Problems based on U.V., I.R., NMR, CMR, Mass and 2D NMR spectroscopy</p> <p>a) Problems based on joint application of U.V., I.R., NMR, CMR, Mass and 2D NMR spectroscopy b) Determination of structure of organic compounds from U.V., I.R., NMR, CMR, Mass and 2D NMR spectra.</p> <p>Assignment</p>	10	

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TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. Jayashri Dinkar Bhirud**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **MSc-II**

SUBJECT: Organic Chemistry

PAPER CODE and TITLE OF PAPER: **CHO-401 Natural Product**

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO. OF LECTURES REQUIRED	REMARKS
March	Unit III: Multi-step synthesis of natural products Synthesis of the following natural products with special reference to reagents used, stereochemistry and functional group transformations: i) Reserpine (Woodward synthesis) ii) Longifoline (Corey synthesis) iii) Estrone iv) Strychnine (Overman's synthesis) v) Fredericamycin-vi) Juvabione	12h	
	Unit II: Chemistry of Natural Products Structure, stereochemistry and biogenesis of Hardwickiiic acid	5h	
April	Prostaglandin: Classification, general structure, biological importance, Structure elucidation & total synthesis of PGE ₂ , PGF _{1α} , and podophlylotoxins.	5h	
	Unit IV: Vitamins a) Classification, sources and biological importance of vitamin B1, B2, B6, folic acid, B12, C, D1, E (α-tocopherol), K1, K2, H (β-biotin). b) synthesis of the following: Vitamin B1 including synthesis of pyrimidine and thiazole moieties Vitamin B2 from 3, 4-dimethylaniline and D(-)-ribose Vitamin B6 from: Ethoxyacetylacetone and cyanoacetamide Vitamin E (α-tocopherol) from trimethylquinol and phytol bromide Vitamin K1 from 2-methyl-1, 4-naphthaquinone and phytol. Vitamin Folic acid from Guanidine and ethyl cyano acetate.	12h	
	First Internal Test		
	Seminar		



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TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. Manoj A. Pande**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **FYBSc**

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: **CH- 111: Inorganic Chemistry I**

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
June	--		
July	...		
August		
September		
October	CH-111 General Introduction, Importance & Scope of Chemistry, Concept of Elements, atoms & Compounds, Atomic models, Discussion on different Atomic model: Dalton, Thomson, Rutherford etc. Review of: Bohr's theory, Hydrogen Spectrum and limitations of Bohr's theory	05	
November	Review of: Bohr's theory, Hydrogen Spectrum and limitations of Bohr's theory, limitations of Bohr's theory cont. & Dual Nature of electron & derivation of de Broglie equation de Broglie, idea of de-Broglie matter waves, Derivation, Characteristics of matter waves, problems on de-Broglie equation, Problems on de-Broglie equation Cont.; Heisenberg's Uncertainty Principle: Statement, Phy. Concept, Phy. Concept & Numerical Problems,	10	
December	Schrodinger equ, Phy. Significance of ψ^2 ; quantum numbers. Quantum Numbers with their significance cont. problems on QN, Shapes of orbitals, Rules for filling electrons in various orbitals Aufbau Princ., Pauli Ex. Principle	08	
January	Writing electronic conf of elements cont.; Principle of Extra stability: Symmetrical Distribution & Exchange Energy, Anomalous elect. Conf. Writing ele. Conf of Ions. Revision & Summarization of Unit I First Assessment test 1 (Practice Test)	05	

February	Unit-II Covalent Bonding: Def., Postulates of VBT, Formation of H ₂ molecule, Limitations. Unit-II Formation of H ₂ molecule on the basis of VBT, Limitations of VBT. CH-111 Limitations of VBT. Cont., Directional Characteristics of Covalent Bond, Overlap Criteria & Bond strength, Hybridization. CH-111 Hybridization cont.: sp, sp ² , sp ³ ,: examples, geometry. Factors determining shape of molecules. CH-111 sp ³ hybridization, factors affecting shape of molecule, VSEPR theory: main pts & limitations,	06	
March	Topic: CH-111 Inorg Chem. Problems on VSEPR, MOT: introduction, overview of VBT, main pts of MOT, LCAO. MO diagram of Homonuclear & Heteronuclear molecules. Ionic Bonding: General characteristics of ionic bonding. Energy consideration in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.	10	

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TEACHING PLAN

ACADEMIC YEAR: 2020- 2021

NAME OF TEACHER: Dr Manoj A. Pande

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: FY B.Sc.

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER:

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
July			
August			
September			
October			
November			

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TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. Manoj A. Pande**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **TYBSc**

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: **CH-504: Ind. Chemistry**

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
June	--		
July	...		
August			
September	Introduction to CH-504 Ind. Chemistry Introduction to Unit -1 of CH-504. Basic Requirement of Chemical Industry., Basic Requirement of Ind. Chem. Raw Materials and Unit Processes Unit Operation; Comparison between Unit operation & Unit Process video after lecture for better understanding of Unit operation & Processes shared You tube link. Quality Assurance; Quality Control and Process Control R & D Department, Pollution Control, Human Resource Dept. Safety Measures, Economics of Chem. React. & Classification of Reactions. Classification of reactions cont. & Batch - Continuous Process Yield calculation; Theoretical, Practical and %. Conversion, Selectivity and Yield Conversion and Selectivity of Chemical Reaction; Intellectual Property & Types of IP	17	
October	Types of IP Rights; Copy right and Trademark, Types of IP Rights; Patent Act & Advantages of IP Patent; Advantages of IP rights. IP Rights in India. ISO & BIS. Comparison. Patent Agent Exam Information You tube video link shared. BIS syllabus & Pattern: You tube video link shared Patent Agent Exam Information You tube video link shared. BIS syllabus & Pattern. Overview and Revision of CH-504 Unit-I General Aspect of Ind. Chem.	15	

November	<p>CH-504 Ind. Chem. Unit-V Introduction, Ind. synthesis of Acetone: Principle, Reaction, process & application.</p> <p>CH-504 Unit I Synthesis of acetone: process, Block dia. & application.; synthesis of methanol: Reaction</p> <p>CH-504 Ind. synthesis of methanol: Reaction, Synthesis, Block dia. & application. Ind. synthesis of Isopropanol: Reaction</p> <p>CH-504 Ind. synthesis of Isopropanol: Reaction, Synthesis, Block dia. & application</p> <p>CH-504 Ind. synthesis of Acetylene: Reaction, Synthesis, Block dia. & application</p> <p>CH-504 Ind. synthesis of Toluene: Reaction, Synthesis, Block dia. & application</p> <p>CH-504 application of Toluene cont. Ind. synthesis of Glycerol: Reaction, Synthesis, Block dia. & application</p> <p>CH-504 cont. Ind. synthesis of Glycerol: Reaction, Synthesis, Block dia. & application</p> <p>CH-504 Unit-V Revision & Summarization</p>	12	
December	<p>Ind.Chem. Unit-2 Sugar Introduction; Sugar Ind in Maharashtra & Ind Ind.Chem.Unit-2 Sugar Ind. Importance of Sugar Ind.;</p> <p>Manufacture of Cane Sugar Ind.Chem.Unit-2 Sugar Ind. Importance of Sugar Ind.;</p> <p>Manufacture of Cane Sugar</p> <p>cane molasses Fermentation ind. Coffey still</p> <p>Coffey still Wine beer</p>	08	
January	<p>Topic: CH 504 U4 Petroleum</p> <p>Ind.: occurrence, producer, exploration method & composition.</p> <p>Petroleum : composition & refining</p> <p>Refining of petroleum, Cracking, catalytic reforming & hydrocracking, Knocking, Anti Knock compd.</p> <p>cracking cont.; knocking, antiknocking; octane no.</p> <p>Cetane no diff</p> <p>Petrohol, Power alcohol: Manufacture, advantages & Disadvantages; manufacture of petrol: Bergius method.</p>	05	

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TEACHING PLAN

ACADEMIC YEAR: 2020- 2021

NAME OF TEACHER: Dr Manoj A. Pande

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: FY B.Sc.

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: CH604 Ind. Chem.

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
March	Unit 5 Dyes, Drugs and Pharmaceuticals.	12	
April	UNIT 4: Soap and Detergents	12	
May	UNIT 3: Pesticide Chemistry UNIT 2: Chemistry of Perfumes	20	
June	UNIT 1: Chemistry of Cosmetics	12	

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TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. Manoj A. Pande**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **TYBSc**

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: **CH-503: Organic Chemistry**

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
June	--		
July	...		
August	Basic concepts of ORM. Unit IV, Aromatic Substitution reaction: Arenium ion mechanism, Mechanism of Nitration & FC Alkylation acylation, Mechanism of Sulphonation, Halogenation and Diazo coupling Reaction, IPSO Substitution, Effect of substituent group I; Activating & Deactivating group Nucleophilic Aromatic Substitution Reaction Addition-Elimination Mechanism, Benzyne Int. Mechanism	15	
September	Evidences for addition-elimination reaction & Benzyne Mechanism, Chichibabin Reaction Examples Overview and Revision of CH-503 Unit-IV. Introduction to CH-503 Unit I SN1 Reaction & SN2 Reaction, SNi Mechanism Scope of Nucleophilic Substitution Reaction at Allylic & Vinylic C NGP, Overview and Revision of CH-503 Unit -I Nucleophilic Subst. @ Sat C Revision & Summarization.	15	
October	Introduction to CH-503 Unit II Electrophilic addition to C=C. Types: Electrophilic addition and Nucleophilic addition; Mechanism of Electrophilic addition. AdE2 Mechanism. Addtn of HX and Orientation of addtn Markovnikov's Rule & Examples Support for Carbocation formation in MR; Anti-Markovnikov's Rule. and Terms Chemo/Regio/Stereo selectivity. Stereochemistry of Add HX to Alkene Mechanism Evidences to support Halogenation Mechanism (Bromination)&	12	

	<p>Factors affecting Anti stereoselect. Effect of Sust. on rate of Addition.</p> <p>Factors affecting Anti Stereoselectivity of</p> <p>Reaction Hydrogenation: Reaction, Mechanism & examples continue and Cis Hydroxylation</p> <p>Cis Hydroxylation Definition, reaction various reagents.</p> <p>Trans Hydroxylation Definition, reaction various reagents, mechanism & examples Ozonolysis</p>		
November	<p>Mechanism of Ozonolysis, Precautions, Application & examples</p> <p>Hydroboration-Oxidation Statement.</p> <p>CH-503 Unit-II Revision & Summarization.</p>	06	
December	<p>Nucleophilic addition to c-o double bond introduction structure reactivity. Cont.Factors affecting reactivity of carbonyl gp; Mechanism of addition of HCN.Addition of alcohol water</p> <p>Shapes of orbitals Thiol am</p> <p>Statement Reaction Mechanism application of aldol, perkin Cannizzaro reaction. Wittig reaction</p> <p>Reformatsky Reaction: statement, reaction, mechanism & application Reducing agents NaBH₄ & LiAlH₄ Synthesis, Reactions, mechanism, application, diff.</p> <p>Topic: CH-503 U5 E11.React: intro, examples, mech.of 1,2eli., E2 eli: reaction, kinetics & Mech.</p> <p>E2, E1 & E1CB reaction, mechanism, evidences & conditions</p> <p>E2vs E1 ; Sust vs Eli.</p>	15	
January	<p>Sn1 vs e1 reactions</p> <p>:dehydrohalogenation,dehalogenation,dehydration;Hoffmann & Saytzeff eli.. Revision and Problem solving for Uni. Exam</p>	10	

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TEACHING PLAN

ACADEMIC YEAR: 2020- 2021

NAME OF TEACHER: Dr Manoj A. Pande

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: FY B.Sc.

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: Organic Spectroscopy

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
February	Unit I Introduction to spectroscopy	15	
March	Mass spectroscopy	5	
April	Unit 2 UV spectroscopy	12	
May	UNIT 3. Infra-red Spectroscopy	12	
June	UNIT 4. NMR Spectroscopy	12	
June	UNIT 5. Combined Problems Based on UV, IR, NMR & Mass	12	

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TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. Rajendra D. Patil**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **FYBSc**

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: **CH- 112: Organic Chemistry I**

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
June	--		
July			
August			
September			
October	Unit I. Fundamentals of Organic Chemistry Introduction, Inductive Effect and Resonance Effect.	02	
November	Unit I. Fundamentals of Organic Chemistry Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule. Revision of Unit I	06	
December	Unit II. IUPAC Nomenclature of Organic Compounds Rules for IUPAC nomenclature for: Saturated hydrocarbons, unsaturated hydrocarbons, organic compounds containing one functional group, organic compounds containing functional group and multiple bonds, organic compounds containing two or more than two functional groups.	08	
January	Unit II. IUPAC Nomenclature of Organic Compounds Cyclic organic compounds, bicyclic organic compounds, Aromatic compounds.	08	

	<p>Revision of Unit II.</p> <p>Unit III. Aliphatic Hydrocarbons</p> <p>Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation.</p> <p>Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alcohols and dehydrohalogenation of alkyl halides (Saytzeff's rule): cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO_4) and trans-addition (bromine). Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation.</p>		
February	<p>Alkynes: (Upto 5 Carbons) Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.</p> <p>Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO_4, ozonolysis and oxidation with hot alkaline KMnO_4.</p> <p>Revision of Unit III.</p>	06	

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TEACHING PLAN

ACADEMIC YEAR: 2020-21

NAME OF TEACHER: **Dr. Rajendra D. Patil**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: SYBSc

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: **CH- 230: IT Skill for Chemist**

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
June	--		
July	Unit I. Introductory Writing Activities Introduction to word processor.	02	
August	Unit I. Introductory Writing Activities Introduction to structure drawing (Chem Sketch/ Chem Draw) software. Incorporating chemical structures, chemical equations, and expressions from chemistry into word processing documents. Revision of Unit I.	06	
September	Unit II Handling Numeric Data Spreadsheet software (Excel), creating a spreadsheet, entering and formatting information, basic functions and formulae, creating charts, tables and graphs. Incorporating tables and graphs into word processing documents.	08	
October	Unit II Handling Numeric Data Simple calculations, plotting graphs using a spreadsheet (Planck's distribution law, radial distribution curves for hydrogenic orbitals, gas kinetic theory, and data from phase equilibria studies). Graphical solution. Revision of Unit I. Unit III Numeric Modelling Simulation of pH metric titration curves.	06	

November	<p>Unit III Numeric Modeling</p> <p>Excel functions LINEST and LeastSquares. Numerical curve fitting, linear regression (rate constants from concentration time data, molar extinction coefficients from absorbance data), numerical differentiation (e.g. handling data from potentiometric and pH metric titrations, pKa of weak acid),</p> <p>First Internal Examination.</p>	06	
December	<p>Unit III Numeric Modelling</p> <p>Numerical integration (e.g. entropy/enthalpy change from heat capacity data).</p> <p>Revision of Unit III. Assignment.</p>	02	

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TEACHING PLAN

ACADEMIC YEAR: 2020-21

NAME OF TEACHER: **Dr. Rajendra D. Patil**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **M.Sc. II**

SUBJECT: M.Sc. II Organic Chemistry

PAPER CODE and TITLE OF PAPER: **CHO-301: Organic Reaction Mechanism**

THIRD TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
June	--		
July	Unit I: Electronic Effect and Reactive intermediates Effect of structure on reactivity: Inductive effect, Electromeric effect, Resonance, Hyperconjugation, and steric effects, Hammett equation and linear free energy relationship, Substituent and reaction constant, Taft equation.	05	
August	Unit I: Electronic Effect and Reactive intermediates Thermodynamic and kinetic requirements for reactions, thermodynamically and kinetically controlled reactions, Hammonds postulate, transition states and intermediates, Kinetic & non kinetic methods of determining mechanisms, identification of products and determination of the presence of an intermediate, isotopic labeling, and kinetic isotope effects. Reactive intermediates: Formation, structure, stability, and reactions of carbocations, carbanions, carbenes, nitrenes and free radicals. Revision of Unit I.	10	
September	Unit II: Aromatic Electrophilic Substitution and Elimination Reactions Aromatic Electrophilic Substitution: The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The <i>o/p</i> ratio, <i>ipso</i> attack, orientation in benzene ring with more than one substituents, orientation in other ring system. Diazonium coupling, Gatterman-Koch reaction, Pechman reaction, Houben–Hoesch reaction. Elimination Reactions:	15	

	<p>The E1, E2 and E1CB mechanisms and orientation of the double bond, Saytzeff and Hoffman's rule, Effect of substrate structure, attacking base, leaving group and medium, Mechanism and orientation in pyrolytic elimination.</p> <p>Revision of Unit II.</p>		
October	<p>Unit III: Carbanion</p> <p>a) Carbanion: Formation, stability and related name reactions. Aldol Condensation, Benzoin Condensation, Michael addition, Mannich reaction, Reimer-Tiemann reaction, Knoevengal reaction, Dieckmann reaction, Perkin reaction, Stobbe reaction, Halogenation of Ketone (Acid & Base catalysed), Darzen Condensation reaction and Claisen Ester condensation.</p>	10	
November	<p>Unit III: Carbanion</p> <p>b) Enamines: Formation and Applications. Revision of Unit III.</p> <p>Unit IV: Umpolung</p> <p>Umpolung Reactivity: Dipole inversion, generation of acyl anion, use of 1,3-dithiane, methylthiomethylsulphoxide, <i>bis</i>-Phenylthiomethane, Metallated enol ethers, alkylidenedithiane, Ketone dithioacetals, and 2-propenethiobismethyl thioallyl anion.</p> <p>b) Phosphorous, Nitrogen and Sulphur ylid Preparation, Reactions, Applications and Stereochemistry.</p> <p>First Internal Examination</p>	12	
December	<p>c) Organoboranes</p> <p>Preparation and properties of organoborane reagents (RBH₂, R₂BH, R₃B, 9-BBN, catecholborane, Thexylborane, cyclohexylborane. Hydroboration mechanism, stereo and regioselectivity. Uses of hydroboration in synthesis of primary, secondary, tertiary alcohols, aldehydes, and ketones. Synthesis of <i>EE</i>, <i>EZ</i>, and <i>ZZ</i> dienes and alkynes. Allylboranes- synthesis, mechanism and uses.</p> <p>d) Organo silicon and Tin Me₃SiCl, Peterson Olefination and Me₃SiH, TBTH and AIBN. Revision of Unit IV.</p> <p>Assignment</p>	08	

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TEACHING PLAN

ACADEMIC YEAR: 2020-21

NAME OF TEACHER: **Dr. Rajendra D. Patil**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **M.Sc. II**

SUBJECT: M.Sc. II Organic Chemistry

PAPER CODE and TITLE OF PAPER: **CHO-306: Photochemistry, Free radical and Pericyclic reactions**

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
June	--		
July	Unit I: Photochemistry Introduction and basic principles, photochemical excitation of the molecule, electronic transitions, spin multiplicity, Jablonski diagram.	04	
August	Unit I: Photochemistry Laws of photochemistry-Grothurs Drapper Law and Einstein's Law of Photochemical Equivalence. Quantum yield, Photosensitization and quenching process. Revision of Unit I. Unit II: Photochemistry of Organic Compound a) Carbonyl compounds Norrish Type I, α -cleavage: Acyclic saturated ketones, saturated cyclic ketones. β -cleavage reaction, hydrogen abstraction, Norrish Type II, and Intermolecular photo reduction.	10	
September	Unit II: Photochemistry of Organic Compound a) Carbonyl compounds Paterno-Buchireaction and reaction of enone with alkenes. b) Photo Rearrangements Cyclohexanone rearrangements, Di- π -methane (DPM) rearrangement, and Aza-Di- π -methanerearrangement c) Photochemistry of alkenes Cis-trans isomerization, dimerization, photochemistry of conjugated diene in solution d) Photochemistry of Aromatic compounds Isomerization, addition of alkenes to benzenoid compounds,	11	

	addition of oxygen and aromatic photo substitution. e) Photofries rearrangement and Barton reaction. Revision of Unit II.		
October	Unit III: Free Radicals Formation, stability, types of free radical reactions, free radical substitution, cyclization mechanism, mechanism at an aromatic substrate, neighbouring group assistance and effect of solvent on reactivity. NBS allylic bromination, aldehyde oxidation, autooxidation, alkynes coupling, arylation of aromatic compounds by diazonium salts.	12	
November	Unit III: Free Radicals Sand-Meyer reaction and Hunsdiecker reaction. Revision of Unit II. Unit IV: Pericyclic Reactions-I a) Introduction, construction of π MO orbitals of ethylene and 1,3-butadiene, symmetry in π MO orbitals, Frontier Molecular Orbitals (FMO), PMO, and Excited states. b) Electrocyclic reactions: Introduction, conrotatory and disrotatory motions in ring opening and ring closing reactions ($4n$ and $4n+2$ π system), FMO method for ring opening and closing of $4n$ and $4n+2$ π system. Revision of Unit III. First Internal Examination	11	
December	Unit V: Pericyclic Reactions-II a) Cycloaddition reactions Introduction, [2+2] cycloaddition (FMO method and stereochemistry), [2+4] cycloaddition (FMO method and stereochemistry), Diels-Alder reaction, retrocycloaddition, Chelotropic reactions and 1,3-dipolar cycloaddition. b) Sigma tropic rearrangements Introduction, classification and nomenclature, Mechanism and FMO, Sigmatropic shifts of alkyl group, Cope rearrangement, Claisen rearrangements, fluxional molecules and ENE reaction. c) Applications of Pericyclic Reactions Synthesis of Vitamin-D and Endiandric acid. Revision of Unit IV. Assignment	12	

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TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. Rajendra D. Patil**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: F. Y. B.Sc.

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: **CH-122 and Organic Chemistry**

Second TERM

Month	Topic	Lectures Allotted	Remarks
May	-		
	Unit 1. Aromatic hydrocarbons Preparation of benzene from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions of benzene: Nitration, halogenation and sulphonation. Friedel-Craft's reaction alkylation and acylation. Side chain oxidation of alkyl benzenes. Revision of Unit 1.	06	
	Unit 2. Alkyl and Aryl Halides a) Alkyl Halides: S_N^1 , S_N^2 and S_{Ni} reactions. Preparation of alkyl halide from alkenes and	04	

	<p>alcohols.</p> <p>Reactions of alkyl halide: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis. Elimination vs substitution.</p>		
June	<p>Unit 2. Alkyl and Aryl Halides</p> <p>b) Aryl Halides: Preparation of Chloro, bromo and iodo-benzene from phenol, Sandmeyer reactions.</p> <p>Reactions of Chlorobenzene: Aromatic nucleophilic substitution- replacement by -OH group. Effect of substituent on nucleophilic substitution. Benzyne Mechanism.</p> <p>Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.</p> <p>Revision of Unit 2.</p> <p>Unit 3. Alcohols, Phenols and Ethers</p> <p>a) Alcohols: Preparation of 1°, 2° and 3° alcohols using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.</p> <p>Reactions of alcohols: With sodium, HX (Lucas test), esterification, oxidation with PCC, alk. KMnO₄, acidic dichromate, conc. HNO₃. Oppeneauer oxidation, Diols: oxidation of diols. Pinacol-Pinacolone rearrangement.</p>	04	
		06	
July	<p>b) Phenols: Preparation of phenol: Cumene hydroperoxide method, from diazonium salts.</p> <p>Reactions of phenol: Nitration, halogenation and sulphonation, Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben-Hoesch Condensation, Schotten Baumann Reaction.</p> <p>c) Ethers : Cleavage of ethers with HI.</p>	04	

	<p>Revision of Chapter-3</p> <p>Chapter-4 Aldehydes and ketones</p> <p>Preparation of formaldehyde, acetaldehyde, acetone and benzaldehyde from acid chlorides and from nitriles.</p> <p>Reactions of aldehyde and ketones – Reaction with HCN, ROH, NaHSO₃, NH₂-G derivatives. Iodoform test, Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation, Clemmensen reduction, Wolff Kishner reduction, Meerwein-Ponndorf Verley reduction.</p> <p>Revision of Chapter-4</p>	06	
	Exams		

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Director/Head	Name of Teacher:



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TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. R. D. Patil**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: **S.Y. B.Sc**

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: **CH- 240: Basic Analytical Chemistry**

FOURTH TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
March	Unit-1: Introduction to Analytical Chemistry Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures.		
April	Unit II : Chromatography Definition, general introduction on principles of chromatography, paper chromatography, TLC etc. a. Paper chromatographic separation of mixture of metal ion (Fe ³⁺ and Al ³⁺). b. To compare paint/dyes/organic samples by TLC method.		
May	Unit III : Analysis of Water Sample and Food Products A] Analysis of water sample Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods. a. Determination of pH, acidity and alkalinity of a water sample. b. Determination of dissolved oxygen (DO) of a water sample		
June	B] Analysis of Food Products Nutritional value of foods, idea about food processing, food preservations and adulteration. a. Identification of adulterants in some common food items like salt, coffee powder, chilli powder, turmeric powder and pulses, etc. b. Analysis of preservatives and colouring matter.	5h	

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TEACHING PLAN

ACADEMIC YEAR: **2020-21**

NAME OF TEACHER: **Dr. Rajendra D. Patil**

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: M.Sc II

SUBJECT: Organic Chemistry

PAPER CODE and TITLE OF PAPER: **CHO-402: Advanced synthetic organic chemistry**

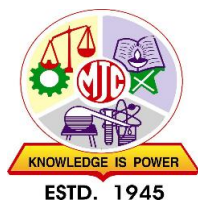
Fourth TERM

Month	Topic	Lectures Allotted	Review (Complete/Incomplete)	Action plan if incomplete
March	Unit I: Metal mediated organic synthesis Transition metal complexes in organic synthesis Cu, Pd, Ni, Co, Fe (Metal mediated C-C and C-X bond formation reactions: Suzuki, Heck, Sonogashira, Stille, Fukuyama, Kumada, Hiyama, Negishi, Buchwald-Hartwig, Noyori, Reppe, Oxo process and Ullman coupling.	10		

	<p>Revision of Unit-4.</p> <p>Unit V:Designing of organic synthesis a) Protection and de-protection of hydroxyl, amino, carboxyl, ketone and aldehyde functions as illustrated in the synthesis of polypeptide and polynucleotide, Umpolung in organic synthesis.</p>	06		
June	<p>Unit V:Designing of organic synthesis</p> <p>b) Retrosynthesis An introduction to synthons and synthetic equivalents, functional group inter conversions.</p> <p>One group Disconnections :Disconnections of simple alcohols, simple olefins, Aryl ketones, control, Disconnections of simple ketones & acids.</p> <p>Two group Disconnections : 1,3-Dioxygenated skeletons, β-hydroxy carbonyl compounds, α-β unsaturated carbonyl compounds, 1,3-dicarbonyl compounds, 1,5-dicarbonyl compounds–Use of Mannich reaction</p> <p>Two group Disconnections : The 1,2-Dioxygenation pattern –α-hydroxy carbonyl compounds, 1,2 diols, Illogical electrophiles, 1,4-Dioxygenation pattern - 1,4 dicarbonyl compounds, γ hydroxy carbonyl compounds, other illogical synthons, 1,6 dicarbonyl compounds, pericyclic reactions, Heteroatoms & heterocyclic compounds.</p>	18		

Exams				

Signature :	Signature:
Director/Head	Name of Teacher:



School of Chemical Sciences

TEACHING PLAN

Name of Teacher:	Dr. R. R. Mahire	Class:	T. Y. B. Sc. (Chemistry)
Subject/Paper :	CH-502 Inorganic Chemistry (Sem-V) (2020-21)	Faculty:	Science

Month	Topic	Lectures Allotted	Review (Complete/Incomplete)	Action plan if incomplete
August	UNIT-1: Structure and Reactivity of Molecules Valence Shell Electron Pair Repulsion Theory (VSEPR), Shapes of simple molecules and ions containing lone-and bond-pairs of electrons multiple bonding, prediction of shapes of irregular molecules and ions like - Sulphur tetra fluoride, Bromine trifluoride, Dichloroiodate (I) anion, Penta fluoro tellurate (IV) anion, Tetrachloroiodate (III) anion, Nitrogen dioxide, Phosphorus trihalides, Carbonyl fluoride, Summary of VSEPR rules Drawbacks of VSEPR theory.	09		
September	UNIT 2: Modern Theories of Coordination Compound Part –A: Assumptions, Werner theory and isomerism, EAN, Stability of complex ion, Factors affecting stability of complex ion, Irving William series, Stabilization of unstable oxidation state, Stereochemistry of coordination compound with C.N. 4 and 6, Isomerism in coordination compounds	09		
October	UNIT 3: Modern Theories of Coordination Compound Part	09		

	<p>-B: Assumptions of V.B.T., V.B. Theory as applied to structural and bonding in complexes of 3d series elements. Examples of square planar, Tetrahedral and Octahedral complexes, inner and outer orbital complexes, Magnetic properties of complexes of 3d series elements, limitations of V.B.T., Assumptions of CFT, Degeneracy of 'd' orbital's, Application of CFT to octahedral complexes, Weak and strong ligand field splitting, spectrochemical series.</p>			
November	<p>UNIT 4: Modern Theories of Coordination Compound Part -C: Definition of C.F.S.E., Calculation of C.F.S.E. in weak and strong field octahedral complexes, Evidences of C.F.S.E., Factor's affecting 10 Dq, CFT and magnetic properties, spin only magnetic moment equation, Electron occupancy in CFT, Application of CFT to tetrahedral and Calculation of C.F.S.E. in tetrahedral complexes. Tetragonal distortions from octahedral geometry, Jahn-Teller theorem Application of CFT to square planer complexes, Problems related to calculation of spin only magnetic moment for square planer, tetrahedral and octahedral complexes (for high spin and low spin complexes)</p>	09		
December	<p>UNIT 5: Modern Theories of Coordination Compound Part -D: Crystal field effects- Variation of lattice energies, enthalpies of hydration and crystal radii variations in halides of first and second row transition metal series and spinel structures,</p>	09		

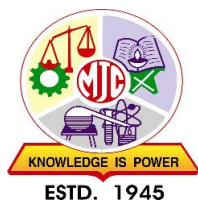
	limitations of CFT, experimental evidences in support of metal ligand bond overlaps. ACFT, Assumptions of Molecular orbital theory, composition of ligand group orbitals, Molecular orbital treatment (Qualitative) of octahedral complexes (strong & weak field), Effect of pi bonding, Charge transfer spectra, Comparison of VBT, CFT and MOT.	09		
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Director/Head

Signature:

Name of Teacher: Dr. R. R. Mahire



School of Chemical Sciences

TEACHING PLAN

Name of Teacher: Dr. R. R. Mahire **Class:** T. Y. B. Sc. (Chemistry)
Subject/Paper : CH-602 Chemistry of Inorganic Solids **Faculty:** Science
(Sem-VI) (2020-21)

Month	Topic	Lectures Allotted	Review (Complete/ Incomplete)	Action plan if incomplete
March	UNIT 1: Synthetic Methods of Nanomaterials Introduction to Nano science, nanostructure and nanotechnology (basic idea), Size dependent properties of nanomaterials (basic idea) a) Semiconducting nanoparticles b) Metallic nanoparticles. Synthesis routes of nanomaterials: a) Bottom up approaches i) Chemical vapor deposition (CVD) ii) Spray pyrolysis iii) Sol gel process b) Top down approaches: mechanical alloying, Role of surfactant in shape and size control of nanomaterials	09		
	UNIT 2: Inorganic Solids of Technological Importance Inorganic pigments, Coloured solids, White and black pigments, Molecular materials and fullerides, Molecular material chemistry – One dimensional metals, Molecular magnets	06		
April	UNIT 2: Inorganic Solids of Technological Importance , Inorganic liquid crystals, Solid electrolytes (a) solid cationic electrolytes (b) solid anionic Electrolytes.	03		

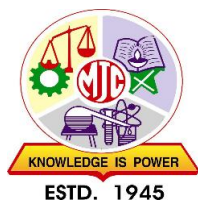
	<p>UNIT 3: Cement and Lime Classification of cement, Ingredients and their role, Manufacture of cement and the setting process. Quick setting cements. Manufacture of lime and applications.</p> <p>UNIT 4: Fertilizers Plant Nutrients, Different types of fertilizers, need for fertilizers, requisite qualities of fertilizers, symptom of deficiency,</p>	09		
		04		
May	<p>UNIT 4: Fertilizers Manufacture of following fertilizers:- Urea, Ammonium nitrate, Calcium ammonium nitrate, Ammonium phosphate, Super phosphates, Compound and Mixed fertilizers, Potassium chloride and Potassium sulphate.</p> <p>UNIT 5: Alloys Classification of alloys, Ferrous and Non-ferrous alloys, Specific properties of elements in alloys, Manufacture of steel, Removal of silicon, decarburization, demagnetization and desulphurization. Composition and properties of different types of steels.</p>	05		
		09		

Signature:

Director/Head

Signature:

Name of Teacher: Dr. R. R. Mahire



School of Chemical Sciences

TEACHING PLAN

Name of Teacher:	Dr. R. R. Mahire	Class :	M. Sc.-II (Analytical Chemistry)
Subject/Paper :	CHA-302 Modern separation science (Sem-III) (2020-21)	Faculty:	Science

Month	Topic	Lectures Allotted	Review (Complete/Incomplete)	Action plan if incomplete
August	Unit I: Chromatography: General Principles Definition and types of chromatography, Theoretical Principles underlying Chromatographic techniques, Theories of Chromatography: (a) Plate Theory, (b) Rate Theory, Behavior of solutes, Column efficiency and band broadening, Resolution, Column process, Reduced variable, Time of analysis, Qualitative & quantitative analysis, Problems.	10		
September	Unit II: Gas Chromatography Optimization of experimental condition, Retention time and Retention volume, Detectors: Thermionic, Flame photometric, Helium and Coulson conductivity detectors, Qualitative and Quantitative analysis, Problems.	10		
October	Unit III: High Performance Liquid Chromatography Introduction, GC and HPLC, Instrumentation, Refractive index detector, luminescence detector, ultraviolet detector and electrochemical detector, Quantitative analysis and data display,	10		

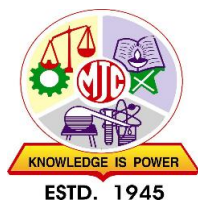
November	<p>Unit III: High Performance Liquid Chromatography Derivatisation technique in HPLC, Chiral columns, C8 and C18 columns, Applications.</p> <p>Unit IV: Ion exchange chromatography Definition, Principle, Cation Exchangers, Anion Exchangers, Regeneration, Ion Exchange Column Used in Chromatographic Separations,</p>	05 05		
December	<p>Unit IV: Ion exchange chromatography Selection of suitable systems, Ion exchange capacity, Ion Exchange Techniques, Applications of Ion exchangers.</p> <p>Unit V: Solvent Extraction and Membrane-Based Methods Distribution coefficient, distribution ratio, percent extracted, solvent extraction of metals, accelerated and</p>	05 05		
January	<p>Unit V: Solvent Extraction and Membrane-Based Methods microwave assisted extraction, solid phase extraction and solid phase microextraction, problems.</p> <p>Reverse Osmosis- Working of techniques and Applications Electrodialysis - Membrane working of techniques and Applications, membranes materials, Ultracentrifugation</p>	10		

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Director/Head

Signature:

Name of Teacher: Dr. R. R. Mahire



School of Chemical Sciences

TEACHING PLAN

Name of Teacher:	Dr. R. R. Mahire	Class :	M. Sc.-II (Analytical Chemistry)
Subject/Paper :	CHA-305B Bio-analysis & analysis of food (Sem-III) (2020-21)	Faculty:	Science

Month	Topic	Lectures Allotted	Review (Complete/Incomplete)	Action plan if incomplete
August	Unit I: Human Nutrition, Biological Value of Food Human nutrition, Biological value of food, Estimation of carbohydrates, Fats, Proteins, Amino Acids.	10		
September	Unit II: Food Analysis Analysis of food: Milk, Cereals, Flour, Spices, Flavors' and Condiments, Honey, jam and jelly, Non-alcoholic beverages (Tea and Coffee).	10		
October	Unit III: Determination of food preservatives Fluorides, Oxidizing agent-Peroxide, Organic Preservative, Formaldehyde, Formic acid , Ether extractive preservative, Separation of organic preservative and sweetening agents,	10		
November	Unit III: Determination of food preservatives Volatile fatty acid in bakery product, 2 Aminopyridine in orange.	05		
	Unit IV: Collection of Specimens and Analysis of Blood and urine Blood: Collection of Blood specimens, storage and preservation, Urine: Collection	05		

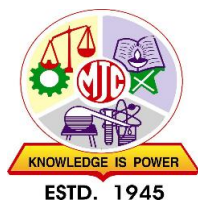
	of Urine, physical characteristics of urea, preservation and storage.			
December	<p>Unit IV: Collection of Specimens and Analysis of Blood and urine</p> <p>Determination of blood and plasma glucose by glucose oxidase method, Determination of urine for glucose, Determination of ketone bodies in blood, Oral Glucose tolerance test. Determination of blood hemoglobin, determination of urea in urine by urease method and by direct colorimetry, Estimation of Na, K, Ca by flame photometry, inorganic phosphate by colorimetry.</p>	10		
January	<p>Unit V: Forensic Analysis</p> <p>Introduction, Forensic examination of biological fluids, stains semen, hair and other materials.</p> <p>Forensic Toxicology: Isolation, identification and determination of following 1) Narcotics-heroin and cocaine. 2) Stimulants-caffeine, amphetamines. 3) Depressants- Barbiturates, Benzodiazepines.</p>	10		

Signature:

Director/Head

Signature:

Name of Teacher: Dr. R. R. Mahire



School of Chemical Sciences

TEACHING PLAN

Name of Teacher: Dr. R. R. Mahire **Class:** M. Sc.-II (Analytical Chemistry)
Subject/Paper : CHA-406 Applications of nanotechnology **Faculty:** Science
(Sem-IV) (2020-21)

Month	Topic	Lectures Allotted	Review (Complete/ Incomplete)	Action plan if incomplete
March	Unit I: Nano- The expanding Horizon Introduction, Fundamentals of nano, Nanoscale phenomena, Significance of nanomaterials and its impact, Classification of nanomaterials, need for it, issues and other perspectives, Prospective applications.	10		
	Unit II: Fabrication of Nanomaterials Top-down and Bottom-up approaches, Gas phase synthesis.	05		
April	Unit II: Fabrication of Nanomaterials Liquid phase synthesis, Solid phase synthesis, Lithography.	05		
	Unit III: Nanomaterial Evaluation: Need for material studies, Structural property studies, Morphological analysis, Optical property studies.	10		

May	Unit III: Nanomaterial Evaluation: Electrical property studies, Magnetic property studies, Mechanical property studies. Unit IV: Nanomaterials for Environmental Remediation Environmental remediation by chemical degradation/ Removal of contaminants, Nanomaterials as sorbents, Nanofiltration- for clean water, Dendrimers- the nanoreactors for remediation, carbon nanomaterials- Versatile new Adsorbents, Nanoscale biopolymers, Future prospects.	05 10		
June	Unit V: Societal Implications of Nanotechnology Societal implications, Physicochemical properties of Nanomaterials, Health hazards, Nanotoxicology, Significance of toxicity studies, Current perspectives.	15		

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Director/Head

Signature:

Name of Teacher: Dr. R. R. Mahire



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TEACHING PLAN

ACADEMIC YEAR: 2021-2022

NAME OF TEACHER: Sonal B Uplapwar

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: M.Sc.II (Analytical Chemistry) SUBJECT: Analytical Chemistry

PAPER CODE and TITLE OF PAPER: CHA-301: Concepts of analytical chemistry

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
August	Unit I: Analytical Science: A perspective & Unit II	12	
September	Unit II: Statistical analysis and validation	12	
October	Unit III: Good laboratory practice: Quality assurance of analytical measurements	12	
November	Unit IV: Introduction to intellectual property rights	12	
December	Unit V: Introduction to patent	12	

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TEACHING PLAN

ACADEMIC YEAR: 2021-2022

NAME OF TEACHER: Sonal B Uplapwar

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: M.Sc II

SUBJECT: Analytical chemistry

PAPER CODE and TITLE OF PAPER: CHA-401: Spectroscopic methods of analysis

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
March	Unit I: Electron spectroscopy	14	
April	Unit II: X-ray methods of analysis Unit III: Atomic mass spectroscopy	18	
May	Unit V: Atomic absorption spectrophotometry	18	
June	Unit IV: Nuclear magnetic resonance spectroscopy	10	

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TEACHING PLAN

ACADEMIC YEAR: 2020-2021

NAME OF TEACHER: Sonal B Uplapwar

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: M.Sc.II (Analytical Chemistry) SUBJECT: Analytical Chemistry

PAPER CODE and TITLE OF PAPER: CHA-306: Instrumental methods of analysis

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
August	Unit I: Polarography	12	
September	Unit II: Amperometric titration	12	
October	Unit III: Electrogravimetric analysis	12	
November	Unit IV: Coulometric analysis	12	
December	Unit V: Automated analysis	12	

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TEACHING PLAN

ACADEMIC YEAR: 2020-2021

NAME OF TEACHER: Sonal B Uplapwar

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: TYBSc

SUBJECT: Analytical Instrumentation

PAPER CODE and TITLE OF PAPER: CH-505: Analytical Instrumentation

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
August	Unit I: Spectrometry	12	
September	Unit II: Infrared spectrometry	12	
October	Unit III A: Emission spectrometry Unit III B: Atomic Absorption spectrophotometry	12	
November	Unit IV: Potentiometry	12	
December	Unit V: pHmetry	12	

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TEACHING PLAN

ACADEMIC YEAR: 2021-2022

NAME OF TEACHER: Sonal B Uplapwar

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: TYBSc

SUBJECT: Analytical Techniques

PAPER CODE and TITLE OF PAPER: CH-605: Analytical Techniques

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
January	Unit I: Solvent Extraction	12	
February	Unit II: High performance liquid chromatography	12	
March	Unit III: Gas chromatography	12	
April	Unit IV: Ion exchange chromatography	12	
May	Unit V: Thermal methods	12	

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TEACHING PLAN

ACADEMIC YEAR: 2020- 2021

NAME OF TEACHER: Padvi Sandip Narpat

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: F.Y.B.Sc.

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: CH-112 Organic Chemistry-I

FIRST TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
October	<p>Unit-1 Fundamental of Organic Chemistry Physical effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation, Cleavage of bonds: Homolysis and Heterolysis, Structure, shape and reactivity of organic molecules: Nucleophiles and Electrophiles ,Reactive Intermediates: Carbocations, Carbanions and Free radicals,Strength of organic acids and bases: comparative study with emphasis on factors affecting pK values,Aromaticity and Huckel’s Rule</p> <p>Unit-2 IUPAC Nomenclature of Organic Compound Rules for IUPAC nomenclature for 1) Saturated Hydrocarbons</p>	08 01	
November	<p>2)Unsaturated Hydrocarbons –Alkenes & Alkynes 3)Organic copound containing one functional group And multiple bonds 4)Organic compounds containing two or more than two functional groups.</p>	06	

December	<p>5)Cyclic Organic Compound 6)Bicyclic Organic Compound 7)Aromatic Compounds</p> <p>Unit-3 Aliphatic Hydrocarbons</p> <p>Alkanes: (upto 5 carbons) Preparation : Catalytic Hydrogenation ,Wurtz Reaction ,Kolbe’s Synthesis, From Grignard Reagent, Reactions: Free Radical Substitution: Halogenation</p> <p>Alkenes: (upto 5 carbons) Preparation :Eliminationreactions,Dehydration of Alcohols and dehydrohalogenation of alkyl halides (Saytzeff’s Rule): Cis alkenes (Partial Catalytic hydrogenation) and Trans alkenes (Birch Reduction). Reactions: Cis – Addition (alk.KMnO₄) and Trans –Addition (Bromine),Addition of HX (Markovnikoff’s and Anti-Markovnikoff’s Addition), Hydration ,Ozonolysis ,Oxymercuration-demercuration, Hydroboration-oxidation.</p>	03 07	
January	<p>Alkynes: (upto 5 carbons) Preparation: Acetylene from CaC₂ and conversion into higher alkynes ,by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides,Reactions: formation of metal acetylides,addition of bromine and alkaline KMnO₄, Ozonolysis and oxidation with hot alkaline KMnO₄</p>	05	
February	Exam		

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TEACHING PLAN

ACADEMIC YEAR: 2020- 2021

NAME OF TEACHER: Padvi Sandip Narpat

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: F.Y.B.Sc.

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: CH-122 Organic Chemistry-II

SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
March	Unit- 1 Aromatic Hydrocarbon Preparation- From Phenol ,by decarboxylation,From acetylene, from benzene sulphonic acid Reactions-Electrophilic Substitution - Nitration , Halogenation , Sulphonation, Friedel Crafts Alkylation & Acylation, Side chain reaction	06	
	Unit- 2 Alkyl and Aryl Halide a) Alkyl Halide -Types of Nucleophilic (S _N 1, S _N 2,S _N i) reactions. Preparation- from Alkene and Alcohols.	02	
April	Reactions -Hydrolysis , nitrite and nitro formation ,nitrile & isonitrile formation, Williamsons ether synthesis Elimination Vs Substitution, b) Aryl Halide -Preparation (chloro, bromo, iodo benzene)From Phenol , Sandmeyer Reaction. Reaction (chlorobenzene) -Aromatic Nucleophilic Substitution (replacement by -OH group), Effect of nitro substituent. Benzyne Mechanism: KNH ₂ /NH ₃ (or NaNH ₂ /NH ₃) Reactivity and relative strength of C-X bond in Alkyl, Allyl,Benzyl, Vinyl and Aryl Halide	06	
	Unit-3 Alcohols, Phenols and Ethers a) Alcohols -Preparation of Primary, secondary, tertiary alcohols ,using Grignard Reagent , Ester hydrolysis, Reduction of aldehydes , ketones ,carboxylic acid and esters.	01	
May	Reactions- with sodium , HX (Lucas Test), Esterification , oxidation (with PCC , alk. KMnO ₄ , acid dichromate , conc . HNO ₃), Oppeneaur Oxidation Diols - oxidation of diols , Pinacol- Pinacolone rearrangement. b) Phenols - Preparation Cumenehydroperoxide method , from diazonium salts. Reactions - Electrophilic	07	

	Substitution- Nitration , halogenation and sulphonation , Reimer- Tiemann Reaction , Gattermann-Koch Reaction , Houben - Hoesch Condensation,Chotten Baumann Reactions.		
June	c) Ethers (Aliphatic And Aromatic)- Cleavage of ethers with HI Unit-4 Aldehydes And Ketones (Aliphatic and Aromatic) (Formaldehyde , Acetaldehyde, Acetone and Benzaldehyde) Preparation- from acid chlorides and from nitriles . Reactions- Reaction with HCN , ROH , NaHSO ₃ ,NH ₂ -G derivatives , Iodoform Test, Aldol Condensation , Cannizaros reaction , wittig reaction , Benzoin Condensation , Clemensen reduction and Wolff Kishner reduction , Meerwein -Ponndorf reduction.	02 06	
July	Exam		

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	Addition to carbon-carbon multiple bonds and carbon heteroatom multiple bonds- Mechanism and stereochemical aspects of addition reaction involving electrophile	02	
April	Structural effects and reactivity: Halogenations, Hydrohalogenation, Hydration, Hydroxylation, Hydroboration, Epoxidation, Carbene addition, Hydrogenation, and Ozonolysis. Unit-4 Linear Free Energy Relationship Hammett plot, Hammett equation, substituent and reaction constants, physical significance of substituent and reaction constants, substituent constant involving through conjugation. Use of Hammett plot and equation. Deviations from straight line plot. Concave upward deviation.	08 06	
May	Concave downward deviation. Steric effects, Taft equation, Steric parameters, solvent effects, and change of reaction constant. Unit-5 Stereochemistry Concept of chirality and molecular dissymmetry, Recognition of symmetry elements and chiral centers, Prochiral relationship, homotopic, enantiotopic and diastereotopic groups and faces. Racemic modifications and their resolution, R and S nomenclature. Geometrical isomerism E and Z in C, N, S, P containing compounds, Prochiral relationship, stereospecific and stereoselective reactions, optical activity in biphenyls, spiranes, allenes	04 10	
June	Exam		

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TEACHING PLAN

ACADEMIC YEAR: 2020- 2021

NAME OF TEACHER: Padvi Sandip Narpat

FACULTY: Science

DEPARTMENT: Chemistry

CLASS: M.Sc.-I

SUBJECT: Chemistry

PAPER CODE and TITLE OF PAPER: CHO-206/CHA-206 Organic Chemistry-II

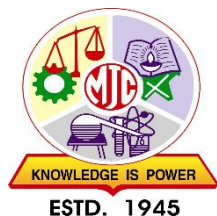
SECOND TERM

MONTH	THEORY / PRACTICALS TO BE COVERED	NO.OF LECTURES REQUIRED	REMARKS
July	Unit- 1 Spectroscopy PMR: • Fundamentals of PMR, chemical shift, factors affecting chemical shift, anisotropic effect, spin-spin coupling, coupling constant, applications to simple structural problems integration coupling (1st order analysis). • Introduction to CMR and mass spectrometry. • Problems on UV, IR and PMR.	15	
	Unit- 2 Molecular Rearrangement and Reaction Intermediate Structure of carbenes, nitrenes, carbocations and carbanions intermediates.	01	
August	generation and stability of carbenes, nitrenes, carbocations and carbanions intermediates ,Rearrangement reactions viz. Beckmann, Curtius, Hofmann, Lossen, Favorskii, Baeyer-Villiger, Wolff, Claisen, Pummerer, Wagner-Meerwin, Stevens, Dienone-Phenol, Sommelet-Hauser, Benzilic acid, Benzidine, Cope, Fries, Neber and Schmidt reaction.	14	
	Unit-3 Name Reaction Bayer-Villiger Oxidation, Reformatsky, Robinson annulation,	02	
September	Stork enamine, Sharpless asymmetric epoxidation, Ene, Barton, Hell-Volhard-Zelinsky reaction, Shapiro reaction, Chichibabin reaction, Vismair Hacck reaction, Ulman reaction, Rosenmund reaction, Darzen reaction, Knoevenagel reaction, and Biginelli reaction.	13	

	Unit-4 Synthetic Reagents Oxidation reactions: CrO ₃ , PDC, PCC (Corey's reagent), KMnO ₄ , MnO ₂ , Swern oxidation,	04	
October	SeO ₂ , Pb(OAc) ₄ , Pd-C, OSO ₄ , m-CPBA, O ₃ , NaIO ₄ , HIO ₄ , chloranil, DDQ, and Oppenauer oxidation. • Reduction reactions: LiAlH ₄ , NaBH ₄ , NaCNBH ₃ , MPV reduction, Na/liquor NH ₃ , H ₂ /Pd-C, Willkinsons catalyst, DIBAL-H, Wolff Kishner reduction, Zn-Hg/H ₂ O/HCL, and Bu ₃ SnH.	11	
November	Exam		

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School of Chemical Sciences

TEACHING PLAN

Name of Teacher: Dr. Vasim R. Shaikh

Class: T. Y. B. Sc.
(Chemistry)
Sem.-V

Subject/Paper : CH-501: Principles of Physical
Chemistry-I

Faculty: Science

Month	Topic	Lectures Allotted	Review (Complete/ Incomplete)	Action plan if incomplete
August	Unit-3: Phase Equilibrium: Phases, Components and Degrees of freedom of a system, Criteria of phase equilibrium. Gibbs Phase rule and its thermodynamic derivation. Derivation of Clausius –Clapeyron equation and its importance in phase equilibria. Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, Congruent and Incongruent melting points (lead-silver, FeCl ₃ -H ₂ O only), Related Numerical.	11		
September	Unit-2: Chemical kinetics The concept of reaction rates. Effect of temperature, Pressure, Catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal initial concentrations of reactants) Half-life of a reaction, Pseudo order reactions, General methods for determination of order of a reaction. Effect of temperature on reaction rate, Arrhenius equation (exponential and integrated form), Collision theory, Concept of	11		

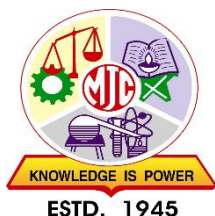
	activation energy and its calculation from Arrhenius equation, Related numerical.			
October	Unit-4: Electrochemical Cell: Introduction, overview of electrode processes, Faradaic and Non-Faradaic Processes, Introduction to electrical double layer, Factors affecting electrode reaction rate and current.	06		
November	Unit-4: Electrochemical Cell: Classification of electrochemical cell, EMF expression for chemical cell with and without transference, Liquid junction potential, Types of liquid junction potential, Minimization of liquid junction potential. Unit-1: Basic Quantum Chemistry: Failures of Classical Mechanics, Origin of quantum mechanics, Particle aspect of radiation: Blackbody radiation, Photoelectric effect, Compton Effect, de Broglie's hypothesis: Matter waves, Heisenberg uncertainty principle, Application of Heisenberg's principle.	06 06		
December	Unit-1: Basic Quantum Chemistry: Interpretation of wave function, Significance of ψ and ψ^2 , Normalization of wave function Operators and operator algebra, Eigen functions and Eigen values, various operators in quantum mechanics: Linear momentum, Kinetic energy and Total energy operator (only equations no derivations), Postulates of quantum mechanics.	06		

Signature:

Director/Head

Signature:

Name of Teacher: Dr. Vasim R. Shaikh



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School of Chemical Sciences

TEACHING PLAN

Name of Teacher: Dr. Vasim R. Shaikh

Class: T. Y. B. Sc.
(Chemistry)
Sem.-VI

Subject/Paper : CH-601: Principles of Physical
Chemistry-II

Faculty: Science

Month	Topic	Lectures Allotted	Review (Complete/ Incomplete)	Action plan if incomplete
March	Unit-3: Photochemistry: Laws of photochemistry, Quantum yield, Examples of low and high quantum yields, Consequence of light absorption by atoms and molecules, Jablonski diagram, Fluorescence, Phosphorescence, Quenching. Experimental setup for determination of quantum yield with actinometer as detector Photochemical gas reactions, Photolysis of ammonia, Combination of H ₂ and Cl ₂ reaction, Reaction between H ₂ and Br ₂ , Photosensitized gas reaction, H ₂ and O ₂ , H ₂ and CO, Chemiluminescence, Related numerical.	11		
April	Unit-2: Nuclear Chemistry: Introduction, Radioactive elements, Types of radioactive decay, Decay schemes, General characteristic of radioactive decay, Decay kinetics, Decay constant, Half-life period, Mean life, Units of radioactivity. Application of radioactivity – Radiochemical principle of tracer technique; Application of tracer technique – Chemical investigation reaction mechanism-esterification, hydrolysis, Oxidation - Oxidation of CO,	12		

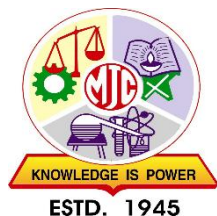
	Intensities of spectral lines, Determination of bond lengths of diatomic and linear triatomic molecules, Isotopic substitution. Related numerical			
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Name of Teacher: Dr. Vasim R. Shaikh



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School of Chemical Sciences

TEACHING PLAN

Name of Teacher: Dr. Vasim R. Shaikh

Class: S. Y. B. Sc.
(Chemistry)
Sem.-III

Subject/Paper : CH-231: Physical Chemistry-II

Faculty: Science

Month	Topic	Lectures Allotted	Review (Complete/ Incomplete)	Action plan if incomplete
September	Unit I: Gaseous State: Introduction, general characteristics of gases, parameters (volume, pressure, temperature and number of moles) of a gas, gas laws (Boyle's law, Charles law, Avogadro's law), Ideal-gas equation, kinetic molecular theory of gases, deviations from ideal behaviour, compressibility factor, effect of pressure and temperature variation on deviations, van der Waals equation.	08		
October	Unit I: Gaseous State: liquefaction of gases-critical phenomenon, van der Waals equation and critical constants, related numericals. Unit II: Theory of Electrolytic Dissociation: Introduction, Arrhenius theory of ionization, migration of ions, relative speed of ions: Hittorf's rule, transport number and its determination by Hittorf's and moving boundary method, Kohlrausch's law of independent	02 08		

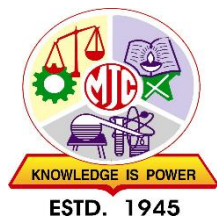
	migration of ions and its application for the calculation of degree of dissociation,			
November	<p>Unit II: Theory of Electrolytic Dissociation: Conductometric titration: titration of a strong acid against a strong base, titration of a weak acid against a strong base, titration of a strong acid against a weak base, titration of a weak acid against a weak base.</p> <p>Unit III: Solutions: Introduction, concentration of solutions, ways of expressing concentration (per cent by volume, per cent by weight, molarity, molality, mole fraction), solutions of gases in gases, Henry's law, solutions of liquids in liquids, solubility of completely miscible liquids, solubility of partially miscible liquids</p>	02 05		
December	<p>Unit III: Solutions: Phenol-water system, triethylamine-water system, nicotine-water system, vapour pressures of liquid-liquid solutions: first type of mixtures of miscible liquids, second type of mixtures of miscible liquids and third type of mixtures of miscible liquids, solutions of solids in liquids.</p>	05		

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Signature:

Name of Teacher: Dr. Vasim R. Shaikh



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School of Chemical Sciences

TEACHING PLAN

Name of Teacher: Dr. Vasim R. Shaikh

Class: S. Y. B. Sc.
(Chemistry)
Sem.-IV

Subject/Paper : CH-241: Physical Chemistry-III

Faculty: Science

Month	Topic	Lectures Allotted	Review (Complete/ Incomplete)	Action plan if incomplete
March	Unit II: Electromotive Force: Introduction, measurement of electromotive force of an unknown cell, Weston standard cell, reversible cells, relation between electromotive force and free energy, single electrode potential, standard electromotive force of a cell, determination of electromotive of a half-cell, Nernst equation, reference electrode, primary reference electrode: Standard Hydrogen Electrode (SHE)	06		
April	Unit II: Electromotive Force: Secondary reference electrode: standard silver-silver electrode, Calomel electrode, glass electrode, quinhydrone electrode, determination of pH of a solution using the quinhydrone electrode and glass electrode, potentiometric titrations (acid-base titrations, oxidation-reduction titrations and precipitation titrations), related numericals. Unit III: Chemical Thermodynamics: Introduction, enthalpy of a system, molar heat	04 10		

	<p>capacities, relation between Cp and Cv, Joule-Thomson effect, concept of entropy, standard entropy, concept of residual entropy, Clapeyron equation, Clausius-Clapeyron equation, integrated form of Clausius-Clapeyron equation, applications of Clausius-Clapeyron equation, fugacity and activity, partial molar properties, chemical potential and its significance, Gibb's-Duhem equation.</p>			
May	<p>Unit I: Theory of Dilute Solutions: Introduction, vapour pressure of a liquid, Raoult's law of vapour pressure colligative properties, lowering of vapour pressure, relative lowering of vapour pressure, relation between relative lowering of vapour pressure and molar mass of solute, elevation of boiling point, relation between elevation of boiling point and molar mass of solute, Landberger's method for the determination of elevation of boiling point, depression of freezing point, relation between depression of freezing point and molar mass of solute, osmotic pressure, van's Hoff equation for osmotic pressure of a solution, determination of molar mass of a solute from osmotic pressure measurements, related numericals.</p>	10		

Signature:

Director/Head

Signature:

Name of Teacher: Dr. Vasim R. Shaikh