

Vijaya College, RV Road, Bengaluru-560004

Department of Chemistry and Bio-Chemistry

NAAC criteria-1: CURRICULAR ASPECTS for the academic years 2022-23

1. Academic Planner with unitisation of the entire syllabus (on hourly basis)

Name of the Department	Chemistry	Subject Title	Chemistry
Semester	II DC	Paper	II
Week/Month & Date (Preferably)	Day	Portions Planned for 1 hour	Teacher
1 st week of May 2023	1	Complexometric titrimetry: Indicators for EDTA titrations -	SAS
	2	Nucleophilic substitution at saturated carbon.	RR
	3	Gaseous state: Molecular velocity, collision frequency, collision diameter, collision cross section,	JP
	4	collision number and mean free path and coefficient of viscosity, calculation of σ and η , variation of viscosity with temperature and pressure.	JP
2 nd week of May 2023	1	theory of metal ion indicators, titration methods employing EDTA - direct, back, displacement	SAS
	2	Mechanism of SN1 and SN2 reactions with suitable examples. Energy profile diagrams, stereochemistry and factors effecting SN1 and SN2 reactions.	RR
	3	Maxwell-Boltzmann distribution law of molecular velocities (most probable, average and root mean square velocities). Relation between RMS,	JP
	4	average and most probable velocity and average kinetic energies. (mathematical derivation not required), law of equipartition of energy.	JP
3 rd week of May 2023	1	indirect determinations, Application-determination of hardness of water..	SAS
	2	Mechanism of SN1 and SN2 reactions with suitable examples..	RR
	3	Behaviour of real gases: Deviation from ideal gas behaviour. Compressibility factor (Z) and	JP
	4	its variation with pressure for different gases. Causes of deviation from ideal behaviour, vander Waals equation of stat (No derivation) and application in explaining real gas behaviour.	JP
4 th week of May 2023	1	Precipitation titrimetry: Titration curves, titrants and standards,	SAS
	2	Energy profile diagrams, stereochemistry and factors effecting SN1 and SN2 reactions	RR
	3	Critical phenomena - Andrews isotherms of CO ₂ , critical constants and their derivation from van der Waals equation, Experimental determination of critical constants. Continuity of states, Law of corresponding states	JP

1 st week of June 2023	4	. Joule Thomson effect. Inversion temperature, application of J-T effect, liquefaction of air by Linde's process. Numerical problems.	JP
	1	indicators for precipitation titrations involving silver nitrate-Volhard's and Mohr's methods and their differences.	SAS
	2	Aromatic electrophilic substitution reactions, mechanisms,	RR
	3	Surface tension: Definition and its determination using stalagmometer,	JP
	4	effect of temperature and solute on surface tension. Viscosity: Definition, coefficient of viscosity. Determination of viscosity of a liquid using Oswald viscometer.	JP
2 nd week of June 2023	1	Gravimetric Analysis: Requisites of precipitation,	SAS
	2	σ and π complexes, halogenation, nitration,	RR
	3	Effect of temperature, size, weight, shape of molecules and intermolecular forces	JP
	4	Refraction: Specific and molar refraction- definition and advantages. Determination of refractive index by Abbes Refractometer.	JP
3 rd week of June 2023	1	, mechanism of precipitation,	SAS
	2	sulphonation,	RR
	3	Additive and constitutive properties. Parachor: Definition, atomic and structure parachor,	JP
	4	Viscosity and molecular structure.	JP
4 th week of June 2023	1	factors influencing precipitation,	SAS
	2	Friedal Crafts alkylation	RR
	3	elucidation of structure of benzene and benzoquinone.	JP
	4	Molar refraction and chemical constitution.Numerical problems.	JP
1 st week of July 2023	1	co-precipitation, post-precipitation. Advantages of organic reagents over inorganic reagents,	SAS
	2	acylation with their mechanism. Activating and deactivating groups. Orientation influence,	RR
	3	Distribution Law: Nernst distribution law - Statement. Distribution coefficient	JP
	4	, factors affecting distribution coefficient, validity of distribution law, modification of distribution law when molecules undergo a) association b) dissociation..	JP
2 nd week of July 2023	1	reagents used in gravimetry : 8-hydroxy quinoline (oxine) and dimethyl glyoxime (DMG)..	SAS
	2	ortho - Para ratio (Cl,NO ₂ ,CH ₃ , NH ₂ , OH)	RR
	3	Application of distribution law in Solvent extraction. Derivation for simple and multiple extractions.	JP
	4	Principles of distribution law in Parke's process of desilverisation of lead. Numerical problems.	JP
	1	Regression equation (least squares method), correlation coefficient (R ²),	SAS

3 rd week of July 2023	2	Aromatic nucleophilic substitution reaction: S _N A mechanism,	RR
	3	Solids: Forms of solids: Unit cell and space lattice,	JP
	4	anisotropy of crystals, size and shape of crystals. Laws of Crystallography:	JP
4 th week of July 2023	1	limit of detection (LOD), limit of quantification (LOQ),	SAS
	2	ipso substitution. Example -- conversion of 2,4-dinitrochlorobenzene to 2,4-dinitrophenyl hydrazine.	RR
	3	Law of constancy of interfacial angles, law of rational indices, law of symmetry (symmetry elements),	JP
	4	crystal systems, Bravais lattice types and identification of lattice planes. Miller indices and its calculation,	JP
1 st week of August 2023	1	linear dynamic range (working range), sensitivity,	SAS
	2	Introduction to benzyne. Stability based on Huckel rule of aromaticity.	RR
	3	X-Ray diffraction by crystals: Bragg's law and derivation of Bragg's equation,	JP
	4	single crystal and powder diffraction methods.	JP
2 nd week of August 2023	1	selectivity, method validation, figures of merit of analytical methods	SAS
	2	Generation of benzyne with mechanism.	RR
	3	Defects in crystals, glasses and liquid crystals.	JP
	4	Numerical problems.	JP
	1	REVISION	SAS
	2	REVISION	RR
	3	REVISION	JP
	4	REVISION	JP
PRACTICAL EXAMINATIONS			

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Department of Chemistry and Bio-Chemistry

NAAC criteria-1: CURRICULAR ASPECTS for the academic years 2022-23

1. Academic Planner with unitisation of the entire syllabus (on hourly basis)

Name of the Department	Chemistry	Subject Title	Chemistry
Semester	II OE	Paper	II
Week/Month & Date (Preferably)	Day	Portions Planned for 1 hour	Teacher
1 st week of May 2023	1	Classification of carbohydrates,	AM
	2	reducing and non-reducing sugars,	AM
	3	Nucleic acids. Components of nucleic acids:	RR
2 nd week of May 2023	1	general properties of glucose and fructose,	AM
	2	their open chain structures. Epimers,	AM
	3	Adenine, guanine, thymine and cytosine (structure only), other components of nucleic acids	RR
3 rd week of May 2023	1	mutarotation and anomers. Linkage between monosaccharides,	AM
	2	structure of disaccharides (sucrose, maltose, lactose) and	AM
	3	, nucleosides and nucleotides (nomenclature), structure of polynucleotides:.	RR
4 th week of May 2023	1	polysaccharides (starch)	AM
	2	(cellulose) excluding their structure elucidation.	AM
	3	structure of DNA (Watson-Crick model) and RNA (types of RNA), Genetic code,	RR
1 st week of June 2023	1	Classification of amino acids,	AM
	2	Zwitterion structure and isoelectric point.	AM
	3	biological roles of DNA and RNA: replication,	RR
2 nd week of June 2023	1	Overview of primary, secondary,	AM
	2	tertiary and quaternary structure of proteins.	AM
	3	transcription and translation	RR
3 rd week of June 2023	1	Determination of primary structure of peptides.	AM
	2	Mechanism of enzyme action,	AM
	3	Calorific value of food. Standard caloric content of carbohydrates,	RR
4 th week of June 2023		Internal tests	
	1	Mechanism of enzyme action,	AM

1 st week of July 2023	2	factors affecting enzyme action, co-enzymes	AM
	3	proteins and fats. Oxidation of foodstuff (organic molecules) as a source of energy for cells. Introduction to metabolism (catabolism, anabolism),	RR
2 nd week of July 2023	1	their role in biological reactions, Specificity of enzyme action	AM
	2	(including stereospecificity). Enzyme inhibitors and their (competitive and noncompetitive inhibition including allosteric inhibition).	AM
	3	ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change.	RR
3 rd week of July 2023	1	importance, phenomenon of inhibition .drug action-receptor theory.	AM
	2	Structure–activity relationships of drug molecules,	AM
	3	Conversion of food into energy. Outline of catabolic pathways of carbohydrate- Glycolysis, fermentation	RR
4 th week of July 2023	1	binding role of –OH group, -NH ₂ group, double bond and aromatic ring.	AM
	2	Introduction to lipids, classification. Biological importance of triglycerides,	AM
	3	Krebs cycle. Overview of catabolic pathways of fats and proteins.	RR
1 st week of August 2023	1	phospholipids, glycolipids, and steroids (cholesterol)	AM
	2	Revision.	AM
	3	Interrelationships in the metabolic pathways of Proteins, fats and carbohydrates	RR
2 nd week of August 2023		Revision	AM
		Revision	AM
		Revision	RR

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Name of the Department	Chemistry	Subject Title	Chemistry
Semester	IV DC	Paper	IV
Week/Month & Date (Preferably)	Day	Portions Planned for 1 hour	Teacher
1 st week of May 2023	1	Structures of ionic solids, Radius ratio rules and its limitations:	RR
	2	Calculation of some limiting radius ratio, Coordination number 3 (planar triangle), 4 (tetrahedral and square planar) and 6 (octahedral),	RR
	3	Differential and integrated form of rate expressions up to second order reactions, Derivation of expression of rate constant of second order reaction ($a = b$ and $a \neq b$). Problems on rate constant ($a = b$).	JP
	4	Methods of determination of order of a reaction – (i) differential method and (ii) Ostwald's isolation method. Temperature dependence of reaction rates; Arrhenius equation, activation energy.	JP
2 nd week of May 2023	1	Close packing: (<i>ccp</i> or <i>fcc</i> - <i>Ex: Al, Fe, Cu, hcp – Ex: Be, Mg, Ca and bcc - Ex: alkali metals closed packed arrangements</i>).	RR
	2	Ionic compounds of the types AX ($ZnS, NaCl, CsCl$), AX_2	RR
	3	Numerical problems on Arrhenius equation in calculating energy of activation and rate constants. Collision theory of reaction rates, Lindemann's mechanism –	JP
	4	<i>explanation of Lindemann's hypothesis for concentration dependence in finding the order of reaction.</i>	JP
3 rd week of May 2023	1	(Calcium fluoride: fluorite) and Rutile structure. Layer structures: CdI_2 .	RR
	2	Lattice energy and Born-Haber cycle, Derivation of Born-Landé equation and its drawbacks,	RR
	3	qualitative treatment of the theory of absolute reaction rates – <i>to derive an expression for rate constant in terms of equilibrium constant.</i>	JP
	4	Experimental determination of kinetics of i) inversion of cane sugar by polarimetric method,	JP

4 th week of May 2023	1	polarizing power and polarizability,	RR
	2	Fajan's rules with applications. Numerical problems	RR
	3	Experimental determination of kinetics of i) inversion of cane sugar by polarimetric method, ii) spectrophotometric method for the reaction between potassium persulphate and potassium iodide	JP
	4	Thermodynamic processes, Reversible and Irreversible Processes, nature of Heat and work, internal energy, First Law of thermodynamics – Statement and mathematical statement , Numerical problems. Joule - Thomson expansion,	JP
1 st week of June 2023	1	Valence bond theory, The Lewis theory, the octet rule,	RR
	2	Exceptions to the octet rule, Sidgwick-Powell theory. Valence shell electron pair repulsion	RR
	3	Enthalpy of a System, Work done in isothermal and adiabatic expansion of an ideal gas – To derive the expressions.	JP
	4	Relation between Joule-Thomson coefficient and other thermodynamic parameters – To derive the relation: $\mu = -\frac{1}{C_p} \left[\frac{\partial H}{\partial T} \right]_T$	JP
2 nd week of June 2023	1	(VSEPR) theory, effect of lone pairs,	RR
	2	electronegativity, isoelectronic principle, examples using VSEPR theory: BF ₃ and BF ₄ ⁻ , NH ₃ and NH ₄ ⁺ ,	RR
	3	Limitations of I law, Spontaneous and non-spontaneous process. Concept of entropy, thermodynamic scale of temperature,	JP
	4	Calculation of entropy change for reversible process and irreversible processes: (To show that, in reversible process $\Delta S_{\text{total}} = 0$ and in irreversible process $\frac{q_{\text{rev}} - q_{\text{irrev}}}{T} > 0, \therefore \Delta S_{\text{total}} > 0$).	JP
3 rd week of June 2023	1	H ₂ O, PCl ₅ , ClF ₃ , SF ₄ , SF ₆ , and IF ₇ . Limitations of VSEPR theory.	RR
	2	Concept of resonance, resonance energy, hybridization, types of hybridization,	RR
	3	Statements of the Second law of Thermodynamics, molecular and statistical interpretation of entropy, Calculation of entropy change for reversible process	JP

	4	(i) isothermal (ii) adiabatic, (iii) chemical reactions and (iv) phase transitions. Free Energy Functions: Gibbs and Helmholtz energy –	JP
4 th week of June 2023		Internal Assessment	
1 st week of July 2023	1	sp, sp ² , sp ³ dsp ² dsp ³ , d ² sp ³ , sp ³ d ² with one example each (<i>Examples: BeCl₂, BF₃, SiCl₄, PCl₅ and SF₆</i>),	RR
	2	energetics of hybridization. Bent's rule, Limitations of Valence Bond Theory.	RR
	3	Brief explanation with mathematical equation , Variation of S, G, A with T, V and P, Numerical problems, Free energy change and spontaneity,	JP
	4	Gibbs-Helmholtz equation. Third Law of Thermodynamics Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules	JP
2 nd week of July 2023	1	LCAO concept: s-s, s-p, p-p, p-d and d-d combinations of orbitals	RR
	2	bonding, nonbonding and anti-bonding molecular orbitals, non-bonding combinations of orbitals, Rules for linear combination of atomic orbitals	RR
	3	Types of adsorption isotherms. Freundlich adsorption isotherm (only equation), its limitations. Langmuir adsorption isotherm (derivation to be done) and BET equation (derivation not included)	JP
	4	Types of catalysis and theories with examples (intermediate compound theory and adsorption theory), Theory of acid base catalysis, Michaelis-Menten mechanism.	JP
3 rd week of July 2023	1	Examples of molecular orbital treatment for Homonuclear diatomic molecules and ions.	RR
	2	H ₂ , H ₂ ⁺ , He ₂ , He ₂ ⁺ , Li ₂ , Be ₂ , B ₂ , C ₂ , N ₂ , N ₂ ⁺ , O ₂ , O ₂ ⁻ and O ₂ ²⁻ .	RR

		M.O. energy diagrams of heteronuclear diatomic molecules with examples (NO, NO ⁺ , CO and HCl).	
	3	Heterogeneous catalysis: surface reactions, unimolecular, bimolecular surface reactions. Autocatalysis with examples. Applications: Design process to removal of toxic compounds from industrial wastewater and treatment of portable water requirements.	JP
	4	Arrhenius theory of electrolytic dissociation. Merits and Demerits, Conductance, Specific conductance,	JP
4 th week of July 2023	1	Calculation of bond order, relationship between bond order, bond energy and bond length, magnetic properties based on MOT	RR
	2	General properties of metals: conductivity, luster, malleability and cohesive force. Crystal structures of metals (covered in Unit I) and bond lengths.	RR
	3	equivalent and molar conductivity and their variation with dilution. Molar conductivity at infinite dilution. Numerical problems	JP
	4	Kohlrausch's law of independent migration of ions and its applications, Debye- Huckel- Onsager equation. Ionic mobilities and their determinations,	JP
1 st week of August 2023	1	Free electron theory, Valence bond theory,	RR
	2	Molecular orbital or band theory of solids Prediction of conducting properties of conductors,	RR
	3	transference numbers and their relation to ionic mobility's, determination of transference numbers using Hittorf and Moving boundary methods	JP
	4	Applications of conductance measurement: (i) degree of dissociation of weak electrolytes (ii) ionic product of water	JP
2 nd week of August 2023	1	insulators and semiconductors, extrinsic and intrinsic semiconductors using M.O. theory.	RR
	2	Revision	RR
	3	(iii) solubility and solubility product of sparingly soluble salts (iv) conductometric titrations (acid base titrations only) and	JP
	4	(v) Hydrolysis constants of salts. Numerical problems, Revision.	JP

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1. Academic Planner with unitisation of the entire syllabus (on hourly basis)

Name of the Department	Chemistry	Subject Title	Physical Chemistry
Semester	VI	Paper	VII
Week/Month & Date (Preferably)	Day	Portions Planned for 1 hour	Teacher
3 rd week April 2023	1	Different types of fertilizers (definition and examples) Classification based on agrochemical nature (Direct and Indirect) Based on number of basic nutrients (Simple, double/triple, micro and complex) Based on application (JP
	2	Single and mixed fertilizers) Manufacture of the following fertilizers (Method, drying and finishing) Urea (Sindri method), Ammonium nitrate (Production-Prilling process,	JP
	3	drying- Stengel process; Finishing- Nitrochalk / parting agents), Calcium ammonium nitrate (From ammonia. nitric acid and limestone), Ammonium phosphates and polyphosphate (from ammonia and phosphoric acid),	JP
4 th week April 2023	1	Superphosphate (from rock phosphate and sulphuric acid), Potassium chloride (Manufacture from Carnallite, Sylvinit), Potassium sulphate (Manufacture from Kainite)	JP
	2	Glass: Glassy state (physical and chemical definition of glass) and its properties (physical and chemical properties of glass) classification (silicate and non-silicate glasses). Manufacture and processing of glass (Basic raw materials used in the manufacture of glass	JP
	3	Sand, Soda ash, Potash, Feldspar, Calcium oxide, Boric oxide; Sources and their role; Saltcake, Cullets, Colouring agents – sources of different colours, Manufacture of soda glass, Shaping, Annealing and Finishing of glass)	JP
1 st week May 2023	1	Composition and properties of the following types of glasses: Soda lime glass, lead glass, armoured glass, safety glass, borosilicate glass, fluorosilicate, coloured glass, photosensitive glass. Ceramics (Definition, Basic raw materials for making ceramics).	JP
	2	Important clays (definition, examples, and action of heat on clay - Kaolinite). Feldspar (types and role of feldspar; Sand or Flint - role in the manufacture of ceramics) Manufacture of ceramic article (brief explanation of the steps -grinding, mixing, filtering,	JP

		kneading, jollying, slit casting, extrusion, turning, drying, firing glazing and decorating.	
	3	Glazing – definition, purpose, types) High technology ceramics (definition, classification with examples – oxides, non-oxides, composites - Alumina, AlN, Zirconia Silicon nitride, silicon carbide) and applications (classification into Heavy clay and Pottery products with examples; types of pottery:- Commercial classification of ceramics-	JP
2 nd week of May 2023	1	Rough ware and Fine ware with examples Classification into permeable and impermeable porous ware with examples) Cement: Definition; Raw materials and their roles; Manufacture of Portland cement (by dry process in detail); Setting of cement (chemical reactions.	JP
	2	Introduction, Objectives of coatings surfaces; preliminary treatment of surface, classification of surface coatings. Paints (definition, characteristics / requirements of a good paint) pigments (definition, composition of inorganic white, red, green, blue, yellow, black and metallic pigments) related properties	JP
	3	(their characteristics). Formulation (PVC formula and its importance) Vehicle (definition, examples and role) modified oils (definition, example) and lakes pigments (definition, examples and role)	JP
3 rd week of May 2023	1	Fillers (Definition, example and role) Thinners (definition, examples and role) Enamels (definition, examples and purpose of using it) emulsifying agents (definition, role and example) Special paints (Heat retardant, Fire retardant, Eco-friendly paint, Plastic paint	JP
	2	definition and examples) Dyes, Wax polishing (Definition, example and role) Water and Oil paints (definition and constituents) additives (definition, role, use and examples) Metallic coatings (electrolytic and electroless), metal spraying (process and advantage) and anodizing (definition and advantages).	JP
	3	Explosives: Introduction, Classification (chemical classification into high - primary & secondary and low explosives) preparation and properties (storage, sensitiveness) of: Lead azide – (preparation from sodium azide); PETN –(preparation from pentaerythritol); cyclonite (RDX) – preparation from Wolfram method	JP
4 th week May 2023	1	Introduction to rocket propellants (definition of propellant, Characteristics of a propellant; Classification of propellants: Solid - Homogeneous and heterogeneous propellants; Single and Double phase propellant and Liquid Propellants - Mono and Bi propellants)	JP
	2	Classification of alloys - ferrous alloys (iron base alloys -cast iron and steel, tool steel, stellite hard alloy) and non-ferrous alloys	JP
	3	(copper, lead and tin alloys – composition of brass, bronze, cupro nickel, manganin, constantan, antifriction bearing , cable alloys, solders, Pb-Sn, Pb-Sb)	JP

1 st week of June 2023	1	Specific properties of elements in alloys (role of Ti in Al and Mg alloys, Ni in copper and iron alloys, Sn and Cu in lead base alloys) Manufacture of steel (removal of silicon, decarbonisation, demanganisation,	JP
	2	desulphurisation, dephosphorisation) and surface treatment (argon treatment, heat treatment, nitriding, carburizing). Composition and properties of different types of steels (role of Ni, Cr, Mo, Si, Mn, V, W, Al)	JP
	3	Overview of nanostructures and nanomaterials (Introduction, Nanostructures - types with examples. Nano materials-Size, shape, specific surface area, crystallinity, solubility and surface morphology;	JP
2 nd week of June 2023	1	Reasons for special properties attributed to materials with nano size) Classification (Classification of nano materials based on dimensions & type of material - organic, inorganic)	JP
	2	Preparation of gold and silver metallic nanoparticles (Turkevich method) self-assembled nanostructures (definition, types of synthesis, significance of molecular interaction & intermolecular forces, examples, applications) control of nanoarchitecture - one dimensional control.	JP
	3	Carbon nanotubes (definition, SWCNT & MWCNT, brief structure & applications) and inorganic nanowires (examples). Bio-inorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials, bionano composites (explanation taking suitable examples	JP
3 rd week of June 2023	1	Conventional heat and beat methods (principle & significance) Co-precipitation method, Sol-gel methods,	JP
	2	Hydrothermal method, Ion-exchange and Intercalation methods	JP
	3	Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases:	JP
4 th week of June 2023		Internal test	
1 st week of July 2023	1	oxygen, nitrogen, argon, neon, helium, hydrogen (from liquid air), acetylene (from Calcium carbide),	JP
	2	carbon monoxide (by gasification of coal or coke), chlorine (by chloralkali method), ore).	JP
	3	fluorine (by electrolysis of KHF ₂), sulphur dioxide (by burning of sulphur) and phosgene (JP
2 nd week of July 2023	1	heterogeneous catalysis of CO & Cl ₂). Inorganic Chemicals: Manufacture, application,	JP
	2	analysis and hazards in handling the following chemicals: hydrochloric acid, nitric acid (JP
	3	Ostwald's method), sulphuric acid (contact process), caustic soda (Chloralkali process), common salt	JP

3 rd week of July 2023	1	(from sea water), borax, bleaching powder, sodium thiosulphate, hydrogen peroxide	JP
	2	(anthraquinone process), potash alum, chrome alum, potassium dichromate (from chrome iron ore) and potassium permanganate (from Pyrolusite	JP
	3	Sources of energy (Classification of sources of energy – renewable & non-renewable) Coal, petrol and natural gas. nuclear fusion).	JP
4 th week of July 2023	1	fission, solar energy, hydrogen, geothermal, tidal and hydel (Advantages and disadvantages)	JP
	2	Nuclear Pollution (hazards of radioactive wastes for ecosystem) Disposal of nuclear waste (solid, liquid and gaseous wastes),	JP
	3	nuclear disaster (Chernobyl disaster) and its management (safety steps	JP

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Name of the Department	Chemistry	Subject Title	Organic Chemistry
Semester	VI	Paper	VIII
Week/Month & Date (Preferably)	Day	Portions Planned for 1 hour	Teacher
3 rd week April 2023	1		AM
	2	What are active methylene compounds, Acidity of α -hydrogen atoms in active methylene compounds. Ex-diethyl malonate, ethyl acetoacetate and acetyl acetone. Diethyl malonate -preparation from acetic acid. Synthetic applications -	RR
	3	Introduction: Electromagnetic spectrum, advantages of spectroscopic techniques, types of spectroscopic techniques (UV-Visible spectroscopy, IR spectroscopy, NMR spectroscopy).	SAS
4 th week April 2023	1	Definition of pharmacology and pharmaceuticals; Classification of Drugs with brief explanation and examples: (a) drugs used for the treatment of diseases not due to infection –	AM

	2	preparation of monocarboxylic (propanoic acid), dicarboxylic (succinic acid), unsaturated acids (cinnamic acid), ketones (butanone), cyclic compounds (barbituric acid). Ethyl acetoacetate -	RR
	3	UV-Visible spectroscopy: Introduction – basic principles of UV-Visible spectroscopy. Types of electronic transitions with suitable examples.	SAS
1 st week May 2023	1	analgesics (aspirin), antipyretics (paracetamol), anti-inflammatory drugs (ibuprofen), Central Nervous System agents (phenobarbital, diazepam),	AM
	2	Preparation from ethyl acetate. Synthetic applications of ethyl acetoacetate - preparation of monocarboxylic (butanoic acid), dicarboxylic (adipic acid), unsaturated acids (crotonic acid), ketones (butanone).	RR
	3	Chromophores and auxochromes (definition and examples). Blue shift and red shift (definition and examples). Influence of conjugation on λ_{max} absorption in UV – Visible region. Comparison of UV spectra of acetone and methyl vinyl ketone.	SAS
2 nd week of May 2023	1	Cardiovascular (Glyceryl trinitrate) (b) drugs used for the treatment of diseases due to infection – antibiotics (Chloramphenicol), antibacterial, antifungal, Sulphonamides	AM
	2	Introduction: Optical isomerism, optical activity, dextro and laevo rotatory molecules (d/l, +/-) [glyceraldehyde and lactic acid as examples]; specific rotation, criteria for optical activity) Elements of symmetry: plane, center,	RR
	3	Graphical representation of spectra of 1,3-butadiene, benzene, and lycopene. Advantages of UV-Visible spectroscopy. IR spectroscopy: Introduction – Basic principles of IR spectroscopy	SAS
3 rd week of May 2023	1	(Sulphamethoxazole, Sulphacetamide, Trimethoprim), antiviral drugs (Acyclovir), HIV-AIDS drugs (AZT- Zidovudine). Synthesis of paracetamol and chloramphenicol.	AM
	2	alternate axis of symmetry – definition, examples (2,3 dichlorobutane, trans-2,4-dimethyl-trans-1,3-cyclobutanedioic acid and 1,2,3,4- tetramethylcyclobutane respectively)	RR
	3	mention the source of IR radiation and sample preparation in brief). Conditions for IR active organic compounds. Vibrational transitions: Stretching and bending modes of vibrations, factors affecting on position of IR absorption peak (atomic mass and force constant-electronic effects and hydrogen bonding).	SAS
4 th week May 2023	1	Terpenes: Occurrence, isoprene rule, special isoprene rule, isolation of essential oils.	AM
	2	Molecular chirality, enantiomers (glyceraldehyde and lactic acid as examples) - absolute configuration D/L notations, R/S notations - Cahn-Ingold-Prelog sequence rules to be explained taking suitable examples; meso compounds (tartaric acid and 2,3-dichlorobutane),	RR

	3	Types of IR region (functional group region and finger print region – their significance). Explanation of stretching frequencies of –OH (free and H-bonded), alkyl –C–H, alkenyl C-H, alkynyl C-H, C=C, C=C, C–C, C=O and C–O groups (IR spectra of acetaldehyde (graphical representation),	SAS
1 st week of June 2023	1	Classification (on the basis of number of isoprene units, acyclic and cyclic) Citral: elucidation of structure and synthesis from methyl heptenone ,	AM
	2	diastereomers (2-bromo-3-chloro butane) and their properties (comparison). Relative Configuration of threo and erythro isomers. (using the above examples) Racemization: Definition and mechanism (taking lactic acid as example), definition of racemic mixture,	RR
	3	acetone, ethanol, ethylene, benzene, acetylene, acetic acid and phenol – mention the absorption of functional groups and their identification). Applications of IR spectroscopy.	SAS
2 nd week of June 2023	1	Zingiberene: structure (no elucidation) and preparation from p-methoxymethylmagnesium bromide. Structures of limonene,	AM
	2	Resolution of racemic mixture: definition, explanation of resolution of racemic mixture of tartaric acid by chemical method and biochemical method. Atropisomerism - Definition and explanation using diphenyl systems. (6, 6'-dinitrodiphenic acid	RR
	3	NMR spectroscopy: Chemical shift [definition and equation in terms of field strength - (δ and τ values)], uses of TMS as reference (reasons/significance to be discussed). Nuclear shielding and deshielding effects.	SAS
3 rd week of June 2023	1	menthol, α -terpineol, camphor, β -carotene, vitamin-A and their uses.	AM
	2	Geometric isomerism in alkenes: Definition, conditions, examples. Determination of configuration of geometric isomers: cis and trans by (i) Physical methods [(a) melting and boiling points (general statement), dipole moments (cis and trans 1,2-dichloroethene), solubility (general)]	RR
	3	Equivalent and non-equivalent protons. Effect of electronegativity of adjacent atoms on chemical shift values (Chloroethane, bromoethane and iodoethane as examples). Spin-spin splitting and spin-spin coupling (qualitative treatment only). Graphical representation (SAS
4 th week of June 2023		Internal Assessment	
1 st week of July 2023	1	Alkaloids: Introduction, classification (based on heterocyclic ring present) and general characteristics.	AM
	2	ii) Spectroscopic methods [UV (cis and trans butadiene), IR (general explanation) evidences] (iii) chemical methods-cyclisation method and pKa values (maleic acid and fumaric acid as example); E and Z system of nomenclature - rules with suitable examples.	RR
	3	interpretation) of NMR spectra of simple organic compounds (i) methane (ii) CH ₃ -Cl (iii) CH ₂ Cl ₂ and (iv) CHCl ₃ using shielding and	SAS

		desielding effects, (iv) Cl_2CHCHO (v) 1,1,2- trichloroethane and (vi) $\text{CH}_3\text{CH}_2\text{Cl}$ using spin-spin splitting and spin-spin coupling.	
2 nd week of July 2023	1	Determination of functional nature of nitrogen- Hoffmann's exhaustive methylation method..	AM
	2	Introduction, classification (based on size of heterocyclic ring – 5 and 6 membered) with examples (furan, pyrrole, thiophene and pyridine), stability-resonance and aromaticity, molecular orbital structures, resonance and aromaticity of furan,	RR
	3	Brief introduction (definition of polymers and polymerization); preparation, structure, properties and application of the following polymers: polyolefins –	SAS
3 rd week of July 2023	1	Nicotine: elucidation of structure and synthesis from succinimide. Structures and uses of ephedrine, caffeine, cocaine, atropine, quinine and morphine.	AM
	2	pyrrole, thiophene and pyridine based on Huckel's rules. Preparation: pyrrole from acetylene, furan from furfural, Thiophene from acetylene, pyridine from acetylene. Electrophilic substitution reactions.	RR
	3	polystyrene and styrene copolymers (BUNA-S), polyvinylchloride, polyvinyl acetate; acrylic polymers – polyacrylonitrile ; fluoropolymers - teflon, polyamides -nylon-6,6. Phenol formaldehyde resins -	SAS
4 th week of July 2023	1	Introduction: Definitions of Green Chemistry. Brief introduction of twelve principles of Green chemistry with examples, special emphasis on atom economy, reducing toxicity, green solvents. Green Chemistry and catalysis (taking synthesis of ibuprofen). Alternative sources of energygreen energy(definition, types and examples) and sustainability (brief discussion	AM
	2	nitration of pyrrole, furan and thiophene, reaction of pyridine with sodamide (Chichibabin reaction).Comparison of basicity of pyrrole, pyridine and piperidine (pKb). Fused heterocyclic compounds i) Indole – preparation by Fischer synthesis, nitration of Indole.	RR
	3	polystyrene and styrene copolymers (BUNA-S), polyvinylchloride, polyvinyl acetate; acrylic polymers – polyacrylonitrile ; fluoropolymers - teflon, polyamides -nylon-6,6. Phenol formaldehyde resins -	SAS