

Vijaya College, RV Road, Bengaluru-560004

Department of Chemistry and Bio-Chemistry

NAAC criteria-1: CURRICULAR ASPECTS for the academic
years 2023-24

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

Name of the Department	Chemistry	Subject Title	Chemistry
Semester	I DC	Paper	I
Week/Month & Date (Preferably)	Day	Portions Planned for 1 hour	Teacher
1 st week of Aug 2023	1	Classification and nomenclature of organic compounds, hybridization,	AM
	2	s, p, d and f-block elements, the long form of periodic table	KGP
	3	Basic laboratory practices, calibration of glassware (pipette, burette and volumetric flask), Sampling (solids and liquids), weighing, drying, dissolving,	KGP
	4	Wave mechanics: de Broglie equation, Heisenberg's Uncertainty Principle	JP
2 nd week of Aug 2023	1	shapes of organic molecules, influence of hybridization on bond properties.	AM
	2	Detailed discussion of the following properties of the elements, with reference to s and p-block elements:	KGP
	3	Acid treatment, Rules of work in analytical laboratory, General rule for performing quantitative determinations (volumetric and gravimetric),	KGP
	4	Its significance. Quantum Mechanics-. Schrödinger's wave equation,	JP
3 rd week of Aug 2023	1	Formation of covalent bond, types of chemical bonding,(Notations used to represent electron movements and directions of reactions- curly arrows, formal charges).	AM
	2	Detailed discussion of the following properties of the elements, with reference to s and p-block elements:	KGP
	3	Safety in Chemical laboratory, Rules of fire prevention and accidents, First aid.	KGP
	4	derivation (time independent) significance of ψ and	JP

		ψ^2	
4 th week of Aug 2023	1	localized and delocalized, conjugation and cross conjugation, with examples. Concept of resonance	AM
	2	(a) Atomic radii (van der Waals) (b) Ionic and crystal radii	KGP
	3	Precautions to be taken while handling toxic chemicals, concentrated/fuming acids and organic solvents.	KGP
	4	Eigen values and functions Applications of Schrödinger's wave equation	JP
1 st week Oct 2023	1	Electronic displacements: Inductive effect, electrometric effect, resonance	AM
	2	(c) Covalent radii (d) Ionization enthalpy,	KGP
	3	Definitions of analysis, determination, measurement, techniques and methods. Significant figures,	KGP
	4	Particals in one-dimension box	JP
2 nd week Oct 2023	1	hyper conjugation, aromaticity, Huckel rule, anti-aromaticity explanation with examples.	AM
	2	successive ionization enthalpies	KGP
	3	Classification of analytical techniques. Choice of an analytical method	KGP
	4	Quantum numbers and their significance.	JP
3 rd week Oct 2023	1	Strengths of organic acid and bases: Comparative study with emphasis on factors effecting pKa values. Relative strength of aliphatic and aromatic carboxylic acids-	AM
	2	factors affecting ionization energy.	KGP
	3	Errors and treatment of analytical data: Limitations of analytical methods	KGP
	4	Quantum mechanical operators- (i) Hamiltonian operator;	JP
4 th week Oct 2023	1	acetic acid and chloroacetic acid, acetic acid and propionic acid, acetic acid and benzoic acid. Steric effectrelative stability of trans and cis-2-butene.	AM
	2	Applications of ionization enthalpy (e) Electron gain enthalpy;	KGP
	3	Titrimetric analysis: Basic principle of titrimetric analysis. Classification, preparation and dilution of reagents/solutions. Equivalent masses of compounds Normality,	KGP
	4	Laplaceanoperator Normalized and orthogonal wave functions. Sign of wave functions. Postulates of quantum mechanics Radial and angular wave functions for hydrogen atom	JP

1 st week Nov 2023	1	INTERNAL TEST	
	2		
	3		
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2 nd week Nov 2023	1	Types of bond cleavages- homolytic and heterolytic cleavages Types of reagents electrophiles, nucleophiles, nucleophilicity and basicity.	AM
	2	trends of electron gain enthalpy. (f) Electronegativity, Pauling's/ Mulliken's/ Allred Rachow's/ and Mulliken-Jaffé's	KGP
	3	Errors: Determinate and indeterminate errors, some important terms replicate, outlier,	KGP
	4	Radial and angular distribution curves. Shapes of s, p, d and f orbitals. Contour boundary and probability diagrams.	JP
3 rd week Nov 2023	1	Types of organic reactions substitution, addition, elimination, and rearrangement explanation with examples.	AM
	2	electronegativity scales. Variation of electronegativity with bond order,	KGP
	3	, Accuracy, precision, ways of expressing accuracy, absolute error, relative error	KGP
	4	Pauli's Exclusion Principle, Hund's rule of maximum multiplicity	JP
4 th week Nov 2023	1	Formation of alkanes: Wurtz reaction, free radical substitution, halogenation Carbon-carbon pi bonds: Formation of alkenes and alkynes by elimination reaction. Mechanism of E1, E2, reactions. Saytzeff and Hofmann eliminations.	AM
	2	partial charge, hybridization, group electronegativity.	KGP
	3	minimization of errors. Statistical treatment of random errors, mean, median, range, standard deviation and variance. External standard calibration. Numerical problems.	KGP
	4		JP
1 st week Dec 2023	1	Addition of HBr to propene, free radical addition of HBr to propene. Addition of halogens to alkenes carbocation and halonium ion mechanism. Ozonolysis - ozonolysis of propene, hydrogenation, hydration,	AM
	2	Trends in the chemistry of the compounds of groups 13 to 17 (hydrides, carbides, oxides and halides) are to be discussed.	KGP
	3	Molarity and Mole fraction. Use of $N_1V_1 = N_2V_2$ formula, preparation of ppm level solutions from	KGP

		source materials (salts), conversion factors. Numerical problems.	
	4	Aufbau's principle and its limitations- Electronic configurations of the elements (Z=1-30), effective nuclear charge, shielding/screening effect,	JP
2 nd week Dec 2023	1	hydroxylation and epoxidation of alkenes, explanation with examples, addition of hydrogen halides to alkynes. Conjugated Dienes- 1,2 and 1,4-addition reactions in conjugated dienes. Diels-Alder reaction.	AM
	2	Trends in the chemistry of the compounds of groups 13 to 17 (hydrides, carbides, oxides and halides) are to be discussed.	KGP
	3	Acid-basetitrimetry: Titration curves for strong acid vs. strong base, weak acid vs. strong base and weak base vs. strong acid titrations. Titration curves, quantitative applications – selecting and standardizing a titrant, inorganic analysis - alkalinity, acidity.	KGP
	4	Slater's rules , Variation of effective nuclear charge in Periodic Table.	JP
		PRACTICAL EXAMINATIONS	

Name of the Department	Chemistry	Subject Title	Chemistry
Semester	III DC	Paper	III
Week/Month & Date (Preferably)	Day	Portions Planned for 1 hour	Teacher
1 st week Oct 2023	1	Electromagnetic spectrum, absorption of electromagnetic radiation,	JP
	2	Reaction Intermediates: Generation,	AM
	3	Fischer projection, Newmann and Sawhorse projection formulae	AM
	4	Solvent Extraction: Definition of solvent extraction, Types- batch, continuous, efficiency, selectivity,	JP
2 nd week Oct 2023	1	Definition and units of frequency, wavelength, wave number,	JP
	2	Stability and Reactions of, i) Carbocations:	AM

	3	Fischer projection, Newmann and Sawhorse projection formulae	AM
	4	Nernst distribution law, derivation, distribution coefficient, factors affecting the partition,	JP
3 rd week Oct 2023	1	Beer's law, Beer-Lambert law derivation,	JP
	2	Dienone-phenol; and Pinacol-Pinacolone Rearrangement detection	AM
	3	interconversions.	AM
	4	relationship between % extraction and volume fraction, Numerical problems on solvent extraction.	JP
4 th week Oct 2023	1	deviations from Beer's law, limitations,	JP
	2	. ii) Carbanions : Perkin Reaction, Aldol condensation,	AM
	3	interconversions	AM
	4	Solvent extraction of iron and copper.	JP
1 st week Nov 2023	1	construction of calibration graph (Plot of absorbance versus concentration),	JP
	2	Claisen-Schmith condensation. iii) Free Radicals:	AM
	3	Geometrical isomerism: Cis-trans isomerism.	AM
	4	Fundamentals of chromatography: General description, definition, terms and parameters used in chromatography,	JP
2 nd week Nov 2023	1	Evaluation Procedures- standard addition,	JP
	2	Sandmeyer Reaction iv) Carbenes and Nitrenes:	AM
	3	Geometrical isomerism: Cis-trans isomerism.	AM
	4	classification of chromatographic methods, criteria for selection of stationary and mobile phase and nature of adsorbents. Principles of paper, thin layer, column chromatography.	JP
3 rd week Nov 2023	1	Internal standard addition, validation parameters- detection limits,	JP
	2	Singlet and Triplet states, their relative stability	AM
	3	syn-anti isomerism, E/Z notations with C.I.P rules. Optical Isomerism:	AM
	4	Column efficiency, factors affecting the column efficiency, van Deemter's equation and its modern version.	JP
4 th week Nov 2023	1	sensitivity, dynamic/linearity range, Instrumentation,	JP
	2	reactions of Arynes: Formation and detection	AM

	3	Optical activity, Specific rotation,	AM
	4	Paper chromatography: Theory and applications	JP
1 st week Dec 2023	1	single beam and double beam spectrophotometers,	JP
	2	Methods for identifying reaction mechanism:	AM
	3	Chirality/Asymmetry,	AM
	4	. Thin layer chromatography (TLC): Mechanism, Rf value, efficiency of TLC plates,	JP
2 nd week Dec 2023	1	quantitative applications of colorimetry (determination of Fe, Mo, Cu, Ti and PO_4^{3-}) and	JP
	2	Product analysis, Isolation and Identification of Intermediates,	AM
	3	Enantiomers, Molecules with two or more chiral centres,	AM
	4	methodology–selection of stationary and mobile phases, development,	JP
3 rd week Dec 2023	1	numerical problems on application of Beer's law.	JP
	2	Product analysis, Isolation and Identification of Intermediates,	AM
	3	Diastereoisomers, meso structures,	AM
	4	spray reagents, identification and detection, qualitative applications	JP
4 th week Dec 2023	1	Nephelometry and Turbidimetry: Introduction, principle,	JP
	2	Stereochemical Evidences,	AM
	3	Racemic mixtures	AM
	4	Ion exchange chromatography: resins, types with examples- cation exchange and anion exchange resins,	JP
1 st week Jan 2024	1	instrumentations of nephelometry and turbidimetry; effects of concentration, particle size and wavelength on scattering;	JP
	2	Effect of Catalyst, crossover Experiments,	AM
	3	Resolution, Relative and absolute configuration,	AM
	4	mechanism of cation and anion exchange process and applications of ionexchange chromatography	JP
2 nd week Jan 2024	1	choice between nephelometry, applications of nephelometry and turbidimetry (determination of SO_4^{2-} and PO_4^{3-})	JP
	2	Isotopic studies, Kinetic Studies	AM
	3	D/L and R/S designations	AM

	4	softening of hard water, separation of lanthanides, industrial applications	JP
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