SRI ADICHUNCHANAGIRI FIRST GRADE COLLEGE
CHANNARAYAPATNA
DEPARTMENT OF CHEMISTRY

LESSON PLAN FOR THE SESSION 2023-2024 (Odd Semester)

Name of the Faculty : Dr. B.N. Chandrashekar
(Theory and Practical)

Semester : 1st

Title of the Paper : **CHEMISTRY –I (DSC-1C)**

Subject code : **CHEDSCP101**

Lesson Plan Duration : 14 weeks

Total teaching period : 14 Hours

Work Load (Lecture/Practical) Per Week (in Hours): Lecture - 02, Practical – 08

Week	Theory	
	Lecture Day	**Topic including Assignment/Test**
1	1	Analytical chemistry Language of analytical chemistry: Definitions of analysis, determination, measurement
	2	Gaseous State Elementary aspects of kinetic theory of gasses, Ideal and real gasses. Boyle temperature (derivation not required).
2	3	Techniques and methods. Classification of analytical techniques. Choice of an analytical method
	4	Gaseous State Elementary aspects of kinetic theory of gases, Ideal and real gases. Boyle temperature (derivation not required)
3	5	Accuracy, precision, sensitivity, selectivity, method validation. Figures of merit of analytical methods and limit of detection (LOD)

	6	Calculation of σ and η, variation of viscosity with temperature and pressure.
4	7	Limit of quantification (LOQ), linear dynamic range (working range).
	8	Maxwell's Boltzmann distribution law of molecular velocities (Most probable, average and root mean square velocities).
5	9	Errors and treatment of analytical data: Limitations of analytical methods
	10	Relation between RMS, average and most probable velocity and average kinetic energies. (Mathematical derivation not required), law of equipartition of energy
6	11	Errors: Determinate and indeterminate errors, absolute error, relative error, minimization of errors
	12	Behaviour of real gases: Deviation from ideal gas behaviour. Compressibility factor (Z) and its variation with pressure for different gases
7	13	Statistical treatment of finite samples -mean, median, range, standard deviation and variance
	14	Causes of deviation from ideal behaviour, vander Waals equation of stat (No derivation) and application in explaining real gas behaviour.
8	15	External standard calibration - regression equation (least squares method)
	16	Critical phenomena - Andrews isotherms of CO2, critical constants and their calculation from van der Waals equation
9	17	Correlation coefficient (R^2). Numerical problems Basic laboratory practices, calibration of glassware.
	18	Continuity of states, Law of corresponding states. Numerical problems.
10	19	(pipette, burette and volumetric flask), Sampling (solids and liquids)
	20	Surface Tension: Definition and its determination using stalagmometer, effect of temperature and solute on surface tension
11	21	Weighing, drying, dissolving, Acid treatment, Rules of work in analytical laboratory
	22	Viscosity: Definition, Coefficient of viscosity. Determination of viscosity of a liquid using Oswald viscometer. Effect of temperature, size, weight, shape of molecules and intermolecular forces.
12	23	General rule for performing quantitative determinations (volumetric and gravimetric)

	24	Refraction: Specific and molar refraction- definition and advantages. Determination of refractive index by Abbes Refractometer. Additive and constitutive properties.
13	25	Safety in Chemical laboratory, Rules of fire prevention and accidents, First aid
	26	Parachor: Definition, Atomic and structure parachor, Elucidation of structure of benzene and benzoquinone.
14	27	Precautions to be taken while handling toxic chemicals, concentrated/fuming acids and organic solvents
	28	Parachor: Definition, Atomic and structure parachor, Elucidation of structure of benzene and benzoquinone.
15	29	Revision of syllabus.
	30	Revision of syllabus.
	31	Revision of syllabus.
	32	Revision of syllabus.

Practical	
Practical Day	**Topic**
1	Preparation of standard sodium carbonate solution and standardization of hydrochloric acid solution (methyl orange indicator). Estimation of sodium hydroxide present in the solution using phenolphthalein indicator**.**
2	Determination of carbonate and hydroxide present in a mixture.
3	Determination of oxalic acid and sodium oxalate in a given mixture using standard KMnO4/NaOH solution.
4	Estimation of ferrous and ferric iron in a given mixture using standard potassium dichromate solution.
5	Preparation of standard oxalic acid solution and standardization of potassium permanganate solution. Estimation of hydrogen peroxide present in the solution.
6	Preparation of standard oxalic acid solution and standardization of potassium permanganate solution. Estimation of ferrous ammonium sulphate present in the solution.
7	Preparation of acetanilide from aniline using Zn/acetic acid (Green method).
8	Synthesis of p-nitro acetanilide from acetanilide using nitrating mixture.
9	Bromination of acetanilide.
10	Hydrolysis of methyl m-nitrobenzoate to m-nitrobenzoic acid (Conventional method)

11	Synthesis of diazoaminobenzene from aniline (conventional method)
12	Preparation of dibenzalacetone (Green method).
13	Practical Test: Part - 1
14	Practical Test: Part - 2
15	Repetition of experiments.

Name of the Faculty : **C. S. Nagendra (Theory)**

Semester : 1st

Title of the Paper : **CHEMISTRY –I (DSC-1C)**

Subject code : **CHEDSCP101**

Lesson Plan Duration : 15 Weeks

Total teaching period : 15 Hours

Work Load (Lecture/Practical) Per Week (in hours): Lecture – 01

Week	Topic including
1	Bohr's theory, its limitations and atomic spectrum of hydrogen atom.
2	Wave mechanics: de Broglie equation, Heisenberg's Uncertainty Principle and its significance.
3	Schrödinger's wave equation, significance of ψ and ψ2. Quantum numbers and their significance.
4	Normalized and orthogonal wave functions. Sign of wave functions.
5	Radial and angular wave functions for hydrogen atom.
6	Radial and angular distribution curves
7	Shapes of s, p, d and f orbitals.
8	Contour boundary and probability diagrams.
9	Pauli's Exclusion Principle.
10	Hund's rule of maximum multiplicity.

11	Aufbau's principle and its limitations- Electronic configurations of the elements (Z=1-30).
12	Effective nuclear charge.
13	shielding/screening effect, Slater's rules.
14	Variation of effective nuclear charge in Periodic Table.
15	Revision of syllabus.

Name of the Faculty : Dr.N. Shankaresh (Theory)

Semester : I

Title of the Paper : CHEMISTRY –I

Subject code : Paper - I

Lesson Plan Duration : 14 weeks

Total teaching period : 14 Hours

Work Load (Lecture/Practical) Per Week (in hours): Lecture - 01

Week	Theory
1	Classification and nomenclature of organic compounds, Hybridization, Shapes of organic molecules,
2	Influence of hybridization on bond properties. Nature of bonding in Organic molecules
3	Formation of Covalent bond, Types of chemical bonding, localized and delocalized, conjugation and cross conjugation, concept of resonance
4	Electronic displacements: Inductive effect, Electromeric effect, Resonance and Hyper conjugation, cross conjugation explanation with examples. Concept of resonance, aromaticity
5	Huckel rule, anti-aromaticity explanation with examples. Strengths of Organic acid and bases: Comparative study with emphasis on factors effecting pK values
6	Relative strength of aliphatic and aromatic carboxylic acids-Acetic acid and chloroacetic acid, acetic acid and propionic acid, acetic acid and Benzoic acid
7	Steric effect- Relative stability of trans and cis-2-butene
8	Mechanisms of Organic Reactions Notations used to represent

	electron movements and directions of reactions- curly arrows, formal charges
9	Types of bonds breaking- Homolytic and Heterolytic. Types of reagents-Electrophiles, nucleophiles, nucleophilicity and basicity. Types of organic reactions- substitution, addition, elimination,
10	Rearrangement and pericyclic reactions, explanation with examples. Chemistry of Aliphatic hydrocarbons, Carbon-Carbon Sigma bonds. Chemistry of alkanes: Formation of alkanes, Wurtz reaction, Wurtz-Fittig reaction, Free radical substitution,
11	Halogenation- relative reactivity and selectivity. Carbon-carbon pi bonds Formation of alkenes and alkynes by elimination reaction. Mechanism of E1, E2, E1cb reaction. Saytzeff and Hofmann eliminations.
12	Addition of HBr to propene, Free radical addition of HBr to propene. Addition of halogens to alkenes-carbocation and halonium ion mechanism. Stereospecificity of halogen addition.
13	Ozonolysis mechanism - ozonolysis of propene. Addition of hydrogen halides to alkenes, mechanism, regioselectivity and relative rates of addition.
14	Addition of hydrogen halides to alkenes, mechanism, regioselectivity and relative rates of addition.
15	Hydrogenation, hydration, hydroxylation and epoxidation of alkenes, explanation with examples, 1,2 and 1,4- addition reactions in conjugated dienes.

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LESSON PLAN FOR THE SESSION 2023-24 (Odd Semester)

Name of the Faculty : **Dr Shankaresh (Theory)**
Semester : III
Title of the Paper : CHEMISTRY –III
Subject code : CHEDSC301
Lesson Plan Duration : 14 weeks
Total teaching period : 14 Hours
Work Load (Lecture/Practical) Per Week (in hours): Lecture – 01 and Practicals - 04

Week	Theory
1	Reaction Intermediates: Generation, structure, stability and reactions involving; i. Carbocations: Dienone-phenol and Pinacol-Pinacolone Rearrangement.
2	Carbanions: Perkin Reaction, Aldol condensation, Claisen-Schmitt condensation.
3	Carbanions: Claisen-Schmitt condensation.
4	Carbenes: Singlet and triplet states, their relative stability. Riemer-Tieman reaction
5	Carbenes: Wolff rearrangement. Nitrenes: Singlet and triplet states, their relative stability
6	Nitrenes: Hoffman and Curtius reactions.
7	Arynes: Formation, detection. Bromobenzene to aniline, (4+2) cycloaddition reaction.
8	Reaction Intermediates: Generation, structure, stability and reactions involving; i. Carbocations to ARYNES
9	Methods for Identifying Reaction Mechanism:
10	Product analysis,
11	Isolation and Identification of Intermediates
12	Stereochemical Evidences,
13	Effect of Catalyst, crossover Experiments,
14	Isotopic studies, Kinetic Studies.
15	Revision of syllabus.

Name of the Faculty : Dr. B.N. Chandrashekar (Theory and Practical)
Semester : 3rd
Title of the Paper : **CHEMISTRY –III**
Subject code : **CHEDSC301**
Lesson Plan Duration : 14 weeks
Total teaching period : 14 Hrs
Work Load (Lecture/Practical) Per Week (in hours): Lecture - 02, Practical – 08

Week	Theory	
	Lecture Day	**Topics**
1	1	**Separation methods**: Fundamentals of chromatography: General description, definition, terms and parameters used in chromatography, classification of chromatographic methods
	2	Chemical Kinetics: Introduction, rate of reaction, order and molecularity with examples. Rate constant-definition and explanation.
2	3	Criteria for selection of stationary and mobile phase and nature of adsorbents. Principles of paper, thin layer, column chromatography
	4	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 ≠ b),
3	5	Column efficiency, factors affecting the column efficiency, van Deemter's equation and its modern version.
	6	Problems on rate constant (a=b), Methods of determination of order of a reaction (half-life method, isolation method)
4	7	Paper chromatography: Theory and applications.
	8	Temperature dependence of reaction rates; Arrhenius equation, activation energy.

5	9	Thin layer chromatography (TLC): Mechanism, Rf value, efficiency of TLC plates
	10	Numerical problems on Arrhenius equation in calculating energy of activation and rate constants. Collision theory of reaction rates.
6	11	TLC: Methodology–selection of stationary and mobile phases, development,
	12	Lindemann's mechanism, qualitative treatment of the theory of absolute reaction rates. Experimental determination of kinetics of (i) inversion of cane sugar by polarimetric method
7	13	TLC: Spray reagents, identification and detection, qualitative applications.
	14	(ii) spectrophotometric method for the reaction between potassium persulphate and potassium iodide.
8	15	TLC: Solvent Extraction: Types - batch, continuous, efficiency, selectivity,
	16	Electrochemistry – I: Introduction, strong and weak electrolytes, definition with examples.
9	17	TLC: distribution coefficient, Nernst distribution law, derivation,
	18	Arrhenius theory of electrolytic dissociation. Merits and Demerits, Conductance, Specific conductance
10	19	TLC: factors affecting the partition, relationship between % extraction and volume fraction,
	20	equivalent and molar conductivity and their variation with dilution. Molar conductivity at infinite dilution. Numerical problems.
11	21	TLC: Numerical problems on solvent extraction. Solvent extraction of iron and copper.

	22	Kohlrausch's law of independent migration of ions and its applications, Debye-Hückel Onsager equation.
12	23	Ion exchange chromatography: resins, types with examples- cation exchange and anion exchange resins
	24	Ionic mobilities and their determinations, transference numbers and their relation to ionic mobility's, determination of transference numbers using Hittorf and Moving Boundary methods.
13	25	Mechanism of cation and anion exchange process and applications of ion- exchange chromatography
	26	Applications of conductance measurement: (i) Degree of dissociation of weak electrolytes
14	27	Softening of hard water, separation of lanthanides, industrial applications
	28	Applications of conductance measurement: (ii) ionic product of water
15	29	Revision of syllabus.
	30	Revision of syllabus.
	31	Revision of syllabus.
	32	Revision of syllabus.

Practical	
Practical Day	**Topic**
1	Qualitative semi-micro analysis of mixtures containing 2 anions and 2 cations **Cations:** NH^{4+}, Al^{3+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+}, Na^{+}, K^{+} **Anions:** CO_3^{2-} , Cl^{-} , Br^{-} , I^{-} , NO_3^{-} , BO_3^{3-} , SO_4^{2-} , and PO_4^{3-} .

2	Qualitative semi-micro analysis of mixtures containing 2 anions and 2 cations **Cations:** NH^{4+}, Al^{3+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+}, Na^{+}, K^{+} **Anions:** CO_3^{2-} , Cl^{-} , Br^{-} , I^{-} , NO_3^{-} , BO_3^{3-} , SO_4^{2-} , and PO_4^{3-} .
3	Qualitative semi-micro analysis of mixtures containing 2 anions and 2 cations **Cations:** NH^{4+}, Al^{3+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+}, Na^{+}, K^{+} **Anions:** CO_3^{2-} , Cl^{-} , Br^{-} , I^{-} , NO_3^{-} , BO_3^{3-} , SO_4^{2-} , and PO_4^{3-} .
4	Qualitative semi-micro analysis of mixtures containing 2 anions and 2 cations **Cations:** NH^{4+}, Al^{3+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+}, Na^{+}, K^{+} **Anions:** CO_3^{2-} , Cl^{-} , Br^{-} , I^{-} , NO_3^{-} , BO_3^{3-} , SO_4^{2-} , and PO_4^{3-} .
5	Qualitative semi-micro analysis of mixtures containing 2 anions and 2 cations **Cations:** NH^{4+}, Al^{3+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+}, Na^{+}, K^{+} **Anions:** CO_3^{2-} , Cl^{-} , Br^{-} , I^{-} , NO_3^{-} , BO_3^{3-} , SO_4^{2-} , and PO_4^{3-} .
6	Qualitative semi-micro analysis of mixtures containing 2 anions and 2 cations **Cations:** NH^{4+}, Al^{3+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+}, Na^{+}, K^{+} **Anions:** CO_3^{2-} , Cl^{-} , Br^{-} , I^{-} , NO_3^{-} , BO_3^{3-} , SO_4^{2-} , and PO_4^{3-} .
7	Qualitative semi-micro analysis of mixtures containing 2 anions and 2 cations **Cations:** NH^{4+}, Al^{3+}, Ni^{2+}, Zn^{2+}, Mn^{2+}, Ba^{2+}, Ca^{2+}, Sr^{2+}, Mg^{2+}, Na^{+}, K^{+} **Anions:** CO_3^{2-}, Cl^{-} , Br^{-} , I^{-} , NO_3^{-} , BO_3^{3-} , SO_4^{2-} , and PO_4^{3-} .
9	Verification of Freundlich and Langmuir isotherms for adsorption of acetic acid on activated charcoal.

10	The study of kinetics of potassium persulphate and potassium iodide volumetrically.
11	Determination of velocity constant for acid catalyzed hydrolysis of methyl acetate volumetrically. Determination of velocity constant for the saponification of ethyl acetate (a = b) volumetrically.
12	Conductometric titration of strong acid and strong base. Conductometric titration of weak acid and strong base.
13	Practical Test: Part - 1
14	Practical Test: Part - 2
15	Repetition of experiments

Name of the Faculty : Nagendra. C. S (Theory)

Semester : **III**

Title of the Paper : **CHEMISTRY –III (DSC-3C)**

Subject code : **CHEDSCP301**

Lesson Plan Duration : 14 weeks

Total teaching period : 14 Hours

Work Load (Lecture/Practical) Per Week (in hours): Lecture - 01

Week	Topic including
1	**The ionic bond**: Structures of ionic solids. Radius ratio rules, Calculation of some limiting radius ratio values.
2	Coordination number 3 (planar triangle), Coordination number 4 (tetrahedral and square planar)
3	Coordination number 6 (octahedral), Close packing.
4	**Classification of ionic structures**: Ionic compounds of the type AX (ZnS, NaCl, CsCI), Ionic compounds of the type AX2 (Calcium fluoride (fluorite)
5	Rutile structure Layer structures CdI2, Cadmium iodide structure.
6	Lattice energy and Born-Haber cycle Limitations of radius ratio concept
7	Derivation of Born-Lande equation and its drawbacks
8	Kapustinskii equation, solvation energy and solubility of ionic solids
9	polarizing power and polarizability, Fajan's rules with applications
10	Numerical problems
11	**Covalent bond**: Valence bond theory
12	The Lewis theory, The octet rule, Exceptions to the octet rule, Sidgwick- Powell theory.
13	Valence shell electron pair repulsion (VSEPR) theory, Effect of lone pairs, electronegativity, isoelectronic principle
14	Examples using VSEPR theory: BF_3 and BF_4^-, NH_3 and NH_4^+, H_2O, PCl_5, ClF_3, SF_4, I_3^- and I_3^+, SF_6, and IF_7. Limitations of VSEPR.
15	Revision of Syllabus

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LESSON PLAN FOR THE SESSION 2023-24 (Odd Semester)

Name of the Faculty : **Dr B N. Chandrashekar,**
(Theory and Practical)

Semester : **V**

Title of the Paper : CHEMISTRY –V

Subject code : Paper - V

Lesson Plan Duration : 15 weeks

Total teaching period : 15 Hrs.

Work Load (Lecture/Practical) Per Week (in hours): Lecture - 01, Practical – 04

Week	Theory
1	**Molecular Spectroscopy:** Electromagnetic radiation: Regions of electromagnetic radiations (spectra)
2	Molecular energy levels, absorption and emission spectra, Born- Oppenheimer approximation.
3	**Rotation spectroscopy:** Selection rules, expression for rotational spectra of diatomic molecules for rigid rotator model
4	Moment of inertia (expression to be derived), rotational energy rotational spectral lines.
5	Determination of bond lengths of diatomic molecules, isotopic substitution effect on rotational lines.
6	**Vibrational spectroscopy:** Selection rules, classical equation of vibration, computation of force constant,
7	Expression for vibrational energy levels and potential energy of simple harmonic oscillator
8	Zero-point energy, determination of force constant bond dissociation energies
9	Fundamental frequencies, overtones.
10	The number of degrees of freedom of vibrations polyatomic molecules, modes of vibration (CO2and H2O).
11	**Raman spectroscopy**- Selection rules, origin of Raman spectrum, quantum mechanical theory
12	Stokes and anti-stokes lines. Pure rotational Raman spectra of diatomic molecule(derivation),
13	Vibrational rotational Raman spectra for diatomic molecule(explanation with equation) .

14	**Electronic spectra:** Concepts of potential energy curves for bonding orbitals
15	Concepts of potential energy curves for anti-bonding molecular orbitals, Franck-Condon principle.
16	Revision

Practical	
Practical Day	**Topic**
1	PART-A: Organic Preparations (Multistep synthesis): Preparation of p-bromo aniline from acetanilide.
2	Preparation of anthranilic acid from phthalic acid.
3	Preparation of benzanilide from benzophenone.
4	Preparation of 2,4-dinitrophenylhydrazine from chlorobenzene
5	Preparation of acridone from 2-chlorobenzoic acid.
6	Preparation of benzocaine from p-nitrobenzoic acid
7	Pechmann Reaction: Preparation of coumarin from resorcinol and ethyl acetoacetate. 8. Sandmeyer reaction: Preparation of 4-chlorotoluene from 4-toluidine
8	Estimation of glucose by colorimetric method Estimation of aspirin by colorimetric method.
9	Estimation of carboxylic acid. Estimation of amino group.
10	Determination of saponification value of oil.
11	Practical Test: Part - 1
12	Repetition of experiments.
13	Repetition of experiments.
14	Practical Test: Part - 2
15	Repetition of experiment

Name of the Faculty : **C. S. Nagendra**
(Theory and Practical)

Semester : **V**

Title of the Paper : CHEMISTRY –V

Subject code : Paper - V

Lesson Plan Duration : 15 weeks

Total teaching period : 15 Hrs

Work Load (Lecture/Practical) Per Week (in hours): Lecture - 01, Practical – 04

Week	Topic including
1	Photochemistry: Laws of photochemistry: Grothus-Draper's law, Stark-Einstein law of photochemical equivalence.
2	Quantum efficiency: definition, reasons for low quantum yield and high quantum yield with examples (formation of HBr and formation of HCl).
3	Actinometers: Uranyl oxalate actinometer, Potassium ferrioxalate actinometer (Qualitative study). (Numerical problems).
4	Photophysical processes: Jabolonski diagram, photosensitization (mercury as an example),
5	photoinhibition, fluorescence and phosphorescence, chemiluminescence and bioluminescence (explanation with examples), mechanism (qualitative).
6	Radiation Chemistry: Definition, primary and secondary stages in radiochemical reactions, ionic yield, energy yield
7	comparison with photochemistry. Units of radiation-rad, gray, Roentgen. Dosimeters-Frick-dosimeter, ceric sulphate dosimeter (qualitative study
8	theories of radiolysis – Lind's and EHT theories. Radiolysis of water (qualitative study) and acetic acid.
9	Phase equilibria: Definition of the terms-phase, component and degree of freedom with examples.

10	Statement of Gibb's phase rule and thermodynamic derivation.
11	Applications: (a) one component system (water system);
12	(b) reduced phase rule and reduced system, two component system (Silver-lead system, eutectic type),
13	desilverization of lead and FeCl3-H2O system (congruent melting point)
14	Freezing mixtures: Definition and examples, explanation based on KI-water system.
15	Revision of syllabus.

Practical	
Practical Day	**Topic**
1	PART-A: Organic Preparations (Multistep synthesis): Preparation of p-bromo aniline from acetanilide.
2	Preparation of anthranilic acid from phthalic acid.
3	Preparation of benzanilide from benzophenone.
4	Preparation of 2,4-dinitrophenylhydrazine from chlorobenzene
5	Preparation of acridone from 2-chlorobenzoic acid.
6	Preparation of benzocaine from p-nitrobenzoic acid
7	Pechmann Reaction: Preparation of coumarin from resorcinol and ethyl acetoacetate. 8. Sandmeyer reaction: Preparation of 4-chlorotoluene from 4-toluidine
8	Estimation of glucose by colorimetric method Estimation of aspirin by colorimetric method.

9	Estimation of carboxylic acid. Estimation of amino group.
10	Determination of saponification value of oil.
11	Practical Test: Part - 1
12	Repetition of experiments.
13	Repetition of experiments.
14	Practical Test: Part - 2
15	Repetition of experiments.

Name of the Faculty : Dr. N. Shankaresh

(Theory and Practical)

Semester : 5th

Title of the Paper : **Chemistry-V, Paper - 5**

Subject code : **CHEDSC501**

Lesson Plan Duration : 15 weeks

Total teaching period : **30 Hours**

Work Load (Lecture/Practical) Per Week (in hours): Lecture - 02, Practical – 08

Week	Theory	
	Lecture Day	**Topic including Assignment/Test**
1	1	Coordination Chemistry:ligands,classification of ligands and chelation
	2	Aromaticity, Homo-aromaticity of azulene, tropone,tropolone, annulenes, benzenoids, meso-ionic compounds
2	3	Physical methods in the study of complexes–change in conductance, color and pH.
	4	Alternant and non-alternant hydrocarbons, Energy levels in odd and even-alternant hydrocarbons.
3	5	Nomenclature of co-ordination compounds, Inner metallic polynuclear and bridged complexes
	6	**Stereochemistry:** Chirality in allenes, alkylidene cycloalkanes and spiranes (with a stereogenic axis).
4	7	Preparation of complexes-by simple addition reactions
	8	Cram's and Prelog's rules.

5	9	Substitution reactions and oxidation-reduction reactions. Geometries of complexes with coordination number 3 to 8.
	10	Conformational analysis of substituted cycloalkanes (Methyl, iso-propyl, tert-butyl, dialkyl, dihalo, diols),
6	11	**Metal-Ligand equilibria in solution**: Stability of complexes- kinetic and thermodynamic stability of metal complexes
	12	Cycloheptane. Nomenclature and conformations of fused rings
7	13	Step-wise and overall formation constant and their relationship, trends in step-wise constant
	14	Conformations of fused rings and bridged ring systems.
8	15	Factors affecting the stability of metal complexes with reference to the nature of the metal ion and ligand
	16	Prochirality: Enantiotopic and diastereotopic atoms, groups and faces.
9	17	Chelate effect, macrocyclic effect
	18	**Vitamins:** Definition, classification. Structure elucidation
10	19	Chelate effect, macrocyclic effect and their thermodynamic origin
	20	Synthesis and biological importance of Vitamin A.
11	21	Determination of formation constant by pH metric, and spectrophotometric methods
	22	Vitamin C. Structural formulae
12	23	**Isomerism in coordination complexes:** Structural isomerism- Ionization
	24	Biological importance of thiamine
13	25	Hydrate, linkage, Ligand isomerism
	26	Biological importance of pyridoxine, folic acid, pantothenic acid,,
14	27	Stereoisomerism – Geometrical and optical isomerism

	28	Biological importance of riboflavin, α-tocopherol, biotin
15	29	Co-ordination compounds of co-ordination number 4 and 6.
	30	Biological importance of vitamin K1 and vitamin K2.

Practical	
Practical Day	**Topic**
1	PART-A: Organic Preparations (Multistep synthesis): Preparation of p-bromoaniline from acetanilide.
2	Preparation of anthranilic acid from phthalic acid.
3	Preparation of benzanilide from benzophenone.
4	Preparation of 2,4-dinitrophenylhydrazine from chlorobenzene
5	Preparation of acridone from 2-chlorobenzoic acid
6	Preparation of benzocaine from p-nitrobenzoic acid
7	Pechmann Reaction: Preparation of coumarin from resorcinol and ethyl acetoacetate. Sandmeyer reaction: Preparation of 4-chlorotoluene from 4-toluidine.
PART-B: Organic Estimations	
8	Estimation of glucose by colorimetric method.
9	Estimation of aspirin by colorimetric method
10	Estimation of ascorbic acid by iodometric method. Estimation of amino acids by formylation method.
11	Estimation of carboxylic acid and amino group.
12	Determination of saponification value of oil.
13	Practical Test: Part - 1
14	Practical Test: Part - 2
15	Repetition of experiments.

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CHANNARAYAPATNA
DEPARTMENT OF CHEMISTRY

LESSON PLAN FOR THE SESSION 2023-24 (Odd Semester)

Name of the Faculty : **Dr B N. Chandrashekar (Theory)**

Semester : **V**

Title of the Paper : **CHEMISTRY –VI**

Subject code : **Paper - VI**

Lesson Plan Duration : 15 weeks

Total teaching period : **15 Hours**

Work Load (Lecture/Practical) Per Week (in hours): Lecture - 01, Practical – 04

Theory	
Week	**Topic including Assignment/Test**
1	**UV-Visible Spectroscopy:** Introduction, measurement of absorption intensities, absorption maxima (λmax)
2	Instrumentation, types of electronic transitions, concept of chromophores
3	Auxochromes. Absorption and intensity shifts
4	Bathochromic, hypsochromic, hyperchromic and hypochromic.
5	Types of absorption bands (K, R, B and E-bands). The effect of solvents temperature and conjugation on absorption.
6	Woodward-Fieser rules for calculation of absorption maxima for: Conjugated dienes
7	Aliphatic, alicyclic, exocyclic, homoannular, heteroannular, with extended conjugation, and polyenes),

8	aliphatic, alicyclic, exocyclic, homoannular, heteroannular, without extended conjugation, and polyenes)
9	α,β-Unsaturated carbonyl compounds (aldehydes, ketones, with and/or without extended conjugation)
10	α,β-Unsaturated carbonyl compounds (carboxylic acids, esters with and/or without extended conjugation)
11	Acyl benzene derivatives. Absorption in compounds with N-O bonds
12	quinones, α-diketones, α-keto aldehydes, benzene and its derivatives.
13	Absorption spectra of heterocyclic and condensed ring systems (cata-condensed and peri-condensed).
14	Effect of steric hindrance and coplanarity (cis, trans isomers) on absorption.
15	The electronic transitions in charge transfer complexes, and keto-enol tautomers.

Name of the Faculty : Nagendra.C.S (Theory)

Semester : V

Title of the Paper : CHEMISTRY –VI

Subject code : Paper - VI

Lesson Plan Duration : 15 weeks

Total teaching period : 15 Hours

Work Load (Lecture/Practical) Per Week (in hours): Lecture - 01

Week	Theory
1	**Physical Chemistry: Quantum Mechanics**: Introduction, black body radiation, plank radiation law
2	Photo electric effect, Compton effect, de Broglie concept and

	uncertainty principle.
3	Concepts of Operators: Laplacian, Hamiltonian, Linear and Hermitian operators.
4	Commutative and non-commutative of operators. Eigen function and eigen values.
5	Postulates of quantum mechanics. Solutions of Schrödinger wave equation for a free particle, particle in a one-dimensional box.
6	**Colligative properties**: Definition and examples. Lowering of vapour pressure: Raoult's law (to be derived), relationship between relative lowering of vapour pressure and molar mass (to be derived).
7	Experimental determination of molar mass of the solute by Dynamic method (Numerical problems).
8	**Elevation in boiling point:** Definition, its relation to lowering of vapour pressure and molar mass (to be derived). Ebullioscopic constant of the solvent and its relation to the boiling point (only equation).
9	Experimental determination of molar mass of the solute by Walker–Lumsden method (Numerical problems).
10	**Depression in freezing point:** Definition, its relation to lowering of vapour pressure and molar mass (to be derived).
11	Cryoscopic constant and its relation to melting point (only equation), Determination of molar mass of non-volatile solute by Rast method (Numerical problems).
12	**Semipermeable membrane**: Definition, types with examples. Preparation of artificial semipermeable membrane (copper

	ferrocyanide) by Morse-Frazer method.
13	**Osmotic pressure:** Definition of osmosis, reverse osmosis and osmotic pressure. Determination of osmotic pressure by Berkely-Hartley's method (Numerical problems). Applications of osmotic pressure (mention only).
14	**Osmotic laws and analogy with gas laws:** Relationship between molar mass and osmotic pressure (to be derived). Isotonic solutions,
15	Plasmolysis and Haemolysis. Abnormal molecular mass, causes, vant Hoff's factor (Numerical problems).

Name of the Faculty : Dr N Shankaresh

(Theory and Practical)

Semester : **V**

Title of the Paper : **Chemistry-Paper VI**

Subject code : **CHEDSC502**

Lesson Plan Duration : **15 Hours**

Weeks Total teaching period : **30 Hours**

Work Load (Lecture/Practical) Per Week (hrs): Lecture - 02, Practical – 04

Day	**Topic including**
1	**Inorganic Chemistry :**Modern concept of acids and bases: Lux-Flood and Usanovich concepts
	Organic Chemistry: Carbohydrates: Introduction. Monosaccharides-

	Open and ring structure of glucose
2	Solvent system and leveling effect. Hard-Soft Acids and Bases, Classification and Theoretical backgrounds.
	Mutarotation, epimerization. Interconversion reactions (aldose to ketose,
3	**Non-aqueous solvents**: Classification of solvents, Properties of solvents (dielectric constant
	Ketose to aldose, chain elongation-Killiani-Fischer method
4	Donor and acceptor properties.
	Chain degradation-Ruff's method), Determination ring size of glucose (methylation).
5	Protic solvents (anhydrous H2SO4, HF and glacial acetic acid)
	Amino sugars: Structural formulae and conformations of α- and β- (glucosamine)
6	aprotic solvents (liquid SO2, BrF3 and N2O4), Solutions of metals in liquid ammonia
	Structural formulae and conformations of α- and β- galactosamine
7	Hydrated electron. Super acids and super bases
	Disaccharides- Structure elucidation of sucrose.
8	**Chemistry of main elements**: Structure and bonding in Boranes
	Polysaccharides-partial structural formulae of starch and cellulose. Application of starch in titrimetric analysis.
9	Structure and bonding in boranes : (B_2H_6, B_4H_{10}, B_5H_9)

	Heterocyclic compounds: Definition, classification and nomenclature. Furan-synthesis (from pentasan),
10	Carboranes ($C_2B_{10}H_{12}$, $C_2B_9H_{13}$, $C_2B_6H_{12}$), Wades rules,
	Reactions (nitration, acylation). Thiophene-synthesis (from sodium succinate),
11	Reactions (sulphonation, chlorination). Pyrrole-synthesis (from furan),
	M-M bond and metal atom clusters: Halide clusters, bonding in $[ReCl_8]^{2-}$
12	Reactions (diazotization, Riemer-Tiemann). Pyridine-synthesis (from acetylene),
	Metal carbonyl clusters- LNCC's and HNCC's
13	Reactions (bromination, with $NaNH_2$). Aromaticity and basicity of pyrrole and pyrimidine, Indole: Synthesis (Fischer), reactions (Br_2/HOAc, $CHCl_3$/NaOH).
	Electron counting in carbonyl clusters
14	Quinoline: Synthesis (Skraup), reactions (nitration, with $NaNH_2$, with $KMnO_4$/NaOH).
	Wades-Mingos and Lauher rule.
15	Pyrazole: Synthesis (From acetyl acetone and hydrazine), Reactions (nitration, bromination).
	Revision

Week	Practical topic
1	**PART-A:** Conductometric titration of weak acid (CH_3COOH/HCOOH) versus weak base (Ammonium hydroxide).
2	Conductometric titration of a mixture of HCl and CH_3COOH versus NaOH.
3	Conductometric titration of strong acid (HCl) with salt ($CuSO_4$) versus NaOH.
4	Potentiometric titration of FAS versus $K_2Cr_2O_7$.
5	Potentiometric method of determination of dissociation constant of Formic acid.
6	Potentiometric titration of weak acid CH_3COOH against a strong base NaOH using a quinhydrone electrode and calculation of pKa and Ka of the weak acid.
7	Colorimetric estimation of Fe^{2+} ions concentration in the given solution by titration of FAS versus $KMnO_4$. Colorimetric estimation of Fe^{2+} ions concentration using 1,10-phenanthroline.
8	PART-B: Determination of the isoelectric point of an amino acid by pH metry.
9	Determination of pH of acetic acid with sodium acetate buffer by pH metry
10	Potentiometric determination of pH of a buffer by using quinhydrone electrode and comparison of the pH values obtained

	with glass electrode.
11	Colorimetric determination of dissociation constant of a given indicator.
12	Potentiometric titration of $AgNO_3$ versus KCl (demonstration).
13	Conductometric titration of weak acid (CH_3COOH) with salt ($CuSO_4$) versus NaOH.
14	Determination of pKa value of phosphoric acid by pH meter.