

**K.T.S.P Mandal's
Hutatma Rajguru Mahavidyala
Rajgurunagar, Tal. Khed Dist. Pune
Teaching Plan Year 2023-24
Class: F. Y. B. Sc., Sem.-I
Name of Paper: Chemistry Practical
No. of Lectures allotted per week: 04 For (3 ½) Batches
Name of Teacher: Prof. Kolekar S.S**

Month Name	Name of Practical
1) Aug 2023	Introduction, Determination of heat capacity of calorimeter for different volumes.
2) Sept.2023	Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
3) Sept.2023	Determination of integral enthalpy of solution of salts (KNO ₃)
4) Sept.2023	Measurement of the pH of buffer solutions and comparison of the values with theoretical values.
5) Oct.2023	Preparation of buffer solutions Sodium acetate-acetic acid and determine its buffer capacity
6) Oct.2023	To determine type and detection of extra elements (N, S, Cl, Br, I) in organic compounds (Thiourea)
7) Oct. 2023	To determine type and detection of extra elements (N, S, Cl, Br, I) in organic compounds (Chloroform)
8) Oct.2023	To determine type and detection of extra elements (N, S, Cl, Br, I) in organic compounds (Aniline)
9) Nov 2023	Separation of constituents of mixtures by Paper Chromatography: Measure the R _f value in each case Amino acids
10) Nov.2023	Identify and separate the sugars present in the given mixture by paper chromatography.
11) Nov.2023	Repetition Physical Chemistry practical for late admitted students

Prof. Kolekar S.S
Subject Teacher

Dr. P.S Kulkarni
Head of the Dept.

K.T.S.P.MANDAL'S
HUTATMA RAJGURU MAHAVIDYALAYA, RAJGURUNAGAR
DEPARTMENT OF CHEMISTRY
Teaching Plan Year 2023-24
Name of Paper -chemistry (S.Y. B.Sc. CH-302)
No. of Lectures allotted per week-03
Name of teacher-Prof. Kolekar S.S.
SEMESTER – I

Month	Chapter	Topic	L
July 2023 and Aug. 2023	1. Molecular Orbital Theory of Covalent Bonding	Introduction to Molecular Orbital Method (MOT) and postulates of MO theory, LCAO approximation, s-s combination of orbitals, s-p combination of orbitals, p-p combination of orbitals, p-d combination of orbitals, d-d combination of orbitals, nonbonding combination of orbitals, Rules for linear combination of atomic orbitals, example of molecular orbital treatment for homonuclear diatomic molecules: Explain following molecules with respect to MO energy level diagram, bond order and magnetism: H ₂ + molecule ion, H ₂ molecule, He ₂ + molecule ion, He ₂ molecule, Li ₂ molecule, Be ₂ molecule, B ₂ molecule, C ₂ molecule, N ₂ molecule, O ₂ molecule, O ₂ - and O ₂ 2- ion, F ₂ molecule, Heteronuclear diatomic molecules: NO, CO, HF.	14

Sep. 2023	2. Introduction to Coordination Compounds	Double salt and coordination compound, basic definitions: coordinate bond, ligand, types of ligands, chelate, central metal ion, charge on complex ion, calculation of oxidation state of central metal ion, metal ligand ratio; Werner's work and theory, Effective atomic number, equilibrium constant	04
Sep. 2023	3.Aromatic Hydrocarbons	Aromatic Hydrocarbons Introduction and IUPAC nomenclature, preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (up to 4 carbons on benzene). Side chain oxidation of alkyl benzenes (up to 4 carbons on benzene).	04
Oct. 2023	4.Alkyl and Aryl Halidel	Introduction and IUPAC nomenclature, Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions. Preparation: from alkenes and alcohols. Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs. substitution. Aryl Halides: Introduction and IUPAC nomenclature, Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer and Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by -OH group) and effect	08

		of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $\text{NaNH}_2/\text{NH}_3$). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides	
Oct 2023 and Nov. 2023	5. Alcohols, Phenols and Ethers	Introduction and IUPAC nomenclature, Preparation: Preparation of 1o, 2o and 3o alcohols: using Grignard reagent, ester hydrolysis, reduction of aldehydes, ketones, carboxylic acid and esters. Reactions: with sodium, HX (Lucas test), esterification, oxidation (with PCC, alc. KMnO_4 , acidic dichromate, conc. HNO_3). Oppeneauer oxidation Diols: (Up to 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement Phenols (Phenol case): Introduction and IUPAC nomenclature, Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann Reaction, Houben-Hoesch Condensation, Schotten-Baumann Reaction. Ethers (aliphatic and aromatic): Cleavage of ethers with HI.	06

Subject Teacher

Dr. P.S Kulkarni
H.O.D of chemistry

**K.T.S.P Mandal's
HutatmaRajguruMahavidyala
Rajgurunagar, Tal. Khed Dist. Pune
Teaching Plan Year Year 2023-24
Class: T. Y. B. Sc., term-1 Sem.-V
Name of Paper: CH-505: Industrial Chemistry - I
No. of Lectures allotted per week: 03
Name- Prof. Kolekar S.S,**

Sr. No.	Month	No. of Lect. Taken	Nameof Chapter	Topic Covered
1	Aug 2023	03L	ModernApproach to Chemical Industry	Introduction, basic requirements of chemical industries, chemical production, unit process and unit operations
2	Sep. 2023	05 L	Modern Approach to Chemical Industry	Quality control and quality assurance, process control, research and development, human resource, safety measures, classification of chemical reactions, batch and continuous process, Conversion, selectivity and yield, copy-right act, patent act, trademarks.
	Sep. 2023	02 L	Manufacture of Basic Chemicals	Ammonia: Manufacture of ammonia by modified Haber-Bosch process, Physico-chemical principles involved and uses of ammonia.Nitric acid: Manufacture of nitric acid by Ostwald's process, Physico-chemical principles involved and uses of nitric acid.

3	Oct. 2023	05 L 03L	Manufacture of Basic Chemicals Soap	<p>Manufacture of Sulphuric acid by contact process, Physico-chemical principles involved and uses of Sulphuric acid</p> <p>Soap: Soap and Fatty Acids: Introduction, Chemistry, Manufacturing Technology, Raw Materials, Functional Properties of Soap, Manufacturing Processes, Saponification Reactor, Cooling, Soap Separator</p>
4	Nov. 2023	8L	Dyes And Pigments	<p>Dyes: Introduction, qualities of good dye, Colour constituents (Chromophore, auxochrome), classification of dyes according to their application, Synthesis and uses of following dyes: Nitroso dye-martius yellow, Azo dyes-Methyl orange and aniline yellow, Triphenylmethane dye-Crystal violet, Phthalein dye - Phenolphthalein, Xanthane-Fluorescein, Antha-quinone Alizarin and Indigo dyes - Indigo Introduction, classification and general properties of pigments. Inorganic pigments: i) Zinc oxide pigments (Fundamentals and properties, Raw materials, Direct process.</p>
5	NOV- 2023	07	Sugar and Fermentation Industry	<p>Sugar: Introduction, manufacture of cane sugar, extraction of juice, purification of juice, sulfitation and carbonation, evaporation, crystallization, separations of crystals, drying refining, grades, recovery of sugar from molasses, by-</p>

				<p>product of sugar industry</p> <p>fermentation Industry: Introduction, importance, conditions favorable for fermentation, Characteristics of enzymes, short account of some fermentation processes, Alcohol beverages,</p>
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Subject Teacher

Dr. P.S Kulkarni
Head of the Dept.

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HutatmaRajguruMahavidyala
Rajgurunagar, Tal. Khed Dist. Pune
Teaching Plan Year 2023-24
Class: F Y. B. Sc. CH-201 Term-II
Name of Paper: Inorganic Chemistry
No. of Lectures allotted per week: 03
Name of Teacher: Prof. Kolekar S.S.**

Sr. No.	Month	Name of Chapter	Topic Covered
1.	Dec. 2023	Chemical Bonding	Attainment of stable electronic configurations, Types of Chemical bonds: Ionic, covalent, coordinate and metallic bonds Ionic Bond: General characteristics of ionic bonding, Types of ions, Energy considerations 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,
	Jan 2024	Chemical Bonding	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. Covalent bond: Valence Bond Approach,
2	Feb. 2024	Periodicity of Element	Explain rules for filling electrons in various orbitals Aufbau's principle, Pauli exclusion principle, Hund's rule of maximum multiplicity, electronic configuration of an atom and anomalous electronic configurations. stability of half-filled and completely filled orbitals. Concept of exchange energy and relative energies of atomic orbitals The long form of periodic table. Block, group, modern periodic law and periodicity. Classification of elements as main group, transition and inner transition elements, name, symbol, electronic configuration, trends and properties. Periodicity in the following properties in details. a. Effective nuclear charge, shielding or screening effect; some numerical problems. b. Atomic and ionic size. c. Crystal and covalent radii d. Ionization energies e. Electronegativity- definition, trend, Pauling electronegativity scale. f. Oxidation state of elements
3	March 2024	Atomic Structure	Origin of Quantum Mechanics and theory Energy quantization- i) Black body radiation ii) The photoelectric effect iii) Wave particle duality-a) The particle character of electromagnetic radiation b) the wave character of particle, iv) diffraction by double slit v) atomic spectra, Review of-Bohr's theory and its limitations, Heisenberg Uncertainty principle. Quantum mechanics: Time independent Schrodinger equation and meaning of various terms in it, Significance of ψ and ψ^2

	March 2024	Atomic Structure	Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals. Radial and angular nodes and their significance. Radial distribution of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers m_l and m_s . Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (m_s).
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Prof. Kolekar S.S
Name of teacher

Dr.P.S.Kulkarni
Head of department

K.T.S.P Mandal's
HutatmaRajguruMahavidyala
Rajgurunagar, Tal. Khed Dist. Pune
Teaching Plan Year 2023-24
Class: F. Y. B. Sc. Chemistry, Sem.-II
Name of Paper: Chemistry Practical
No. of Lectures allotted per week: 4 For (3 ½) Batches
Name of Teacher: Prof. Kolekar S.S

Month name	Name of Practical
1) Jan 2024	Synthesis of potash alum from aluminium metal (scrap Aluminium metal)
2) Jan. 2024	Synthesis of Mohr's Salt $[(\text{FeSO}_4)(\text{NH}_4)_2\text{SO}_4] \cdot 6\text{H}_2\text{O}$
3) Jan. 2024	Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture
4) Feb 2024	Estimation of acid neutralizing capacity of antacids like Gelusil tablet/ Gellusil syrup etc.
5) Feb.2024	Determination of Basicity of oxalic acid
6) Feb. 2024	Purification of organic compounds by crystallization (from water and alcohol)
7) Feb.2024	To draw polar plots of s and p orbitals.
8) March2024	Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone
9)March 2024	Semi carbazone derivatives of aldehydes and ketones

Prof Kolekar S.S
Subject Teacher

Head Of the Department

K.T.S.P. Mandal's
Hutatma Rajguru Mahavidyalaya, Rajgurunagar,
Tal. Khed Dist. Pune
Teaching Plan Year 2023-24
Class: S. Y. B. Sc, CH-402 Sem.-IV
Name of Paper: Inorganic and organic Chemistry
No. of Lectures allotted per week: 03
Name of Teacher: Prof. Kolekar S.S.

Month	Chapter	Topic Covered	L
		Inorganic chemistry	
Jan. 2024	Isomerism co-ordination complexes	Introduction polymerization isomerism, ionization isomerism, hydrates isomerism, coordination isomerism, coordination position isomerism, geometrical isomerism, optical isomerism	02
Feb. 2024	Valance bond Theory of Coordination Compounds	Aspects and assumptions of VBT, applications of application of VBT on the basis of hybridizatization, structure and bonding in linear, square planer, tetrahedral and octahedral complexes Inner and outer octahedral complexes observed magnetic moment in deciding the geometry in complexes. with limitations of VBT	04
March 2024	Crystal field Theory	Shapes of d orbitals, Crystal field Theory (CFT) Assumptions. Application of CFT, splitting of d orbitals in ligand field, effect of weak and strong ligand field , colours, absorbed and spectrochemical series ,crystal splitting energy , planar complexes and tetrahedral complexes, spin only magnetic moment.	12L

Organic Chemistry			
Jan. 2024	Aldehydes and Ketones	Aldehydes and Ketones (aliphatic and aromatic) (Formaldehyde, acetaldehyde, acetone and benzaldehyde) Introduction and IUPAC nomenclature, Preparation from acid chlorides and from nitriles. Reactions - Reaction with HCN, ROH, NH-G derivatives. Iodoform test, Aldol Condensation, Cannizzaro's reaction, Wittig reaction. Benzoin condensation, Clemenson reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction.	
Feb. 2024	Carboxylic acids	Carboxylic acids (aliphatic and aromatic): (up to 5 carbons) Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their inter conversion. Reaction: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction. Perkin condensation	
Feb. 2024	Amines	Amines (Aliphatic and Aromatic): Introduction and IUPAC nomenclature, Preparation from alkyl halides, Gabriel's Phthalimide synthesis, Hoffmann Bromamide reaction. Reactions Hofmann vs. Saytzeff elimination, Electrophilic substitution - nitration, bromination, sulphonation. Diazonium salts: Preparation from aromatic amines.	
March 2024	Stereochemistry of Cyclohexane	Stereochemistry of Cyclohexane: Bayer's strain theory, heat of combustion of cycloalkanes, structure of cyclohexane, axial and equatorial H atoms, conformations of cycloalkane, stability of conformations of cyclohexane, methyl and t-butyl monosubstituted cyclohexane, 1, 1 and 1, 2 dimethyl cyclohexane and their stability	

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Head of Department

