



## ANNUAL TEACHING PLAN

(Academic Year: 2019-2020)

Mr. Subhash V Patil

Asso. Prof. & Head

Dept. of Chemistry

Month	Class	Paper No.	Unit to be completed (Theory/ Practical)
June	B.Sc-III	XI	<b>Unit 1. Introduction to Spectroscopy [03]</b> 1.1 Meaning of spectroscopy. 1.2 Nature of electromagnetic radiation: wavelength, frequency, energy, amplitude, wave number and their relationship. 1.3 Different units of measurement of wavelength and frequency. 1.4 Different regions of electromagnetic radiations. 1.5 Interaction of radiation with matter: absorption, emission, fluorescence and scattering. 1.6 Types of spectroscopy and advantages of spectroscopic methods. 1.7 Energy types and energy levels of atoms and molecules. To the
	B.Sc-I	II	Introduction of Course & Syllabus
	Practical		<b>B.Sc.I:-</b> <b>1. Formation of batches &amp; Introduction, General instructions</b> <b>B.Sc.III:-</b> <b>Formation of batches &amp; Introduction, General instructions</b>
July	B.Sc-III	XI	<b>Unit 2. UV-Vis Spectroscopy [05]</b> <b>2.1 Introduction.</b> <b>2.2 Beer-Lambert's law, absorption of UV radiation by organic molecules leading to different excitations.</b> <b>2.3 Terms used in UV Spectroscopy: Chromophore, Auxochrome, Bathochromic shift, hypsochromic shift, hyperchromic and hypochromic effect.</b> <b>2.4 Modes of electromagnetic transitions.</b> <b>2.5 Effect of conjugation on position of UV band.</b> <b>2.6 Calculation of <math>\lambda_{max}</math> by Woodward and Fischer rules for dienes and enones.</b> <b>2.7 Colour and visible spectrum.</b> <b>2.8 Applications of UV Spectroscopy.</b>
	B.Sc-I	II	Unit I: Fundamentals of Organic Chemistry (08) Introduction, Curved arrow notations, Cleavage of Bonds:



			Homolysis and Heterolysis. Organic molecular species: Nucleophiles and electrophiles. Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation effect, Reactive Intermediates: Generation, Structure, Stability and Reactions of Carbocations, Carbanions and carbon free radicals.
		Practical	B..Sc.I:- 2.Volumetric Estimation of $Kmno_4$ 3.Volumetric Estimation of FAS 4.Water Analysis B.Sc.III:- 1.Determination of Molecular weight 2.Estimation of cane sugar 3.Saponification value of an oil
August	B.Sc-III	XI	Unit 3. IR Spectroscopy [06] 3.1 Introduction. 3.2 Principles of IR Spectroscopy. 3.3 Instrumentation, schematic diagram. 3.4 Fundamental modes of vibrations, types and calculation. 3.5 Conditions for absorption of IR radiations. 3.6 Regions of IR spectrum, fundamental group region, finger print region. 3.7 Hook's Law for Calculation of vibrational frequency. 3.8 Factors affecting IR absorption frequency.
	B.Sc-I	II	Unit II: Stereochemistry (09) Introduction, Types of Stereoisomerism, Optical Isomerism: Concept of Chirality, Elements of Symmetry, Optical Isomerism in tartaric acid, 2, 3 Dihydroxybutanoic acid, Enantiomerism, Diastereomerism and Meso compounds, Geometrical isomerism in C=C, C=N and alicyclic compounds. Nomenclature of stereoisomers: D and L, erythro and threo, R and S, E and Z.
		Practical	B.Sc.I - 5.Paper Chromatography 6.Spot Tests 7.Determination of Equivalent wt.of metal B.Sc.III:- 4.Estimation of Acid & Ester 5.Organic Preparation no.1 6.Organic Preparation no.2
	B.Sc-III	XI	Unit 4. NMR Spectroscopy [09] 4.1 Introduction. 4.2 Principles of PMR Spectroscopy. 4.3 NMR- Instrumentation, Schematic diagram. 4.4 Magnetic and nonmagnetic nuclei.



Septemb er			<p>4.5 Chemical shift: definition, measurement, calculation, Factors affecting Chemical shift.          4.6 Shielding &amp; deshielding.          4.7 Peak Integration.          4.8 Merits of TMS as PMR reference compound.          4.9 Coupling Constant.          4.10 Types of Coupling Constant.          4.11 Spin-spin splitting (n+1 rule).          4.12 Applications.</p>
	B.Sc-I	II	<p>Unit III: Aromaticity (07)          Introduction, Characteristics properties of organic compounds, Meaning of terms: Aromatic, Non aromatic, Antiaromatic, Pseudoaromatic, Structure of Benzene: Kekule structure, Resonance structure, M.O. picture, Modern theory of Aromaticity, Mechanism of Electrophilic substitution reactions: Nitration, Sulphonation, Halogenation and Friedel craft reaction.          Unit IV: Cycloalkanes, cycloalkenes and alkadienes (06)          Cycloalkanes: - Introduction. Method of formation - a) By addition of carbene to alkene          b) Action of metallic sodium on dihaloalkane c) Diels - Alder reaction d) By reduction of aromatic compounds, Chemical properties- a) Photohalogenation          b) Catalytic halogenations c) Catalytic hydrogenation d) Effect of heat e) Reaction with hydrogen halide</p>
		Practical	<p>B.Sc.I:-          8.Heat of Ionization          9.Chemical Kinetics II          10.Viscosity          B.Sc.III:-          5.Organic Preparation no.3          6.Organic Preparation no.4          7.Organic Preparation no 5</p>
Oct 2019	B.Sc-III	XI	<p>Unit 4. NMR Spectroscopy [09]          4.1 Introduction.          4.2 Principles of PMR Spectroscopy.          4.3 NMR- Instrumentation, Schematic diagram.          4.4 Magnetic and nonmagnetic nuclei.          4.5 Chemical shift: definition, measurement, calculation, Factors affecting Chemical shift.          4.6 Shielding &amp; deshielding.</p>



		<p>4.7 Peak Integration.          4.8 Merits of TMS as PMR reference compound.          4.9 Coupling Constant.          4.10 Types of Coupling Constant.          4.11 Spin-spin splitting (n+1 rule).          4.12 Applications.          Unit 5. Mass Spectroscopy. [08]          5.1 Introduction.          5.2 Principles of mass spectroscopy.          5.3 Mass spectrometer - schematic diagram.          5.4 Types of ions produced during fragmentation.          5.5 Nitrogen rule          5.6 Fragmentation patterns of: alkanes, alkenes, aromatic hydrocarbons, alcohols, phenols, amines and carbonyl compounds.          5.7 McLafferty rearrangement.          5.8 Applications.          Unit 6. Combined Problems based on UV, IR, NMR and Mass Spectral data.</p>
B.Sc-I	II	<p>Unit IV: Cycloalkanes, cycloalkenes and alkadienes          (06)Cycloalkanes: - Introduction. Method of formation - a) By addition of carbene to alkene          b) Action of metallic sodium on dihaloalkane c) Diels - Alder reaction d) By reduction of aromatic compounds, Chemical properties- a) Photohalogenation b) Catalytic halogenations c) Catalytic hydrogenation d) Effect of heat e) Reaction with hydrogen          Cycloalkenes : Introduction, Method of formation from cyclic compounds, Chemical Properties - a) Hydrogenation b) Addition of Halogens and halogen acids, c) Allylic halogenations          Alkadienes : Introduction, Classification, Buta-1,3-diene - a) Structure b) Methods of formation - from cyclohexane, From Butane by dehydrogenation, From acetylene, From Butane-1,3 - diol, From ethanol and acetaldehyde (Industrial method), Chemical Properties - a) Reaction with hydrogen halide b) Reaction with halogens -With one molar equivalent of halogens (Cl<sub>2</sub> or Br<sub>2</sub>) c) Diels- Alder reaction d) Reduction – hydrogenation e) Oxidation – Ozonolysis f) Polymerization</p>



		Practical	B.Sc.I:- 11.Chemical Kinetics I 12.Organic Qualitative Analysis -Intoduction B.Sc.III:- 8.Binary Mixture Separation & Identification 9.Mixture no.1 10.Mixture no.2
Nov 2019	University Exam		
Dec 2019	B.Sc-III	XV	Unit 1 Name Reactions Diel's Alder Reaction,Oppenauer Oxidation,M.P.V.Reduction,Schmidt Rearrangement,Hoffman Rearrangement,Sitting Reaction,Wagner Meerwein Rearrangement,Favorskii Rearrangement,Michael Addition Reaction,Sockman's Reaction,Problems based on Reactions
		Practical	B.Sc.I:- Organic Compound no.1 Organic Compound no.2 B.Sc.III:- Mixture no.3 Mixture no.4
Jan 2020	B.Sc-II	VIII	
	B.Sc-III	XV	Unit 2 Reagents in Organic Synthesis Lithium Aluminium hydride,Osmium Tetroxide,Dicyclohexyl Carbodiimide,Randy Nickel,DDQ,Polyphosphoric Acid,Diazomethane,Ceric Ammonium Nitrate,NBS,Selenium Dioxide Unit 5 Pharmaceuticals Introduction,classification,Qualities of ideal drug,Synthesis & uses of Ethambutal,pheno barbitone,Isiniazide,Benzocaine,Chloramphenic ol,Paludrine. Drug action of Sulphate drugs.



	Practical	Practical	B.Sc.1:- Organic Compound no.3 Organic Compound no.4 B.Sc.III:- Mixture no.5 Mixture no.6
February	B.Sc-II	VIII	
	B.Sc-III	XV	Unit 3 Electrophilic Addition to C=C & C=C. Addition to carbon carbon double bond Addition to carbon carbon triple bond
	Practical		B.Sc.I:- Organic Compound no.5 Organic Compound no.6 B.Sc.III:- Mixture no.7 Mixture no.8
March	B.Sc-II	VIII	
	B.Sc-III	XV	Unit 4 Natural Products Terpenoids:- Occurance, Methods of Structure Determination, Isoprene rule, Analytical evidences & Synthesis of Citral & alpha-Terpineol Alkaloids:- Occurance, Methods of Structure Determination, Analytical evidence, Synthesis of Ephedrine & Nicotine
	Practical		B.Sc.I:- Assessment of Journals B.Sc.III:- Projects
April/May	Practical Exams of B.Sc.-I, II, III		

*[Signature]*  
Head

Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist-Sangli



# ANNUAL TEACHING PLAN

(Academic Year : 2019-2020)

Dr. kore gurupad dundappa

Associate Professor,

Dept.

of Chemistry Class - B. Sc. I, II & III

Month	Class	Course No.	Units to be completed
1 <sup>st</sup> July to 3 <sup>rd</sup> August	B. Sc. I	I	Atomic Structure and Periodicity of Elements 1.1 Bohr's theory of hydrogen atom and its limitations 1.2 Wave particle duality 1.3 Heisenberg uncertainty principle 1.4 Quantum numbers and their significance 1.5 Shapes of s, p and d atomic orbitals 1.6 Electrons filling rules in various orbitals: a) Aufbau's principle b) Hund's rule of maximum multiplicity c) Pauli's exclusion principle 1.7 Electronic configuration of elements. Stability of empty, half-filled and completely filled orbitals 1.8 Periodicity of the elements: General discussion of the following properties of the elements with reference to s block elements: a) electronic configuration b) atomic radii c) ionic radii d) ionization energy e) electron affinity f) electronegativity g) metallic characters h) reactivity i) oxidation state j) melting and boiling points k) chemical properties
November- to 30 <sup>th</sup> December	B. Sc. II	VIII	Co-ordination chemistry 1.1 Introduction-Definition and formation of coordinate covalent bond in $\text{BF}_3 - \text{NH}_3$ , $[\text{NH}_4]^+$ and $\text{H}_2\text{O}$ 1.2 Distinguish between double salt and complex salt 1.3 Werner's theory- 1.3.1. Postulates 1.3.2. The theory as applied to cobalt amines viz. $\text{CoCl}_3.6\text{NH}_3$ , $\text{CoCl}_3.5\text{NH}_3$ , $\text{CoCl}_3.4\text{NH}_3$ ,



			<p>CoCl<sub>3</sub>. 3NH<sub>3</sub></p> <p>1.4 Description of the terms- ligand, co-ordination number, co-ordination sphere, Effective atomic number</p> <p>1.5 IUPAC nomenclature of coordination compounds.</p> <p>1.6 Isomerism in complexes with C.N. 4 and 6</p> <p>1.6.1 Geometrical Isomerism</p> <p>1.6.2 Optical Isomerism</p> <p>1.6.3 Structural Isomerism-Ionisation Isomerism, Hydrate Isomerism, Coordination Isomerism, Linkage Isomerism and Co-ordination position Isomerism</p> <p>1.7 Valance bond theory of transition metal complex with respect to, C.N. 4, complexes of Cu and Ni</p> <p>C.N. 6 complexes of Fe and Co</p>
1 <sup>st</sup> July to 3 <sup>rd</sup> August	B. Sc. III Sem. V	X	<p>Acids, Bases and Non aqueous Solvents [8]</p> <p>1.1 Introduction to theories of Acids and Bases- Arrhenius concept, Bronsted-Lowry concept, Lewis Concept, Lux-Flood Concept (definition and examples)</p> <p>1.2 Hard and Soft Acids and Bases. (HSAB Concept)</p> <p>1.2.1 Classification of acids and bases as hard, soft and borderline.</p> <p>1.2.2 Pearson's HSAB concept.</p> <p>1.2.3 Acid-Base strength and hardness-softness.</p> <p>1.2.4 Applications and limitations of HSAB principle.</p> <p>1.3 Chemistry of Non aqueous Solvents.</p> <p>1.3.1 Introduction, definition and characteristics of solvents.</p> <p>1.3.2 Classification of solvents.</p> <p>1.3.3 Physical properties and Acid-Base reactions in Liquid Ammonia (NH<sub>3</sub>) and Liquid Sulphur Dioxide (SO<sub>2</sub>). Metal Ligand bonding in Transition Metal Complexes [10]</p> <p>2.1 Crystal field theory (CFT)</p> <p>2.1.1 Introduction: Shapes of d-orbitals, Basic assumptions of CFT.</p> <p>2.1.2 Crystal field splitting of d-orbitals of metal ion in octahedral, tetrahedral, square planar complexes and John-Teller distortion.</p>



			<p>2.1.3 Factors affecting the Crystal field splitting.</p> <p>2.1.4 High spin and low spin octahedral complexes w.r.t. Co (II).</p> <p>2.1.5 Crystal Field stabilization energy (CFSE), Calculation with respect to octahedral complexes only.</p> <p>2.1.6 Limitations of CFT.</p> <p>2.2 Molecular orbital theory (MOT).</p> <p>2.2.1 Introduction.</p> <p>2.2.2 MOT of octahedral complexes with sigma bonding such as <math>[\text{Ti}(\text{H}_2\text{O})_6]^{3+}</math>, <math>[\text{CoF}_6]^{3-}</math>, <math>[\text{Co}(\text{NH}_3)_6]^{3+}</math>.</p> <p>2.2.3 Merits and demerits of MOT.</p>
1 <sup>st</sup> July to 3 <sup>rd</sup> August	B. Sc. I	I	<p>Chemical Bonding and Molecular structure (A) Ionic Bonding (07)</p> <p>2:1 Definition and formation of ionic bond. General characteristics of ionic bonding</p> <p>2:2 Energetic in Ionic bond formation</p> <p>2:3 Born-Haber cycle for NaCl and its applications</p> <p>2:4 Fajan's Rule, Applications of Fajan's rule for,</p> <ul style="list-style-type: none"> <li>• Polarizing power and polarizability</li> <li>• Ionic character in covalent compounds</li> <li>• Bond moment, dipole moment and percentage ionic character</li> </ul> <p>Unit III: Chemical Bonding and Molecular structure (B) Valence bond theory (VBT). (07)</p> <p>3.1 Concept of hybridization, different types of hybridization and geometry of following molecules,</p> <ul style="list-style-type: none"> <li>• Linear geometry- <math>\text{BeCl}_2</math> ( sp hybridization )</li> <li>3</li> <li>• Planer trigonal geometry- <math>\text{BF}_3</math> ( sp<sup>2</sup> hybridization )</li> <li>• Tetrahedral geometry- <math>\text{SiCl}_4</math> ( sp<sup>3</sup> hybridization )</li> <li>• Trigonal bipyramidal geometry- <math>\text{PCl}_5</math> ( sp<sup>3</sup>d hybridization )</li> <li>• Octahedral geometry- <math>\text{SF}_6</math> ( sp<sup>3</sup>d<sup>2</sup> hybridization )</li> <li>• Pentagonal bipyramidal geometry - <math>\text{IF}_7</math> ( sp<sup>3</sup>d<sup>3</sup> hybridization )</li> </ul>



31 <sup>st</sup> December to 29 <sup>th</sup> January	B. Sc II	VIII	<p>Chemistry of elements of 3d series elements (06)</p> <p>4.1 Position of elements in periodic table</p> <p>4.2 Characteristics of d-block elements with special reference to</p> <p>i) Electronic structure</p> <p>ii) Oxidation states, stability of oxidation states of Fe with respect to Latimer diagram</p> <p>iii) Magnetic character</p> <p>iv) Colored ions</p> <p>v) Complex formation</p>
1 <sup>st</sup> July to 3 <sup>rd</sup> August	B.Sc III Sem. V	X	<p>Metals, Semiconductors and Superconductors. [9]</p> <p>3.1 Introduction.</p> <p>3.2 Properties of metallic solids.</p> <p>3.3 Theories of bonding in metal.</p> <p>i. Free electron theory.</p> <p>ii. Molecular orbital theory (Band theory).</p> <p>3.4 Classification of solids as conductor, insulators and semiconductors on the basis of band theory.</p> <p>3.5 Semiconductors- Types - intrinsic and extrinsic and applications of semiconductors.</p> <p>3.6 Superconductors: Ceramic superconductors - Preparation and structures of mixed oxide YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub>.</p> <p>3.7 Applications of superconductors.</p> <p>Organometallic Chemistry. [4]</p> <p>4.1 Definition, Nomenclature of organometallic compounds.</p> <p>4.2 Synthesis and structural study of alkyl and aryl compounds of Be and Al.</p> <p>4.3 Mononuclear carbonyls -Nature of bonding in simple mononuclear carbonyls.: [Ni(CO)<sub>4</sub>], [Fe(CO)<sub>5</sub>], [Cr(CO)<sub>6</sub>].</p>
4 <sup>th</sup> September to October	B. Sc. I	I	<p>Chemical Bonding and Molecular structure (C) Molecular orbital theory (MOT) (07)</p> <p>4.1 LCAO method, formation of bonding , anti bonding and nonbonding molecular orbitals.</p> <p>4.2 Conditions for successful overlap, Types of overlaps - S-S ,S-p<sub>x</sub>, P<sub>x</sub>-P<sub>x</sub>, P<sub>y</sub>-P<sub>y</sub> and P<sub>z</sub>-P<sub>z</sub> overlaps.</p> <p>4.3 Bond order and its significance.</p>



			<p>4.4 Energy level sequence for molecular orbital when <math>n=1&amp;2</math>.</p> <p>4.5 MO diagrams for homonuclear diatomic molecule of 1st &amp; 2nd period Elements ( He<sub>2</sub>, Li<sub>2</sub>, B<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>).</p> <p>4.6 Molecular orbital diagrams for heteroatomic diatomic molecules. (CO, NO )</p>
1 February to 1 march	B. Sc. II	VIII	<p>P- Block elements ( Group 13, 14 and 15 ) (09)</p> <p>3.1. Position of elements in periodic table</p> <p>3.2. Characteristics of p-block elements with special reference to Electronic configuration and Periodic properties</p> <p>3.3. Compounds of group 13,14 and 15</p> <p>3.3.1 Boron-Diborane method of preparation and nature of bonding (structure)</p> <p>3.3.2 Borazine method of preparation and nature of bonding (structure)</p> <p>3.3.3 Allotropes of carbon and phosphorus</p> <p>3.3.4 Oxyacids of nitrogen – HNO<sub>2</sub> , HNO<sub>3</sub>.</p> <p>3.3.5 Hydrides of Nitrogen- NH<sub>3</sub> and N<sub>2</sub>H<sub>4</sub></p>
March	B. Sc. II	VIII	<p>Inorganic semi-micro qualitative analysis (08)</p> <p>5.1 Theoretical principles involved in qualitative analysis.</p> <p>5.2 Applications of solubility product and common ion effect in separation of cations into groups.</p> <p>5.3 Application of complex formation in</p> <p>a) Separation of II group into IIA and IIB sub-groups.</p> <p>b) Separation of Copper from Cadmium.</p> <p>c) Separation of Cobalt from Nickel.</p> <p>d) Separation of Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>.</p> <p>e) Detection of NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup></p> <p>- (Brown ring test).</p> <p>5.4 Application of oxidation and reduction in</p> <p>a) Separation of Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup> in mixture b) Separation of NO<sub>2</sub><sup>-</sup> and NO<sub>3</sub><sup>-</sup> in mixture.</p> <p>5.5 Spot test analysis.</p>
April	B.Sc II	VIII	<p>Chelation (05)</p> <p>2.1 A brief introduction with respect to ligands, chelating agent, chelation and metal chelates.</p> <p>2.2 Structural requirements of chelate formation</p> <p>2.3 Difference between metal chelate and metal</p>



			<p>complex</p> <p>2.4 Classification of chelating agents (with specific illustration of bidentate chelating agents)</p> <p>2.5 Application of chelation with respect to chelating agents - EDTA and DMG</p>
4 <sup>th</sup> September to 2 <sup>nd</sup> October	B. Sc III Sem. V	X	<p>Catalysis</p> <p>5.1 Introduction</p> <p>5.2 Classification of catalytic reaction- Homogenous and Heterogeneous</p> <p>5.3 Types of Catalysis.</p> <p>5.4 Characteristics of catalytic reactions.</p> <p>5.5 Mechanism of catalysis</p>
December	B. Sc III Sem VI	XIV	<p>Inorganic Reaction mechanism</p> <p>1.1 Introduction.</p> <p>1.2 Classification of Mechanism: Association, dissociation, interchange and the rate determining steps.</p> <p>1.3 SN 1 and SN 2 reactions for inert and labile complexes.</p> <p>1.4 Mechanism of substitution in cobalt (III) octahedral complexes.</p> <p>1.5 Trans effect and its theories.</p> <p>1.6 Applications of trans effect in synthesis of Pt (II) complexes.</p>
January	B. Sc III Sem VI	XIV	<p>Thermodynamic and Kinetic aspects of metal complexes.</p> <p>1.7 Introduction.</p> <p>1.8 Thermodynamic stability.</p> <p>26</p> <p>1.9 Kinetic Stability.</p> <p>1.10 Relation between thermodynamic and kinetic stability.</p> <p>1.11 Stepwise stability constant.</p> <p>1.12 Factor affecting the stability of complexes.</p> <p>1.13 Determination of Stability constant by Job variation, Mole ratio and Slope ratio method.</p>
February	B. Sc III Sem VI	XIV	<p>Nuclear Chemistry [05]</p> <p>2.1 Nuclear reactions and energetic of nuclear reactions.</p> <p>2.2 Types of nuclear reactions</p> <p>i. Artificial transmutation.</p> <p>ii. Artificial radioactivity.</p> <p>iii. Nuclear fission and its application in heavy</p>



			<p>water nuclear reactor.  iv. Nuclear fusion.  2.3 Use of Thorium, Uranium and Plutonium in atomic energy  2.4 Applications of radio-isotopes as tracers.  i. Chemical investigation – Esterification.  ii. Structural determination – Phosphorus pentachloride.  iii. Analytical Chemistry – Isotopic dilution method for determination of volume of blood Actinides  3.7 Position in periodic table.  3.8 Electronic configuration.  3.9 General methods of preparation of transuranic elements.  i. Neutron capture – followed by <math>\beta</math> decay.  ii. Accelerated projectile bombardment.  iii. Heavy ion bombardment.  3.10 IUPAC nomenclature of the super heavy elements with atomic number (Z) greater than 100</p>
March	B. Sc III Sem VI	XIV	<p>Iron and Steel. [07]  4.1 Occurrence and ores of iron.  4.2 Definition of the Terms- Ore , Mineral, Slag, Flux, Gangue , Matrix, Calcinations, Reduction, Roasting, Smelting and Leaching.  4.3 Extraction of iron by Blast furnace.  4.4 Steel: Definition and types.  4.5 Conversion of cast iron into steel by  i. Bessemer process.  ii. L.D. process.  4.6 Heat treatment on steel</p>
April	B. Sc III Sem VI	XIV	<p>Bio-inorganic Chemistry. [05]  5.1 Introduction.  5.2 Essential and trace elements in biological process.  5.3 Metalloporphyrins with special reference to hemoglobin and myoglobin.  5.4 Biological role of alkali and alkaline earth metal ions with special referenc to <math>\text{Na}^+</math>, <math>\text{K}^+</math> and <math>\text{Ca}^{2+}</math></p>

Head  
Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist-Sangli



## ANNUAL TEACHING PLAN

(Academic Year: 2019-2020)

**Mr. Avinash Ashok Kamble**

Assistant Professor

Dept. of Chemistry

Month	Class	Paper No.	Unit to be completed
Jun 2019	B.Sc-III	XII	<b>Unit- Manufacture of Industrial Heavy Chemicals</b> 2.1 Introduction Manufacture of Ammonia (NH <sub>3</sub> ) Manufacture of Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> ) Manufacture of Nitric acid (HNO <sub>3</sub> ) Manufacture of Sodium carbonate (Na <sub>2</sub> CO <sub>3</sub> )
	B.Sc-II	V	<b>Unit- Electrolytic Conductivity</b> -Introduction, Types of conductors, Conductivity, Equivalent and Molar conductivity and their variation with dilution for weak and strong electrolytes in aqueous solution.
	Practical		<b>B.Sc-III</b>  Chemical kinetics I,II  <b>B.Sc-II</b>  Gravimetric estimation of Ba Gravimetric estimation of Fe
July 2019	B.Sc-III	XII	<b>Unit. Sugar Industry</b> Introduction. Manufacture of cane sugar in India: Extraction of juice, Clarification, Concentration, crystallization, centrifugation and other details of industrial process. By products of sugar industry.
	B.Sc-II	V	Unit- I Electrolytic Conductivity- Equivalent conductivity at infinite dilution, Measurement of conductance by using Wheatstone bridge. Kohlrausch law of independent migration of ions and its applications such as Ionic mobility, determination of degree of ionization of weak electrolyte,



		Practical	<p>B.Sc-III Chemical kinetics III, IV</p> <p>B.Sc-II Inorganic Preparation I,II Titrimetric Analysis I,II</p>
ug 2019	B.Sc-III	XII	<p><b>Unit. Nanomaterials</b> Introduction of nanotechnology, terminology and history, optical properties, characterization and fabrication, Applications.</p>
	B.Sc-II	V	<p><b>Unit- Electrolytic Conductivity-</b> solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of salt. Conductometric titrations (only acid base titrations). Advantages of conductometric titrations. Transference number, Hittorf's rule, determination of transport number using Moving boundary method, factors affecting transport numbers. Numerical problems. Introduction, Third order reactions: derivation of rate constant, characteristics and examples of third order reaction. Theories of reaction rates as Collision theory and Transition state theory</p>
			<p>B.Sc-III Solubility, Adsorption</p> <p>B.Sc-II Semi-micro qualitative analysis</p>
sept 2019	B.Sc-III	XII	<p><b>Unit-Corrosion and passivity</b> Introduction, electrochemical theory of corrosion, factors affecting on corrosion, Methods of protection of metal from corrosion, passivity.</p>
	B.Sc-II	V	<p><b>Unit- Nuclear Chemistry</b> Introduction, Types of Nuclear radiation, properties of <math>\alpha</math>, <math>\beta</math> and <math>\gamma</math> radiations, Detection and measurement of nuclear radiations by Scintillation and Geiger muller counter methods, radioactive equilibrium and range of <math>\alpha</math>-particles, Geiger Nuttal relations, determination of radioactive constant.</p>
		Practical	<p>B.Sc-III Conductometry- I,II,III</p> <p>B.Sc-II Organic qualitative analysis</p>



Oct 2019	B.Sc-III		<b>Unit-Soaps and detergents</b> Introduction, Soaps, Manufacture of soap, Detergents, Comparison between soap and detergent.
	B.Sc-II		<b>Unit- Physical Properties of Liquids</b> Introduction, Classification of physical properties, Surface tension and its determination using Stalagmometric and differential capillary rise methods, Viscosity and its determination using Ostwald's viscometer, Refractive index (Snell's law), Specific and Molecular refractivities and its determination using Abbe's refractometer.
	B.Sc-II		<b>Unit – Surface Chemistry</b> Introduction, Adsorption as a surface phenomenon, Definition of adsorption, adsorbent, adsorbate, absorbent. factors affecting adsorption, Types of adsorption, Distinction between physical and chemical adsorption, Adsorption isotherms: Freundlich adsorption isotherm, Langmuir adsorption isotherm. Types of physical adsorption isotherms, applications of adsorption.
	Practical		B.Sc-III Conductometry IV,V Potentiometry I,II B.Sc-II  Organic Estimation I,II Organic preparation I,II
Nov 2019	University Exam		
Dec 2019	B.Sc-II	VIII	<b>Unit-Stereochemistry</b> Conformational isomerism – Introduction. Representation of conformations of ethane by using Saw- Horse, Fischer (dotted line wedge) and Newmann's projection formulae. Conformations and conformational analysis of ethane and n-butane by Newmann's Projection formula with the help of energy profile diagrams. Cycloalkanes relative stability - Baeyer's strain theory, Theory of strainless rings. Conformations and stability of cyclohexane and monosubstituted cyclohexanes Cyclohexanol, bromocyclohexane and methyl cyclohexane. Locking of conformation in t-butyl cyclohexane.



	B.Sc-III	XVI	<b>Unit.Theory of titrimetric Analysis</b> Introduction Acid-base indicators Theory of indicators w.r.t. Ostwald's ionization theory and quinoid theory Neutralization curves and choice of indicators, complexometric titrations.
		Practical	B.Sc-III- Potentiometry ,III,IV B.Sc-II- Chemical kinetics I,II,III,IV
Jan 2020	B.Sc-II	VIII	<b>Unit: Carbonyl Compounds- Aldehydes and Ketone</b> Introduction, Nomenclature, structure. Reactivity of Carbonyl group, mechanism of Nucleophilic addition to Carbonyl group Reactions: mechanism and application of Aldol condensation, Perkin reaction, Cannizaros reaction, Knoevenagel condensation, Reformatsky reaction.
	B.Sc-III		<b>Unit Potentiometric titrations</b> Introduction, Determination of pH., Study of Quinhydrone and Glass electrodes and their use in determination of pH., Potentiometric titrations: Classical and analytical methods for locating end points. Acids-Bases titration with suitable example. Redox titration with suitable example. Precipitation titration with suitable example. Basic circuit of direct reading potentiometer. Advantages of potentiometric titrations.
	Practical	Practical	B.Sc-III- colorimetry I,II and pH metry- I B.Sc-II- Conductometry I,II,III
Feb 2020	B.Sc-I	VIII	<b>Unit : Carbohydrates</b> Classification of carbohydrates, General properties of glucose and fructose, their open chain structure. Epimers, mutarotation and anomers. Determination of configuration of Glucose (Fischer proof). Ring structure of glucose Determination of size of the ring of Glucose by methylation method..Haworth projections. Cyclic structure of fructose. Linkage between monosachharides, structure of disacharrides (sucrose, maltose, lactose) and polysacharrides (starch and cellulose) excluding their structure elucidation.
	B.Sc-III		<b>Unit-Chromatography</b>



			<p>Introduction, classification.</p> <p>Column chromatography: Introduction, types, Principle of adsorption column chromatography, solvent system, stationary phases, Methodology-Column packing, gas chromatography.</p>
	Practical		<p>B.Sc-III- Refractometry I,II</p> <p>B.Sc-II- Refractometry I,II ,viscosity</p>
Mar 2020	B.Sc-II	VIII	<p><b>Unit 2: Amines and Diazonium Salts</b></p> <p>Introduction, Classification, Nomenclature, structure.</p> <p>Methods of preparation: a) From Alkyl halide by Amonolysis, b) By Reduction of Nitriles or Cyanides, c)From Unsubstituted amides (Hoffmann degradation), d) By Gabriel Synthesis ( From Phthalamide).</p> <p>Reactions: Carbylamine reaction, Schotten-Baumann reaction, Electrophilic substitution (Aniline), Nitration, Bromination, Sulphonation. Diazonium salt:Introduction, Preparation of Benzene diazonium chloride. Reactions: Replacement by Halogen(Sandmeyer), Replacement by Iodine, Replacement by -OH, C and N</p> <p>Coupling reactions: Synthesis of Methyl orange and Congo red.Reduction of BDC.</p>
	B.Sc-III		<p><b>Unit Flame Photometry</b></p> <p>2.1 Introduction.</p> <p>General principles of flame photometry.Instrumentation: Block diagram, Burners (Premix and Lundergraph burners), mirror, slits, filters, detector (Photomultiplier tube). Effect of solvent in flame photometry.</p> <p>Experimental procedure of analysis (Standard addition and internal standard). Interferences and Factors that influence the intensity of emitted radiation in a flame photometer. Applications of flame photometry in real sample analysis.Limitations of flame photometry.</p> <p><b>Unit-Colorimetry and Spectrophotometry</b></p> <p>3.1 Theory of colorimetry and spectrophotometry.Lambert Beer's law, deviation from Beer's law.Terms used in colorimetry and spectrophotometry.Cification of methods of 'colour' measurement or comparison. Photoelectric colorimeter method-Single beam photo-electric colorimeter.</p> <p>Spectrophotometer method-Single beam direct reading spectrophotometer.Determination of unknown concentration by using concentration-absorbance plot.</p> <p>Applications of colorimetry and spectrophotometry.</p>



	Practical	B.Sc-III- Project B.Sc-II- Conductometry I,II,III
April 2019	Practical Exams of B.Sc.-I, II, III	

*P. V. P.*  
Head

Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist-Sangli



## ANNUAL TEACHING PLAN

(Academic Year : 2020-2021)

**Mr. Patil Subhash Viitthal**

Associate Professor and Head

Dept. of Chemistry

Class - B. Sc. I, II & III

Month	Class	Course No.	Units to be completed (Theory/Practical)
November	B. Sc. I	II	Unit I: Fundamentals of Organic Chemistry (08) Introduction, Curved arrow notations, Cleavage of Bonds: Homolysis and Heterolysis. Organic molecular species: Nucleophiles and electrophiles. Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation effect, Reactive Intermediates: Generation, Structure, Stability and Reactions of Carbocations, Carbanions and carbon free radicals. <b>Practical:-</b> 1. Introductions & Instructions to handle Instruments & glasswares etc. 2. Volumetric Estimation of $Kmno_4$ 3. Volumetric Estimation of FAS 4. Water Analysis
April	B. Sc. II	VIII	Unit 1: Carboxylic acids and their derivatives. [8L] 1.1 Monocarboxylic acid: Introduction, Methods of Formation from Alcohols, Aldehydes, Ketones, Nitriles and Alkyl benzenes. Chemical Reaction: Hell-Vohland-Zelinsky (HVZ) reaction. 1.2 Formation of Halo Acids, Mono, Di, Tri- chloro acetic acid. Substitution reaction of Monochloro acetic acid by Nucleophile $OH^-$ , $I^-$ , $CN^-$ and $NF_3$ 1.3 Hydroxy acids: Malic and Citric acid Methods of formation of Malic acid from maleic acid, from Alpha bromo succinic acid and moist $Ag_2O$ . Chemical Reactions: Reactions of Malic acid- Action of heat, oxidation by $KMnO_4$ and reduction reaction with $HI$ .



			<p>Uses of Malic acid  Method of formation of Citric acid from glycerol.  Chemical Reactions: Reaction of citric acid: acetylation by acetic anhydride, reduction by HI, action of heat.  Uses of citric acid.  1.4 Unsaturated acid: Cinnamic acid: method of formation from benzaldehyde using diethyl malonate and by using acetic anhydride and sodium acetate.  Chemical Reactions- Bromination, Oxidation. Uses of cinnamic acid  Acrylic acid: Method of formation from acrolein and by dehydration of beta hydroxy propionic acid.  Chemical Reactions: Addition of water, Reduction by Na/C<sub>2</sub>H<sub>5</sub>OH. Uses of acrylic acid.  1.5 Dicarboxylic acid: Succinic and phthalic acid  Method of formation of succinic acid from ethylene dibromide, maleic acid  Chemical Reactions: Action of heat, Action of NaHCO<sub>3</sub>, C<sub>2</sub>H<sub>5</sub>OH in presence of acid.  Uses of succinic acid.  Phthalic acid: Method of formation from o-xylene and Naphthalene  Chemical Reactions: Action of heat, reaction with sodalime, amm</p>
<p>July  August</p>	<p>B. Sc.  III  Sem. V</p>	<p>X</p>	<p>Unit 1. Introduction to Spectroscopy [03]  1.1 Meaning of spectroscopy.  1.2 Nature of electromagnetic radiation: wavelength, frequency, energy, amplitude, wave number and their relationship.  1.3 Different units of measurement of wavelength and frequency.  1.4 Different regions of electromagnetic radiations.  1.5 Interaction of radiation with matter: absorption, emission, fluorescence and scattering.  1.6 Types of spectroscopy and advantages of spectroscopic methods.  1.7 Energy types and energy levels of atoms and molecules.  Unit 2. UV-Vis Spectroscopy [05]  2.1 Introduction.  2.2 Beer-Lambert's law, absorption of UV radiation by organic molecules leading to different excitations.  2.3 Terms used in UV Spectroscopy: Chromophore, Auxochrome, Bathochromic shift, hypsochromic shift, hyperchromic and hypochromic</p>



			<p>effect.</p> <p>2.4 Modes of electromagnetic transitions.</p> <p>2.5 Effect of conjugation on position of UV band.</p> <p>2.6 Calculation of <math>\lambda_{max}</math> by Woodward and Fischer rules for dienes and enones.</p> <p>2.7 Colour and visible spectrum.</p> <p>2.8 Applications of UV Spectroscopy.</p> <p><b>B.Sc.III Practical:-</b></p> <p>1.Determination of Molecular weight</p> <p>2.Estimation of cane sugar</p> <p>3.Saponification value of an oil</p>
December	B. Sc. I	II	<p>Unit II: Stereochemistry (09)</p> <p>Introduction, Types of Stereoisomerism, Optical Isomerism: Concept of Chirality, Elements of Symmetry, Optical Isomerism in tartaric acid, 2, 3 Dihydroxybutanoic acid, Enantiomerism, Diastereomerism and Meso compounds, Geometrical isomerism in C=C, C=N and alicyclic compounds. Nomenclature of stereoisomers: D and L, erythro and threo, R and S, E and Z nomenclature.</p> <p><b>Practicals:-</b></p> <p>5.Paper Chromatography</p> <p>6.Spot Tests</p> <p>7.Determination of Equivalent wt.of metal.</p>
May	B. Sc II	VIII	<p>Acid halide derivative: Acetyl chloride: formation from acid, by action with <math>PCl_3</math> and <math>SOCl_2</math>, reaction with water, alcohol (Mechanism of esterification is expected) and ammonia.</p> <p>Uses of acetyl chloride.</p> <p>Acid anhydride derivative: Method of formation of acetic anhydride by dehydration of acetic acid, reactions with water, alcohol and ammonia, uses of acetic anhydride.</p> <p>Unit 2: Amines and Diazonium Salts: [8L]</p> <p>2.1 Introduction, Classification, Nomenclature, structure.</p> <p>2.2 Methods of preparation: a) From Alkyl halide by Amonolysis, b) By Reduction of Nitriles or Cyanides, c) From Unsubstituted amides (Hoffmann degradation), d) By Gabriel Synthesis (From Phthalamide).</p> <p>2.3 Reactions: Carbylamine reaction, Schotten-Baumann reaction, Electrophilic substitution (Aniline), Nitration, Bromination, Sulphonation.</p> <p>2.4 Diazonium salt: Introduction, Preparation of Benzene diazonium chloride.</p>



			2.5 Reactions: Replacement by Halogen(Sandmeyer), Replacement by Iodine, Replacement by -OH, C and N Coupling reactions: Synthesis of Methyl orange and Congo red.Reduction of BDC.
September	B.Sc III Sem. V	X	Unit 3. IR Spectroscopy [06] 3.1 Introduction. 3.2 Principles of IR Spectroscopy. 3.3 Instrumentation, schematic diagram. 3.4 Fundamental modes of vibrations, types and calculation. 3.5 Conditions for absorption of IR radiations. 3.6 Regions of IR spectrum, fundamental group region, finger print region. 3.7 Hook's Law for Calculation of vibrational frequency. 3.8 Factors affecting IR absorption frequency. Unit 4. NMR Spectroscopy [09] 4.1 Introduction. 4.2 Principles of PMR Spectroscopy. 4.3 NMR- Instrumentation, Schematic diagram. 4.4 Magnetic and nonmagnetic nuclei. 4.5 Chemical shift: definition, measurement, calculation, Factors affecting Chemical shift. 4.6 Shielding & deshielding. 4.7 Peak Integration. 4.8 Merits of TMS as PMR reference compound. 4.9 Coupling Constant. 4.10 Types of Coupling Constant. 4.11 Spin-spin splitting (n+1 rule). Practical B.Sc.III:- 4.Estimation of Acid & Ester 5.Organic Preparation no.1 6.Organic Preparation no.2
January & February	B. Sc. I	II	Unit III: Aromaticity (07) Introduction, Characteristics properties of organic compounds, Meaning of terms: Aromatic, Non aromatic, Antiaromatic, Pseudoaromatic , Structure of Benzene: Kekule structure, Resonance structure, M.O. picture, Modern theory of Aromaticity, Mechanism of Electrophilic substitution reactions: Nitration, Sulphonation, Halogenation and Friedel Practicals:- 8.Heat of Ionization 9.Chemical Kinetics II



March	B. Sc. I	II	<p>10. Viscosity</p> <p>Unit IV: Cycloalkanes, cycloalkenes and alkadienes (06)</p> <p>Cycloalkanes: - Introduction. Method of formation - a) By addition of carbene to alkene b) Action of metallic sodium on dihaloalkane c) Diels - Alder reaction d) By reduction of aromatic compounds, Chemical properties- a) Photohalogenation b) Catalytic halogenations c) Catalytic hydrogenation d) Effect of heat e) Reaction with hydrogen halide Cycloalkenes : Introduction, Method of formation from cyclic compounds, Chemical Properties - a) Hydrogenation b) Addition of Halogens and halogen acids, c) Allylic halogenations Alkadienes : Introduction, Classification, Buta-1,3-diene - a) Structure b) Methods of formation - from cyclohexane, From Butane by dehydrogenation, From acetylene, From Butane-1,3 - diol, From ethanol and acetaldehyde (Industrial method), Chemical Properties - a) Reaction with hydrogen halide b) Reaction with halogens -With one molar equivalent of halogens (Cl<sub>2</sub> or Br<sub>2</sub>) c) Diels- Alder reaction d) Reduction – hydrogenation e) Oxidation – Ozonolysis f) Polymerization</p> <p>Practicals:- 11. Chemical Kinetics I 12. Organic Qualitative Analysis -Introduction</p>
June	B. Sc. II	VIII	<p>Unit 3: Carbohydrate [8L]</p> <p>Classification of carbohydrates, reducing and non-reducing sugars, General properties of glucose and fructose, their open chain structure, Epimers, mutarotation and anomers. Determination of configuration of Glucose (Fischer proof). Ring structure of glucose. Determination of size of the ring of Glucose by methylation method. Haworth projection. Cyclic structure of fructose. Linkage between monosaccharides, structure of disaccharides (sucrose, maltose, lactose) and polysaccharides (starch and cellulose) including their structure elucidation.</p>
July	B. Sc. II	VIII	<p>Unit 4: Carbonyl Compounds- Aldehydes and Ketone [6L]</p> <p>4.1 Introduction, Nomenclature, structure. 4.2 Reactivity of Carbonyl group, mechanism of Nucleophilic addition to Carbonyl group 4.3 Reactions: mechanism and application of Aldol condensation, Perkin reaction, Cannizaros reaction, Knoevenagel condensation, Reformatsky reaction.</p> <p>Unit 5: Stereochemistry [8L]</p> <p>5.1 Conformational isomerism – Introduction. 5.2 Representation of conformations of ethane by using Saw- Horse, Fischer (dotted line wedge) and Newmann's projection formulae.</p>



			<p>5.3 Conformations and conformational analysis of ethane and n-butane by Newmann's Projection formula with the help of energy profile diagrams.</p> <p>5.4 Cycloalkanes relative stability - Baeyer's strain theory, Theory of strainless rings.</p> <p>5.5 Conformations and stability of cyclohexane and monosubstituted cyclohexanes Cyclohexanol, bromocyclohexane and methyl cyclohexane.</p> <p>5.6 Locking of conformation in t-butyl cyclohexane.</p>
October	B. Sc III Sem. V	X	<p>Unit 5. Mass Spectroscopy. [08]</p> <p>5.1 Introduction.</p> <p>5.2 Principles of mass spectroscopy.</p> <p>5.3 Mass spectrometer - schematic diagram.</p> <p>5.4 Types of ions produced during fragmentation.</p> <p>5.5 Nitrogen rule</p> <p>5.6 Fragmentation patterns of: alkanes, alkenes, aromatic hydrocarbons, alcohols, phenols, amines and carbonyl compounds.</p> <p>5.7 McLafferty rearrangement.</p> <p>5.8 Applications.</p> <p>Unit 6. Combined Problems based on UV, IR, NMR and Mass Spectral data.</p> <p>B.Sc.III Practical:-</p> <p>5.Organic Preparation no.3</p> <p>6.Organic Preparation no.4</p> <p>7.Organic Preparation no 5</p>
March/April	B. Sc III Sem VI	XIV	<p>Unit 1. Reagents and Reactions in Organic Synthesis [10]</p> <p>A) Reagents</p> <p>Preparation and Applications of following reagents.</p> <ol style="list-style-type: none"> <li>1. Lithium aluminium hydride <math>\text{LiAlH}_4</math>.</li> <li>2. Raney Nickel.</li> <li>3. Osmium tetroxide Selenium dioxide (<math>\text{SeO}_2</math>).</li> <li>5. Dicyclohexyl Carbodiimide (DCC).</li> <li>6. Diazomethane.</li> </ol> <p>B) Reactions</p> <p>Statement, General Reaction, Mechanism and Synthetic applications</p> <ol style="list-style-type: none"> <li>1. Diels -Alder reaction.</li> <li>2. Meerwein -Ponndorf-Verley reduction.</li> <li>3. Hofmann rearrangement.</li> <li>4. Wittig reaction.</li> <li>5. Wagner- Meerwein rearrangement.</li> <li>6. Baeyer Villiger oxidation.</li> </ol>



			<p>7. Problem based on above reactions.</p> <p><b>B.Sc.III Practical:-</b></p> <p>8.Binary Mixture Separation &amp; Identification</p> <p>9.Mixture no.1</p> <p>10.Mixture no.2</p> <p><b>B.Sc.I Practical:-</b></p> <p>13.Organic Spotting no.1</p> <p>14.Organic Spotting no.2</p> <p>15.Organic Spotting no.3</p>
April	B. Sc III Sem VI	XIV	<p>Unit 2. Retrosynthesis [06]</p> <p>2.1 Introduction.</p> <p>2.2 Recapitulation of basics of reaction mechanism and reagents.</p> <p>2.3 Terms used- Target molecule (TM), Disconnection, Synthons, Synthetic equivalence, Functional group interconversion (FGI), one group disconnection (w. r. t. suitable examples).</p> <p>2.4 Retrosynthetic analysis and synthesis of target molecules: Cinnamaldehyde, Cyclohexene, para methoxy acetophenone, Methyl-3-phenyl propionate, <math>\alpha,\alpha</math>-dimethyl benzyl alcohol, Paracetamol.</p>
May	B. Sc III Sem VI	XIV	<p>Unit 3. Electrophilic addition to <math>&gt;C=C&lt;</math> and <math>-C\equiv C-</math> bonds [08]</p> <p>A. Addition to Carbon-Carbon double (<math>&gt;C=C&lt;</math>) bond:</p> <p>3.1 Introduction.</p> <p>3.2 Examples of addition reactions.</p> <p>3.3 Mechanism of electrophilic addition to <math>&gt;C=C&lt;</math> bond, orientation &amp; reactivity,</p> <p>i. Hydrohalogenation.</p> <p>ii. Anti-Markovnikoff's addition (peroxide effect).</p> <p>iii. Rearrangements (support for formation of carbonation)</p>



May

B. Sc  
III  
Sem VI

XIV

iv. Addition of halogens.  
 v. Addition of water.  
 vi. Addition of hypohalous acids (HO-X).  
 vii. Hydroxylation (formation of 1,2-diols).  
 viii. Hydroboration-oxidation (formation of alcohol).  
 ix. Hydrogenation (formation of alkane).  
 x. Ozonolysis (formation of aldehydes & ketones).  
 B. Addition to Carbon-Carbon triple ( $-C\equiv C-$ ) bond:  
 3.4 Introduction.  
 3.5 Examples of addition reactions.  
 3.6 Mechanism of electrophilic addition to  $-C\equiv C-$  bond.  
 i. Addition of halogens.  
 ii. Addition of halogen acids.  
 iii. Addition of hydrogen.  
 iv. Addition of water.  
 v. Formation of metal acetylides.  
 B.Sc.I Practical:-  
 16. Organic Spotting no.4  
 17. Organic Spotting no.5  
 Organic Spotting no.6  
 B.Sc.III Practical:-  
 Mixture no.3  
 Mixture no.4

June

B. Sc

XIV

Unit 4. Natural Products [08]



	III Sem VI		A] Terpenoids: 4.1 Introduction, Occurrence, Isolation, General Characteristic, Classification. 4.2 General Methods for structure determinations. 4.3 Isoprene rule. 4.4 Analytical evidences and synthesis of Citral. B] Alkaloids: 4.5 Introduction, Occurrence, Isolation, Classification, Properties. 4.6 General Methods for structure determination . B.Sc.III Practical :- Mixture no.5 Mixture no.6
July	B. Sc III Sem VI	XIV	Unit 5. Pharmaceuticals [06] 5.1 Introductio. 5.2 Classification. 5.3 Qualities of ideal drug. 5.4 Synthesis and uses of ethambutal, phenobarbitone, isoniazide, benzocaine, Chloramphenicol, paludrine. 5.5 Drug action of sulpha drugs. B.Sc.III Practical:- Mixture no.7 Mixture no.8 Projects

  
Head

Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist-Sangli



## ANNUAL TEACHING PLAN

(Academic Year : 2020-2021)

Dr. kore gurupad dundappa

Associate Professor,

Dept. of Chemistry

Class - B. Sc. I, II & III

Month	Class	Course No.	Units to be completed
November	B. Sc. I	I	Atomic Structure and Periodicity of Elements 1.1 Bohr's theory of hydrogen atom and its limitations 1.2 Wave particle duality 1.3 Heisenberg uncertainty principle 1.4 Quantum numbers and their significance 1.5 Shapes of s, p and d atomic orbitals 1.6 Electrons filling rules in various orbitals: a) Aufbau's principle b) Hund's rule of maximum multiplicity c) Pauli's exclusion principle 1.7 Electronic configuration of elements. Stability of empty, half-filled and completely filled orbitals 1.8 Periodicity of the elements: General discussion of the following properties of the elements with reference to s block elements: a) electronic configuration b) atomic radii c) ionic radii d) ionization energy e) electron affinity f) electronegativity g) metallic characters h) reactivity i) oxidation state j) melting and boiling points k) chemical properties
April	B. Sc. II	VIII	Co-ordination chemistry 1.1 Introduction-Definition and formation of co-ordinate covalent bond in $\text{BF}_3 - \text{NH}_3$ , $[\text{NH}_4]^+$ and $\text{H}_2\text{O}$ 1.2 Distinguish between double salt and complex salt 1.3 Werner's theory- 1.3.1. Postulates 1.3.2. The theory as applied to cobalt amines viz. $\text{CoCl}_3.6\text{NH}_3$ , $\text{CoCl}_3.5\text{NH}_3$ , $\text{CoCl}_3.4\text{NH}_3$ , $\text{CoCl}_3.3\text{NH}_3$ 1.4 Description of the terms- ligand, co-ordination number, co-ordination sphere, Effective atomic number 1.5 IUPAC nomenclature of coordination compounds.



			<p>1.6 Isomerism in complexes with C.N. 4 and 6</p> <p>1.6.1 Geometrical Isomerism</p> <p>1.6.2 Optical Isomerism</p> <p>1.6.3 Structural Isomerism-Ionisation Isomerism, Hydrate Isomerism, Coordination Isomerism, Linkage Isomerism and Co-ordination position Isomerism</p> <p>1.7 Valance bond theory of transition metal complex with respect to, C.N. 4, complexes of Cu and Ni C.N. 6 complexes of Fe and Co</p>
July August	B. Sc. III Sem. V	X	<p>Acids, Bases and Non aqueous Solvents [8]</p> <p>1.1 Introduction to theories of Acids and Bases- Arrhenius concept, Bronsted-Lowry concept, Lewis Concept, Lux-Flood Concept (definition and examples)</p> <p>1.2 Hard and Soft Acids and Bases. (HSAB Concept)</p> <p>1.2.1 Classification of acids and bases as hard, soft and borderline.</p> <p>1.2.2 Pearson's HSAB concept.</p> <p>1.2.3 Acid-Base strength and hardness-softness.</p> <p>1.2.4 Applications and limitations of HSAB principle.</p> <p>1.3 Chemistry of Non aqueous Solvents.</p> <p>1.3.1 Introduction, definition and characteristics of solvents.</p> <p>1.3.2 Classification of solvents.</p> <p>1.3.3 Physical properties and Acid-Base reactions in Liquid Ammonia (NH<sub>3</sub>) and Liquid Sulphur Dioxide (SO<sub>2</sub>).</p> <p>Metal Ligand bonding in Transition Metal Complexes [10]</p> <p>2.1 Crystal field theory (CFT)</p> <p>2.1.1 Introduction: Shapes of d-orbitals, Basic assumptions of CFT.</p> <p>2.1.2 Crystal field splitting of d-orbitals of metal ion in octahedral, tetrahedral, square planar complexes and John-Teller distortion.</p> <p>2.1.3 Factors affecting the Crystal field splitting.</p> <p>2.1.4 High spin and low spin octahedral complexes w.r.t. Co (II).</p> <p>2.1.5 Crystal Field stabilization energy (CFSE), Calculation with respect to octahedral complexes only.</p> <p>2.1.6 Limitations of CFT.</p> <p>2.2 Molecular orbital theory (MOT).</p> <p>2.2.1 Introduction.</p> <p>2.2.2 MOT of octahedral complexes with sigma bonding</p>



			such as [Ti(H <sub>2</sub> O) <sub>6</sub> ] <sup>3+</sup> , [CoF <sub>6</sub> ] <sup>3-</sup> , [Co(NH <sub>3</sub> ) <sub>6</sub> ] <sup>3+</sup> . 2.2.3 Merits and demerits of MOT.
December	B. Sc. I	I	Chemical Bonding and Molecular structure (A) Ionic Bonding (07) 2:1 Definition and formation of ionic bond. General characteristics of ionic bonding 2:2 Energetic in Ionic bond formation 2:3 Born-Haber cycle for NaCl and its applications 2:4 Fajan's Rule, Applications of Fajan's rule for, • Polarizing power and polarizability • Ionic character in covalent compounds • Bond moment, dipole moment and percentage ionic character
May	B. Sc II	VIII	Chemistry of elements of 3d series elements (06) 4.1 Position of elements in periodic table 4.2 Characteristics of d-block elements with special reference to i) Electronic structure ii) Oxidation states, stability of oxidation states of Fe with respect to Latimer diagram iii) Magnetic character iv) Colored ions v) Complex formation
September	B.Sc III Sem. V	X	Metals, Semiconductors and Superconductors. [9] 3.1 Introduction. 3.2 Properties of metallic solids. 3.3 Theories of bonding in metal. i. Free electron theory. ii. Molecular orbital theory (Band theory). 3.4 Classification of solids as conductor, insulators and semiconductors on the basis of band theory. 3.5 Semiconductors- Types - intrinsic and extrinsic and applications of semiconductors. 3.6 Superconductors: Ceramic superconductors - Preparation and structures of mixed oxide YBa <sub>2</sub> Cu <sub>3</sub> O <sub>7-x</sub> . 3.7 Applications of superconductors. Organometallic Chemistry. [4] 4.1 Definition, Nomenclature of organometallic compounds. 4.2 Synthesis and structural study of alkyl and aryl



			<p>compounds of Be and Al.</p> <p>4.3 Mononuclear carbonyls -Nature of bonding in simple mononuclear carbonyls.:<math>[\text{Ni}(\text{CO})_4]</math>, <math>[\text{Fe}(\text{CO})_5]</math>, <math>[\text{Cr}(\text{CO})_6]</math>.</p>
January & February	B. Sc. I	I	<p>Chemical Bonding and Molecular structure (C)</p> <p>Molecular orbital theory (MOT) (07)</p> <p>4.1 LCAO method, formation of bonding , anti bonding and nonbonding molecular orbitals.</p> <p>4.2 Conditions for successful overlap, Types of overlaps - S-S ,S-px, Px-Px, Py-Py and Pz-Pz overlaps.</p> <p>4.3 Bond order and its significance.</p> <p>4.4 Energy level sequence for molecular orbital when <math>n=1 \&amp; 2</math>.</p> <p>4.5 MO diagrams for homonuclear diatomic molecule of 1st &amp; 2nd period Elements ( He<sub>2</sub>, Li<sub>2</sub>, B<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>).</p> <p>4.6 Molecular orbital diagrams for heteroatomic diatomic molecules. (CO, NO )</p>
March	B. Sc. I	I	<p>Unit III: Chemical Bonding and Molecular structure (B)</p> <p>Valence bond theory (VBT). (07)</p> <p>3.1 Concept of hybridization, different types of hybridization and geometry of following molecules,</p> <ul style="list-style-type: none"> <li>• Linear geometry- BeCl<sub>2</sub> ( sp hybridization )</li> <li>3</li> <li>• Planer trigonal geometry- BF<sub>3</sub> (sp<sup>2</sup> hybridization )</li> <li>• Tetrahedral geometry- SiCl<sub>4</sub> (sp<sup>3</sup> hybridization)</li> <li>• Trigonal bipyramidal geometry- PCl<sub>5</sub> (sp<sup>3</sup>d hybridization )</li> <li>• Octahedral geometry- SF<sub>6</sub> ( sp<sup>3</sup>d<sup>2</sup> hybridization )</li> <li>• Pentagonal bipyramidal geometry -IF<sub>7</sub> ( sp<sup>3</sup>d<sup>3</sup> hybridization)</li> </ul>
June	B. Sc. II	VIII	<p>P- Block elements ( Group 13, 14 and 15 ) (09)</p> <p>3.1. Position of elements in periodic table</p> <p>3.2. Characteristics of p-block elements with special reference to Electronic configuration and Periodic properties</p> <p>3.3. Compounds of group 13,14 and 15</p> <p>3.3.1 Boron-Diborane method of preparation and nature of bonding (structure)</p> <p>3.3.2 Borazine method of preparation and nature of bonding (structure)</p>




			<p>3.3.3 Allotropes of carbon and phosphorus</p> <p>3.3.4 Oxyacids of nitrogen – HNO<sub>2</sub> , HNO<sub>3</sub>.</p> <p>3.3.5 Hydrides of Nitrogen- NH<sub>3</sub> and N<sub>2</sub>H<sub>4</sub></p>
July	B. Sc. II	VIII	<p>Inorganic semi-micro qualitative analysis (08)</p> <p>5.1 Theoretical principles involved in qualitative analysis.</p> <p>5.2 Applications of solubility product and common ion effect in separation of cations into groups.</p> <p>5.3 Application of complex formation in</p> <p>a) Separation of II group into IIA and IIB sub-groups.</p> <p>b) Separation of Copper from Cadmium.</p> <p>c) Separation of Cobalt from Nickel.</p> <p>d) Separation of Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>.</p> <p>e) Detection of NO<sub>2</sub> - , NO<sub>3</sub> - (Brown ring test).</p> <p>5.4 Application of oxidation and reduction in</p> <p>a) Separation of Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup> in mixture b) Separation of NO<sub>2</sub> - and NO<sub>3</sub> - in mixture.</p> <p>5.5 Spot test analysis.</p>
April	B.Sc II	VIII	<p>Chelation (05)</p> <p>2.1 A brief introduction with respect to ligands, chelating agent, chelation and metal chelates.</p> <p>2.2 Structural requirements of chelate formation</p> <p>2.3 Difference between metal chelate and metal complex</p> <p>2.4 Classification of chelating agents (with specific illustration of bidentate chelating agents)</p> <p>2.5 Application of chelation with respect to chelating agents - EDTA and DMG</p>
October	B. Sc III Sem. V	X	<p>Catalysis</p> <p>5.1 Introduction</p> <p>5.2 Classification of catalytic reaction- Homogenous and Heterogeneous</p> <p>5.3 Types of Catalysis.</p> <p>5.4 Characteristics of catalytic reactions.</p> <p>5.5 Mechanism of catalysis</p>
April	B. Sc III Sem VI	XIV	<p>Inorganic Reaction mechanism</p> <p>1.1 Introduction.</p> <p>1.2 Classification of Mechanism: Association, dissociation, interchange and the rate determining steps.</p> <p>1.3 SN<sub>1</sub> and SN<sub>2</sub></p> <p>2 reactions for inert and labile complexes.</p>



			<p>1.4 Mechanism of substitution in cobalt (III) octahedral complexes.</p> <p>1.5 Trans effect and its theories.</p> <p>1.6 Applications of trans effect in synthesis of Pt (II) complexes.</p>
April	B. Sc III Sem VI	XIV	<p>Thermodynamic and Kinetic aspects of metal complexes.</p> <p>1.7 Introduction.</p> <p>1.8 Thermodynamic stability.</p> <p>26</p> <p>1.9 Kinetic Stability.</p> <p>1.10 Relation between thermodynamic and kinetic stability.</p> <p>1.11 Stepwise stability constant.</p> <p>1.12 Factor affecting the stability of complexes.</p> <p>1.13 Determination of Stability constant by Job variation, Mole ratio and Slope ratio method.</p>
May	B. Sc III Sem VI	XIV	<p>Nuclear Chemistry [05]</p> <p>2.1 Nuclear reactions and energetic of nuclear reactions.</p> <p>2.2 Types of nuclear reactions</p> <p>i. Artificial transmutation.</p> <p>ii. Artificial radioactivity.</p> <p>iii. Nuclear fission and its application in heavy water nuclear reactor.</p> <p>iv. Nuclear fusion.</p> <p>2.3 Use of Thorium, Uranium and Plutonium in atomic energy</p> <p>2.4 Applications of radio-isotopes as tracers.</p> <p>i. Chemical investigation – Esterification.</p> <p>ii. Structural determination – Phosphorus pentachloride.</p> <p>iii. Analytical Chemistry – Isotopic dilution method for determination of volume of blood Actinides</p> <p>3.7 Position in periodic table.</p> <p>3.8 Electronic configuration.</p> <p>3.9 General methods of preparation of transuranic elements.</p> <p>i. Neutron capture – followed by <math>\beta</math> decay.</p> <p>ii. Accelerated projectile bombardment.</p> <p>iii. Heavy ion bombardment.</p> <p>3.10 IUPAC nomenclature of the super heavy elements with atomic number (Z) greater than 100</p>
May	B. Sc III	XIV	Iron and Steel. [07]



	Sem VI		<p>4.1 Occurrence and ores of iron.</p> <p>4.2 Definition of the Terms- Ore , Mineral, Slag, Flux, Gangue , Matrix, Calcinations, Reduction, Roasting, Smelting and Leaching.</p> <p>4.3 Extraction of iron by Blast furnace.</p> <p>4.4 Steel: Definition and types.</p> <p>4.5 Conversion of cast iron into steel by</p> <p>i. Bessemer process.</p> <p>ii. L.D. process.</p> <p>4.6 Heat treatment on steel</p> <p>Chemistry of f- Block Elements [09]</p> <p>A ] Lanthanides</p> <p>3.1 Introduction.</p> <p>3.2 Occurrence.</p> <p>3.3 Electronic Configuration.</p> <p>3.4 Oxidation State.</p> <p>3.5 Lanthanide contraction.</p> <p>3.6 Separation of Lanthanides by Ion exchange method.</p> <p>27</p> <p>B] Actinides</p> <p>3.7 Position in periodic table.</p> <p>3.8 Electronic configuration.</p> <p>3.9 General methods of preparation of transuranic elements.</p> <p>i. Neutron capture – followed by <math>\beta</math> decay.</p> <p>ii. Accelerated projectile bombardment.</p> <p>iii. Heavy ion bombardment.</p> <p>3.10 IUPAC nomenclature of the super heavy elements with atomic number (Z) greater than 100.</p> <p>Unit</p>
June	B. Sc III Sem VI	XIV	<p>Bio-inorganic Chemistry. [05]</p> <p>5.1 Introduction.</p> <p>5.2 Essential and trace elements in biological process.</p> <p>5.3 Metalloporphyrins with special reference to hemoglobin and myoglobin.</p> <p>5.4 Biological role of alkali and alkaline earth metal ions with special referenc to <math>\text{Na}^+</math>, <math>\text{K}^+</math> and <math>\text{Ca}^{2+}</math></p>

  
 Head  
 Department Of Chemistry  
 P. V. P. Mahavidyalaya,  
 K. Mahankal, Dist-Sangli



## ANNUAL TEACHING PLAN

(Academic Year: 2020-2021)

**Mr. Avinash Ashok Kamble**

Assistant Professor

Dept. of Chemistry

Month	Class	Paper No.	Unit to be completed
Sept 2020	B.Sc-III	XII	<b>Unit Potentiometric titrations</b> Introduction, Determination of pH., Study of Quinhydrone and Glass electrodes and their use in determination of pH., Potentiometric titrations: Classical and analytical methods for locating end points. Acids- Bases titration with suitable example. Redox titration with suitable example. Precipitation titration with suitable example. Basic circuit of direct reading potentiometer. Advantages of potentiometric titrations.
	B.Sc-II	V	<b>Unit- Electrolytic Conductivity</b> -Introduction, Types of conductors, Conductivity, Equivalent and Molar conductivity and their variation with dilution for weak and strong electrolytes in aqueous solution.
Oct 2020	B.Sc-III	XII	<b>Unit -Theory of Gravimetric Analysis</b> Introduction Gravimetric analysis by precipitation: nucleation, crystal growth, digestion/ageing, filtration, drying, ignition, weighing. Optimum conditions for good precipitation. Physical nature of precipitate. Purity of precipitate: co-precipitation, post precipitation. Organic precipitants and their applications.
	B.Sc-II	V	Unit- I Electrolytic Conductivity- Equivalent conductivity at infinite dilution, Measurement of conductance by using Wheatstone bridge. Kohlrausch law of independent migration of ions and its applications such as Ionic mobility, determination of degree of ionization of weak electrolyte,
		Practical	B.Sc-III Chemical kinetics I,II
	B.Sc-III	XII	<b>Unit-Chromatographic techniques and Quality control</b> Introduction, classification. Column chromatography: Introduction, types, Principle of adsorption column



			(Snell's law), Specific and Molecular refractivities and its determination using Abbe's refractometer.
Feb 2021	B.Sc-III		<b>Unit-Colorimetry and Spectrophotometry</b> 3.1 Theory of colorimetry and spectrophotometry. Lambert Beer's law, deviation from Beer's law. Terms used in colorimetry and spectrophotometry. Classification of methods of 'colour' measurement or comparison. Photoelectric colorimeter method—Single beam photo-electric colorimeter. Spectrophotometer method—Single beam direct reading spectrophotometer. Determination of unknown concentration by using concentration-absorbance plot. Applications of colorimetry and spectrophotometry.
	B.Sc-II		<b>Unit – Surface Chemistry</b> Introduction, Adsorption as a surface phenomenon, Definition of adsorption, adsorbent, adsorbate, adsorbent. factors affecting adsorption, Types of adsorption, Distinction between physical and chemical adsorption, Adsorption isotherms: Freundlich adsorption isotherm, Langmuir adsorption isotherm. Types of physical adsorption isotherms, applications of adsorption.
March 2021	University Exam		
Apr 2021	B.Sc-I		<b>Unit. Theory of titrimetric Analysis</b> Introduction Acid-base indicators Theory of indicators w.r.t. Ostwald's ionization theory and quinoid theory Neutralization curves and choice of indicators, complexometric titrations.
	B.Sc-III		<b>Unit. Sugar Industry</b> Introduction. Manufacture of cane sugar in India: Extraction of juice, Clarification, Concentration, crystallization, centrifugation and other details of industrial process. Byproducts of sugar industry. Manufacture of Ethyl Alcohol from Molasses: by Fermentation.
		Practical	B.Sc-III- Potentiometry I,II,III,IV B.Sc-II- Chemical kinetics I,II,III B.Sc-I Eudiometer
May 2021	B.Sc-I		<b>Unit. Water Analysis</b> Physical analysis of water – pH, Conductance, Colour, odour, Turbidity and taste



			Chemical Analysis – Total Dissolved solids , Hardness, Salinity, Alkalinity, Acidity, Sulphates, Nitrates, Dissolved Oxygen, Chemical Oxygen Demand, Biological Oxygen Demand
	B.Sc-III		<b>Unit- Manufacture of Industrial Heavy Chemicals</b> 2.1 Introduction Manufacture of Ammonia (NH <sub>3</sub> ) Manufacture of Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> ) Manufacture of Nitric acid (HNO <sub>3</sub> ) Manufacture of Sodium carbonate (Na <sub>2</sub> CO <sub>3</sub> )
	Practical	Practical	B.Sc-III- conductometry I,II,III,IV B.Sc-II- Conductometry I,II,III B.Sc-I Enthalpy of neutralization
Jun 2021	B.Sc-I		<b>Unit. Analysis of Fertilizers</b> Introduction Types of fertilizers Necessity and requirements of good fertilizers Sampling and sample preparation Analysis of Nitrogen by Kjeldahl's method Analysis of Phosphorus by phosphomolybdate method Analysis of Potassium by sodium tetraphenyl borate method
	B.Sc-III		<b>Unit. Synthetic Polymers</b> Introductio,Classification. Addition Polymerization: Free radical addition and ionic addition polymerization.Zigler Nata polymerization. Methods of preparation and applications of some organic polymers: Conducting organic polymers: Synthesis and properties of Polyaniline, polypyrrol. Applications of conducting organic polymers.
	Practical		B.Sc-III- PH metry I, Refractometry I,II B.Sc-II- Refractometry I,II B.Sc-I  Hydrolysis of methyl acetate
Jul 2021	B.Sc-I		<b>Unit-Chromatography</b> Introduction, Basic Principle of Chromatography, Basic terms, Classification of Chromatography Paper Chromatography-Thin layer chromatography Comparison of paper chromatography and TLC



	B.Sc-III		<b>Unit. Nanotechnology</b> Introduction of nanotechnology, history, Classification of nanoparticles based on size. Optical properties of Nanomaterial's i. Semiconducting NPs. ii. Metallic NPs. Synthetic Routes of nanomaterials: Top-down and bottom-up approaches. Synthesis methods: Sol-gel, precipitation, chemical reduction, chemical vapor deposition, hydrothermal, electrodeposition. Characterization of nanomaterials: X-Ray diffractometer, Scanning Electron Microscope, Transmission electron microscope. Applications
	Practical		B.Sc-III- colorimetry I,II, B.Sc-II- Revision B.Sc-I Solubility
Aug & Sept 2021	Practical Exams of B.Sc.-I, II, III		

  
Head

Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist-Sangli



## ANNUAL TEACHING PLAN

(Academic Year: 2021-2022)

**Mr.Subhash V Patil**

Asso.Prof.& Head

Dept. of Chemistry

Month	Class	Paper No.	Unit to be completed (Theory/ Practical)
Oct.21	B.Sc-III	X	Unit 1. Introduction to Spectroscopy [03]  1.1 Meaning of spectroscopy. 1.2 Nature of electromagnetic radiation: wavelength, frequency, energy, amplitude, wave number and their relationship. 1.3 Different units of measurement of wavelength and frequency. 1.4 Different regions of electromagnetic radiations.  1.5 Interaction of radiation with matter: absorption, emission, fluorescence and scattering. 1.6 Types of spectroscopy and advantages of spectroscopic methods. 1.7 Energy types and energy levels of atoms and molecules. To the
	B.Sc-I	II	Introduction of Course & Syllabus
	Practical		B.Sc.I:- 1. Formation of batches & Introduction, General instructions B.Sc.III:- Formation of batches & Introduction, General instructions
Nov..21	B.Sc-III	X	Unit 2. UV-V Spectroscopy [05] 2.1 Introduction.  2.2 Beer-Lambert's law, absorption of UV radiation by organic



			<p>molecules leading to different excitations.</p> <p>2.3 Terms used in UV Spectroscopy: Chromophore, Auxochrome, Bathochromic shift, hypsochromic shift, hyperchromic and hypochromic effect.</p> <p>2.4 Modes of electromagnetic transitions. .</p> <p>2.5 Effect of conjugation on position of UV band.</p> <p>2.6 Calculation of <math>\lambda_{max}</math> by Woodward and Fischer rules for dienes and enones.</p> <p>2.7 Colour and visible spectrum.</p> <p>2.8 Applications of UV Spectroscopy.</p>
B.Sc-I	II		<p>Unit I: Fundamentals of Organic Chemistry (08)</p> <p>Introduction, Curved arrow notations, Cleavage of Bonds: Homolysis and Heterolysis. Organic molecular species: Nucleophiles and electrophiles. Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyper conjugation effect,</p>
	Practical		<p>B..Sc.I:-</p> <p>2.Volumetric Estimation of <math>KMnO_4</math></p> <p>3.Volumetric Estimation of FAS</p> <p>4.Water Analysis</p> <p>B.Sc.III:-</p> <p>1.Determination of Molecular weight</p> <p>2.Estimation of cane sugar</p> <p>3.Saponification value of an oil</p>



Dec.21	B.Sc-III	X	Unit 3. IR Spectroscopy [06] 3.1 Introduction. 3.2 Principles of IR Spectroscopy. 3.3 Instrumentation, schematic diagram. 3.4 Fundamental modes of vibrations, types and calculation. 3.5 Conditions for absorption of IR radiations. 3.6 Regions of IR spectrum, fundamental group region, finger print region. 3.7 Hook's Law for Calculation of vibrational frequency. 3.8 Factors affecting IR absorption frequency.
	B.Sc-I	II	Reactive Intermediates: Generation, Structure, Stability and Reactions of Carbocations, Carbanions and carbon free radicals. nit II: Stereochemistry (09) Introduction, Types of Stereoisomerism, Optical Isomerism: Concept of Chirality, Elements of Symmetry, Optical Isomerism in tartaric acid, 2, 3 Dihydroxybutanoic acid
		Practical	B.Sc.I - 5.PaperChromatography 6.SpotTests 7.DeterminationofEquivalentwt.ofmetal B.Sc.III:- 4.Estimation of Acid & Ester 5.Organic Preparation no.1 6.Organic Preparation no.2
	B.Sc-III	X	Unit 4. NMR Spectroscopy [09] 4.1 Introduction. 4.2 Principles of PMR Spectroscopy. 4.3 NMR-Instrumentation, Schematic diagram. 4.4 Magnetic and nonmagnetic nuclei. 4.5 Chemical shift: definition, measurement,



Jan.22			calculation, Factors affecting Chemical shift.
	B.Sc-I	II	Enantiomerism, Diastereomerism and Meso compounds, Geometrical isomerism in C=C, C=N and alicyclic compounds. Nomenclature of stereoisomers: D and L, erythro and threo, R and S, E and Z. Nomenclature.
Jan. 22		Practical	<p>B.Sc.I:-</p> <p>8.Heat of Ionization</p> <p>9.Chemical Kinetics II</p> <p>10.Viscosity</p> <p>B.Sc.III:-</p> <p>5.Organic Preparation no.3</p> <p>6.Organic Preparation no.4</p> <p>7.Organic Preparation no 5</p>
	B.Sc-III	X	<p>4.6 Shielding &amp; deshielding.</p> <p>4.7 Peak Integration.</p> <p>4.8 Merits of TMS as PMR reference compound.</p> <p>4.9 Coupling Constant.</p> <p>4.10 Types of Coupling Constant.</p> <p>4.11 Spin-spin splitting (n+1 rule).</p> <p>4.12 Applications.</p>
	B.Sc.1	II	Previous University Question Paper -Nature & Analysis




		Practical	11.Organic Estimation of Acetamide  Organic Qualitative Analysis
Feb.22	University Exam		
	B.Sc-III	XIV	Unit 3 Electrophilic Addition to C=C & C=C. Addition to carbon carbon double bond Addition to carbon carbon triple bond
		Practical	B.Sc.I:-  Organic Compound no.1  OrganicCompoundno.2  B.Sc.III:-  Mixture no.3  Mixture no.4
April.22			
	B.Sc-III	XIV	Unit 5 Pharmaceuticals  Introduction,classification,Qualities



			of ideal drug, Synthesis & uses of Ethambutal, phenobarbitone, Isiniazide, Benzocaine, Chloramphenicol, Paludrine. Drug action of Sulphate drugs.
	Practical	Practical	B.Sc.1:- OrganicCompoundno.3 OrganicCompoundno.4 B.Sc.III:- Mixture no.5 Mixture no.6
May.22			
	B.Sc-III	XIV	Unit 4 Natural Products Terpenoids:- Occurance, Methods of Structure Determination, Isoprene rule, Analytical evidences & Synthesis of Citral & alpha-Terpineol
	Practical		B.Sc.I:- OrganicCompoundno.5 OrganicCompoundno.6 B.Sc.III:- Mixture no.7 Mixture no.8
Jun.22			
	B.Sc-III	XIV	Alkaloids:-



			Occurance, Methods of Structure Determination, Analytical evidence, Synthesis of Ephedrine & Nicotine
	Practical		B.Sc.I:- Assessment of Journals B.Sc.III:- Projects
July/Aug 22	Practical Exams of B.Sc.-I, II, III		

  
Head  
Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K.Mahankal,Dist-Sangli



## ANNUAL TEACHING PLAN

(Academic Year: 2022-2023)

**Mr. Subhash V Patil**

Asso.Prof.& Head

Dept. of Chemistry

Month	Class	Paper No.	Unit to be completed (Theory/ Practical)
AUG	B.Sc-III	X	Unit 1. Introduction to Spectroscopy [03] 1.1 Meaning of spectroscopy. 1.2 Nature of electromagnetic radiation: wavelength, frequency, energy, amplitude, wave number and their relationship. 1.3 Different units of measurement of wavelength and frequency. 1.4 Different regions of electromagnetic radiations. 1.5 Interaction of radiation with matter: absorption, emission, fluorescence and scattering. 1.6 Types of spectroscopy and advantages of spectroscopic methods. 1.7 Energy types and energy levels of atoms and molecules. To the
	B.Sc-I	II	Introduction of Course & Syllabus
	Practical		B.Sc.I:- 1. Formation of batches & Introduction, General instructions B.Sc.III:- Formation of batches & Introduction, General instructions
SEPT	B.Sc-III	X	Unit 2. UV-Vis Spectroscopy [05] 2.1 Introduction. 2.2 Beer-Lambert's law, absorption of UV radiation by organic molecules leading to different excitations. 2.3 Terms used in UV Spectroscopy: Chromophore, Auxochrome, Bathochromic shift, hypsochromic shift, hyperchromic and hypochromic effect. 2.4 Modes of electromagnetic transitions. 2.5 Effect of conjugation on position of UV band. 2.6 Calculation of $\lambda_{max}$ by Woodward and Fischer rules for dienes and enones. 2.7 Colour and visible spectrum.



			2.8 Applications of UV Spectroscopy.
	B.Sc-I	II	Unit I: Fundamentals of Organic Chemistry (08) Introduction, Curved arrow notations, Cleavage of Bonds: Homolysis and Heterolysis. Organic molecular species: Nucleophiles and electrophiles. Electron Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyper conjugation effect,
		Practical	B..Sc.I:- 2.Volumetric Estimation of $KMnO_4$ 3.Volumetric Estimation of FAS 4.Water Analysis B.Sc.III:- 1.Determination of Molecular weight 2.Estimation of cane sugar 3.Saponification value of an oil
OCT	B.Sc-III	X	Unit 3. IR Spectroscopy [06] 3.1 Introduction. 3.2 Principles of IR Spectroscopy. 3.3 Instrumentation, schematic diagram. 3.4 Fundamental modes of vibrations, types and calculation. 3.5 Conditions for absorption of IR radiations. 3.6 Regions of IR spectrum, fundamental group region, finger print region. 3.7 Hook's Law for Calculation of vibrational frequency. 3.8 Factors affecting IR absorption frequency.
	B.Sc-I	II	Reactive Intermediates: Generation, Structure, Stability and Reactions of Carbocations, Carbanions and carbon free radicals. nit II: Stereochemistry (09) Introduction, Types of Stereoisomerism, Optical Isomerism: Concept of Chirality, Elements of Symmetry, Optical Isomerism in tartaric acid, 2, 3 Dihydroxybutanoic acid
		Practical	B.Sc.I - 5.Paper Chromatography 6.Spot Tests 7.Determination of Equivalent wt. of metal B.Sc.III:- 4.Estimation of Acid & Ester 5.Organic Preparation no.1 6.Organic Preparation no.2
	B.Sc-III	X	Unit 4. NMR Spectroscopy [09] 4.1 Introduction. 4.2 Principles of PMR Spectroscopy.



NOV			4.3 NMR- Instrumentation, Schematic diagram. 4.4 Magnetic and nonmagnetic nuclei. 4.5 Chemical shift: definition, measurement, calculation, Factors affecting Chemical shift.
	B.Sc-I	II	Enantiomerism, Diastereomerism and Meso compounds, Geometrical isomerism in C=C, C=N and alicyclic compounds. Nomenclature of stereoisomers: D and L, erythro and threo, R and S, E and Z. Nomenclature.
		Practical	B.Sc.I:- 8.Heat of Ionization 9.Chemical Kinetics II 10.Viscosity B.Sc.III:- 5.Organic Preparation no.3 6.Organic Preparation no.4 7.Organic Preparation no 5
JAN	B.Sc-III	X	4.6 Shielding & de shielding. 4.7 Peak Integration. 4.8 Merits of TMS as PMR reference compound. 4.9 Coupling Constant. 4.10 Types of Coupling Constant. 4.11 Spin-spin splitting (n+1 rule). 4.12 Applications.
	B.Sc.1	II	Previous University Question Paper -Nature & Analysis
		Practical	11.Organic Estimation of Acetamide Organic Qualitative Analysis



	B.Sc-III	XIV	Unit 3 Electrophilic Addition to C=C & C=C. Addition to carbon carbon double bond Addition to carbon carbon triple bond
	Practical		B.Sc.I:- Organic Compound no.1 Organic Compoundno.2 B.Sc.III:- Mixture no.3 Mixture no.4
FEB			
	B.Sc-III	XIV	Unit 5 Pharmaceuticals Introduction, classification, Qualities of ideal drug, Synthesis & uses of Ethambutal, phenobarbitone, Isiniazide, Benzocaine, Chloramphenicol, Paludrine. Drug action of Sulphate drugs.
	Practical	Practical	B.Sc.I:- OrganicCompoundno.3 OrganicCompoundno.4 B.Sc.III:- Mixture no.5 Mixture no.6
MARCH			
	B.Sc-III	XIV	Unit 4 Natural Products Terpenoids:- Occurance, Methods of Structure Determination ,Isoprene rule, Analytical evidences & Synthesis of Citral & alpha-Terpineol
	Practical		B.Sc.I:- OrganicCompoundno.5 OrganicCompoundno.6 B.Sc.III:- Mixture no.7 Mixture no.8



APR			
	B.Sc-III	XIV	Alkaloids:- Occurance, Methods of Structure Determination, Analytical evidence, Synthesis of Ephidrene & Nicotine
	Practical		B.Sc.I:- Assessment of Journals B.Sc.III:- Projects
MAY	Practical Exams of B.Sc.-I, II, III		

*[Signature]*  
Head

Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K.Mahankal,Dist-Sangli



# ANNUAL TEACHING PLAN

(Academic Year : 2021-2022)

Dr. KoreGurupad Dundappa

Associate Professor,

Dept. of Chemistry

Class - B. Sc. I, II & III

Month	Class	Course No.	Units to be completed
August	B. Sc. I	I	<p><b>Chemical Bonding and Molecular structure (A) Ionic Bonding (07)</b></p> <p>2:1 Definition and formation of ionic bond. General characteristics of ionic bonding</p> <p>2:2 Energetic in ionic bond formation</p> <p>2:3 Born-Haber cycle for NaCl and its applications</p> <p>2:4 Fajan's Rule, Applications of Fajan's rule for,</p> <ul style="list-style-type: none"><li>• Polarizing power and polarizability</li><li>• Ionic character in covalent compounds</li><li>• Bond moment, dipole moment and percentage ionic character</li></ul> <p><b>Practicals B.Sc. I:-</b></p> <p>1. Introduction &amp; Instructions to handle Instruments &amp; glassware etc.</p>
September	B Sc. I	I	<ul style="list-style-type: none"><li>• Polarizing power and polarizability</li></ul>



			<ul style="list-style-type: none"> <li>• Ionic character in covalent compounds</li> <li>• Bond moment, dipole moment and percentage ionic character</li> </ul> <p>Practical B.Sc. I:-</p> <ol style="list-style-type: none"> <li>2. Volumetric Estimation of <math>KMnO_4</math></li> <li>3. Volumetric Estimation of FAS</li> </ol>
October	B.Sc. I	I	<p><b>Unit III: Chemical Bonding and Molecular structure (B) Valence bond theory (VBT). (07)</b></p> <p>3.1 Concept of hybridization, different types of hybridization and geometry of following molecules,</p> <ul style="list-style-type: none"> <li>• Linear geometry- <math>BeCl_2</math> ( <math>sp^3</math> hybridization )</li> <li>• Planer trigonal geometry- <math>BF_3</math> (<math>sp^2</math> hybridization)</li> </ul> <p>Practicals B Sc. I :-</p> <ol style="list-style-type: none"> <li>4. .Water Analysis</li> <li>5. Paper Chromatography</li> </ol>
October	B.Sc. III	IX	<p><b>Metal Ligand bonding in Transition Metal Complexes [10]</b></p> <p>Introduction</p>
November	B.Sc I	I	<ul style="list-style-type: none"> <li>• Tetrahedral geometry- <math>SiCl_4</math> (<math>sp^3</math> hybridization)</li> <li>• Trigonal bipyramidal geometry- <math>PCl_5</math> (<math>sp^3d</math> hybridization)</li> <li>• Octahedral geometry- <math>SF_6</math> (<math>sp^3d^2</math> hybridization)</li> <li>• Pentagonal bipyramidal geometry- <math>IF_7</math> (<math>sp^3d^3</math> hybridization)</li> </ul>



			<p><b>Practicals B.Sc.I:-</b></p> <p>7.DeterminationofEquivalentwt.ofmetal.</p> <p>8.Heatofionization</p> <p>9.ChemicalKineticsII</p>
Novem ber	B Sc. III	IX	<p>2.1Crystalfieldtheory(CFT)</p> <p>2.1.1Introduction:Shapesofd-orbitals,BasicassumptionsofCFT.</p> <p>2.1.2Crystalfieldsplittingofd-orbitalsofmetalionin octahedral, tetrahedral, square planar complexes and John-Teller distortion.</p> <p>2.1.3Factors affecting the Crystal fields splitting.</p> <p>2.1.4High spin and low spin octahedral complexes w.r.t. Co(II).</p> <p>2.1.5Crystal Field stabilization energy (CFSE), Calculation with respect to octahedral complexes only.</p> <p>2.1.6Limitations of CFT.</p> <p>2.2Molecularorbitaltheory(MOT).</p> <p>2.2.1Introduction.</p> <p>2.2.2MOT of octahedral complexes with sigma bondings such as <math>[Ti(H_2O)_6]^{3+}</math>, <math>[CoF_6]^{3-}</math>, <math>[Co(NH_3)_6]^{3+}</math>.</p> <p>2.2.3Merits and demerits of MOT.</p> <p><b>Practical B.Sc.III:-</b></p> <p>1. Gravimetric Estimation of Iron</p> <p>2. Gravimetric Estimation of Barium</p>



Decem ber	B.Sc. I	I	<p><b>Chemical Bonding and Molecular structure (C) Molecular orbital theory (MOT). (07)</b></p> <p>4.1 LCAO method, formation of bonding, antibonding and nonbonding molecular orbitals.</p> <p>4.2 Conditions for successful overlap, Types of overlaps-S-S, S-px, Px-Px, Py-Py and Pz-Pz overlaps.</p> <p>4.3 Bond order and its significance.</p> <p><b>Practical B.Sc.I:-</b></p> <p>10. Viscosity</p> <p>11. Chemical Kinetics I</p>
Decem ber	B.Sc. III	IX	<p><b>Metals, Semiconductors and Superconductors. [9]</b></p> <p>3.1 Introduction.</p> <p>3.2 Properties of metallic solids.</p> <p>3.3 Theories of bonding in metal.</p> <p>i. Free electron theory.</p> <p>ii. Molecular orbital theory (Band theory).</p> <p>3.4 Classification of solids as conductor, insulators and semiconductor on the basis of band theory.</p> <p>3.4 Classification of solids as conductor, insulators and semiconductor on the</p>



			<p>basis of band theory.</p> <p>3.5 Semiconductors - Types - intrinsic and extrinsic and applications of semiconductors.</p> <p>3.6 Superconductors: Ceramics superconductors - Preparation and structures of mixed oxide <math>YBa_2Cu_3O_{7-x}</math>.</p> <p>3.7 Applications of superconductors.</p> <p>Practical B.Sc. III:-</p> <p>3. Preparation -1 4. Preparation -2</p>
January	B.Sc. I	I	<p>4.4 Energy level sequence for molecular orbital when <math>n=1</math> &amp; 2.</p> <p>4.5 MO diagrams for homonuclear diatomic molecule of 1st &amp; 2nd period elements (<math>He_2, Li_2, B_2, N_2, O_2</math>).</p> <p>4.6 Molecular orbital diagrams for heteroatomic diatomic molecules. (CO, NO)</p> <p>Practical B.Sc. I:-</p> <p>12. Organic Qualitative Analysis - Introduction 13. Organic Spotting no. 1</p>
January	B.Sc. III	IX	<p><b>Organometallic Chemistry. [4]</b></p> <p>4.1 Definition, Nomenclature of organometallic compounds.</p> <p>4.2 Synthesis and structural study of alkyl and aryl compounds of Be and Al.</p> <p>4.3 Mononuclear carbonyls - Nature of bonding in simple mononuclear carbonyls: <math>[Ni(CO)_4]</math>, <math>[Fe(CO)_5]</math>, <math>[Cr(CO)_6]</math>.</p>



			<p><b>Catalysis (05)</b></p> <p>5.1 Introduction</p> <p>5.2 Classification of catalytic reaction - Homogenous and Heterogeneous</p> <p>5.3 Types of Catalysis.</p> <p>5.4 Characteristics of catalytic reactions.</p> <p>5.5 Mechanism of catalysis</p> <p><b>Practical B.Sc.III:-</b></p> <p>5. Preparation -3</p> <p>6. Preparation -4</p>
March	B Sc. II	VII	<p><b>Co-ordination chemistry (10)</b></p> <p>1.1 Introduction - Definition and formation of co-ordinate covalent bond in <math>\text{BF}_3\text{-NH}_3</math>, <math>[\text{NH}_4]^+</math> and <math>\text{H}_2\text{O}</math></p> <p>1.2 Distinguish between double salt and complex salt</p> <p>1.3 Werner's theory -</p> <p>1.3.1 Postulates</p> <p>1.3.2 The theory as applied to cobalt amines viz. <math>\text{CoCl}_3.6\text{NH}_3</math>, <math>\text{CoCl}_3.5\text{NH}_3</math>, <math>\text{CoCl}_3.4\text{NH}_3</math>, <math>\text{CoCl}_3.3\text{NH}_3</math></p> <p>1.4 Description of the terms - ligand, co-ordination number, co-ordination sphere, Effective atomic number</p> <p>1.5 IUPAC nomenclature of coordination compounds.</p> <p>1.6 Isomerism in complexes with C.N.4 and 6</p> <p>1.6.1 Geometrical Isomerism</p> <p>1.6.2 Optical Isomerism</p> <p>1.6.3 Structural Isomerism -</p>



			<p>Ionisation Isomerism, Hydrate Isomerism, Coordination Isomerism, Linkage Isomerism and Co-ordination position Isomerism</p> <p>1.7 Valence bond theory of transition metal complex with respect to, C.N.4, complexes of Cu and Ni C.N.6 complexes of Fe and Co</p>
March	B.Sc. III	XIII	<p><b>Nuclear Chemistry [05]</b></p> <p>2.1 Nuclear reactions and energetic of nuclear reactions.</p> <p>2.2 Types of nuclear reactions</p> <p>i. Artificial transmutation.</p> <p>ii. Artificial radioactivity.</p> <p>iii. Nuclear fission and its application in heavy water nuclear reactor.</p> <p>iv. Nuclear fusion.</p> <p>2.3 Use of Thorium, Uranium and Plutonium in atomic energy</p> <p>2.4 Applications of radio-isotopes as tracers.</p> <p>i. Chemical investigation – Esterification.</p> <p>ii. Structural determination – Phosphorus pentachloride.</p> <p>iii. Analytical Chemistry – Isotopic dilution method for determination of volume of blood Actinides</p> <p><b>Practical B.Sc.III:-</b></p> <p>7. Preparation</p> <p><b>Practical B.Sc.I:-</b></p> <p>14. Organic Spotting -2</p> <p>15. Organic Spotting -3</p>



			16. Organic Spotting -4
April	B.Sc. II	VII	<p><b>Chelation (05)</b></p> <p>2.1 A brief introduction with respect to ligands, chelating agent, chelation and metal chelates.</p> <p>2.2 Structural requirements of chelate formation</p> <p>2.3 Difference between metal chelate and metal complex</p> <p>2.4 Classification of chelating agents (with specific illustration of bidentate chelating agents)</p> <p>2.5 Application of chelation with respect to chelating agents- EDTA and DMG</p> <p><b>Chemistry of elements of 3d series elements (06)</b></p> <p>4.1 Position of elements in periodic table</p> <p>4.2 Characteristics of d-block elements with special reference to</p> <p>i) Electronic structure</p> <p>ii) Oxidation states, stability of oxidation states of Fe with respect to Latimer diagram</p>
April	B.Sc. III	XII	<p><b>Chemistry of f-block elements</b></p> <p>3.1 Introduction</p> <p>3.2 Occurrence</p> <p>3.3 Electronic Configuration</p> <p>3.4 Oxidation State</p> <p>3.5 Lanthanide Contraction</p> <p>3.6 Separation of Lanthanons by Ion exchange method</p> <p>3.7 Position in periodic table.</p> <p>3.8 Electronic configuration.</p> <p>3.9 General methods of preparation of transuranic elements.</p> <p>i. Neutron capture – followed by <math>\beta</math> decay.</p> <p>ii. Accelerated projectile bombardment.</p>



			<p>iii. Heavy ion bombardment.</p> <p>3.10 IUPAC nomenclature of the superheavy elements with atomic number (Z) greater than 100</p> <p>Practical B.Sc.III:-</p> <p>8. Percentage Purity -1</p> <p>9. Percentage Purity -2</p> <p>10. Titrable acidity of Milk</p> <p>Practical B.Sc.I:-</p> <p>17. Organic Spotting -5</p> <p>18. Organic Spotting -6</p>
May	B.Sc. II	VII	<p>iii) Magnetic character</p> <p>iv) Colored ions</p> <p>v) Complex formation</p> <p><b>Inorganic semi-micro qualitative analysis (08)</b></p> <p>5.1 Theoretical principles involved in qualitative analysis.</p> <p>5.2 Application of solubility product and common ion effect in separation of cations into groups.</p> <p>5.3 Application of complex formation in</p> <p>a) Separation of II group into IIA and IIB sub-groups.</p> <p>b) Separation of Copper from Cadmium.</p> <p>c) Separation of Cobalt from Nickel.</p> <p>d) Separation of Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>.</p> <p>e) Detection of NO<sub>2</sub><sup>-</sup>, NO<sub>3</sub><sup>-</sup></p>



			<p>-(Brownringtest).</p> <p>5.4 Application of oxidation and reduction in</p> <p>a) Separation of Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup> in mixture b) Separation of NO<sub>2</sub> -and NO<sub>3</sub>- in mixture.</p> <p>5.5 Spot test analysis.</p>
May	B.Sc. III	XIII	<p><b>Iron and Steel. [07]</b></p> <p>4.1 Occurrence and ores of iron.</p> <p>4.2 Definition of the Terms- Ore, Mineral, Slag, Flux, Gangue, Matrix, Calcinations, Reduction, Roasting, Smelting and Leaching.</p> <p>4.3 Extraction of iron by Blast furnace.</p> <p>4.4 Steel: Definition and types.</p> <p>4.5 Conversion of cast iron into steel by</p> <p>i. Bessemer process.</p> <p>ii. L.D. process.</p> <p>4.6 Heat treatment on steel</p> <p><b>Bio-inorganic Chemistry. [05]</b></p> <p>5.1 Introduction.</p> <p>5.2 Essential and trace elements in biological process.</p> <p>5.3 Metalloporphyrins with special reference to hemoglobin and myoglobin.</p> <p>5.4 Biological role of alkali and alkaline earth metal ions with special reference to Na<sup>+</sup>, K<sup>+</sup></p>



			andCa <sup>2+</sup>
June			<b>University Exam</b>

*[Signature]*  
Head

Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist. Sangli



## ANNUAL TEACHING PLAN

(Academic Year: 2021-2022)

**Mr. Avinash Ashok Kamble**

Assistant Professor

Dept. of Chemistry

Month	Class	Paper No.	Unit to be completed
oct 2021	B.Sc-III	XII	<b>Unit- Potentiometric titrations</b> Introduction, Determination of pH. Study of Quinhydrone and Glass electrodes and their use in determination of pH., Potentiometric titrations: Classical and analytical methods for locating end points. Acids-Bases titration with suitable example. Redox titration with suitable example. Precipitation titration with suitable example.
	B.Sc-II	V	<b>Unit- Electrolytic Conductivity-</b> Introduction, Types of conductors, Conductivity, Equivalent and Molar conductivity and their variation with dilution for weak and strong electrolytes in aqueous solution.
Nov 2021	B.Sc-III	XII	Basic circuit of direct reading potentiometer. Advantages of potentiometric titrations.  <b>Unit-Chromatographic techniques and Quality control</b>  Introduction, classification. Column chromatography: Introduction, types, Principle of adsorption column chromatography,



	B.Sc-II	V	<p><b>Unit- I Electrolytic Conductivity-</b> Equivalent conductivity at infinite dilution, Measurement of conductance by using Wheatstone bridge. Kolharusch law of independent migration of ions and its applications such as Ionic mobility, determination of degree of ionization of weak electrolyte,</p>
		Practical	<p>B.Sc-III Chemical kinetics I,II</p>
	B.Sc-III	XII	<p>solvent system, stationary phases, Methodology-Column packing, applications of sample, development, detection methods, recovery of components, Applications. Concepts in Quality control</p>
	B.Sc-II	V	<p><b>Unit- Electrolytic Conductivity-</b> solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of salt. Conductometric titrations (only acid base titrations). Advantages of conductometric titrations. Transference number, Hittorf's rule, determination of transport number using Moving boundary method, factors affecting transport numbers. Numerical problems. Introduction, Third order reactions: derivation of rate constant, characteristics and examples of third order reaction. Theories of reaction rates as Collision theory and Transition state theory</p>
	B.Sc-III	XII	<p><b>Unit Flame Photometry</b> 2.1 Introduction. General principles of flame photometry. Instrumentation: Block</p>



Dec 2021			diagram, Burners (Premix and Lundergraph burners), mirror, slits, filters, detector (Photomultiplier tube).
	B.Sc-II	V	<b>Unit- Nuclear Chemistry</b> Introduction, Types of Nuclear radiation, properties of $\alpha$ , $\beta$ and $\gamma$ radiations, Detection and measurement of nuclear radiations by Scintillation and Geiger muller counter methods, radioactive equilibrium and range of $\alpha$ -particles, Geiger Nuttal relations, determination of radioactive constant.
		Practical	B.Sc-III Chemical kinetics III,IV, Solubility
Jan 2022	B.Sc-III	XII	Effect of solvent in flame photometry. Experimental procedure of analysis (Standard addition and internal standard). Interferences and Factors that influence the intensity of emitted radiation in a flame photometer.
	B.Sc-II	VIII	<b>Unit- Physical Properties of Liquids</b> Introduction, Classification of physical properties, Surface tension and its determination using Stalagmometric and differential capillary rise methods, Viscosity and its determination using Ostwald's viscometer, Refractive index (Snell's law), Specific and Molecular refractivities and its determination using Abbe's refractometer.
Feb 2022	B.Sc-III	XII	Applications of flame photometry in real sample analysis. Limitations of flame photometry.
	B.Sc-II	V	<b>Unit – Surface Chemistry</b>



			Introduction, Adsorption as a surface phenomenon, Definition of adsorption, adsorbent, adsorbate, absorbent. factors affecting adsorption, Types of adsorption, Distinction between physical and chemical adsorption, Adsorption isotherms: Freundlich adsorption isotherm, Langmuir adsorption isotherm. Types of physical adsorption isotherms, applications of adsorption.
Feb 2022	University Exam		
<b>SEMESTER - II</b>			
Mar 2022	B.Sc-II	VIII	<b>Unit 1: Carboxylic acids and their derivatives</b> 1.1 Monocarboxylic acid: Chemical Reaction: Hell-Vohland-Zelinsky (HVZ) reaction. 1.2 Formation of Halo Acids, 1.3 Hydroxy acids: Malic and Citric acid, Chemical Reactions, Method of formation, Chemical Reactions 1.4 Unsaturated acid: Cinnamic acid: method of formation Chemical Reactions Acrylic acid: Method of formation Chemical Reactions:
	B.Sc-III	XVI	<b>Unit. Synthetic Polymers</b> Introduction, Classification Addition Polymerization: Free radical addition and ionic addition polymerization. Ziegler-Natta polymerization. Methods of preparation and applications of some organic polymers:
		Practical	B.Sc-III- Potentiometry I,II,III,IV




			B.Sc-II- Chemical kinetics I,II,III
Apr 2022	B.Sc-II	VIII	1.5 Dicarboxylic acid: Succinic acid- Method of formation Chemical Reactions Phthalic acid- Chemical Reactions 1.6 Carboxylic acid derivatives: Acid halide derivative: Acetyl chloride: formation Uses of acetyl chloride. Acid anhydride derivative: Method of formation of acetic anhydride by dehydration of acetic acid, reactions with water, alcohol and ammonia, uses of acetic anhydride.
	B.Sc-III	XVI	Conducting organic polymers: Synthesis and properties of Polyaniline, polypyrrol. Applications of conducting organic polymers.
	Practical	Practical	B.Sc-III- conductometry I,II,III,IV  B.Sc-II- Conductometry I,II,III
May 2022	B.Sc-II	VIII	Unit : Carbohydrates Classification of carbohydrates, reducing and non-reducing sugars, General properties of glucose and fructose, their open chain structure. Epimers, mutarotation and anomers. Determination of configuration of Glucose (Fischer proof). Ring structure of glucose Determination of size of



			the ring of Glucose by methylation method. Haworth projections. Cyclic structure of fructose.
	B.Sc-III	XVI	<b>Unit. Nanotechnology</b> Introduction of nanotechnology, history, Classification of nanoparticles based on size. Optical properties of Nanomaterial's i. Semiconducting NPs. ii. Metallic NPs.....
	Practical		B.Sc-III- PH metry I, Refractometry I,II  B.Sc-II- Refractometry I,II
Jun 2022	B.Sc-II	VIII	Cyclic structure of fructose.Linkage between monosachharides, structure of disacharrides and polysacharrides. <b>Unit : Amines and Diazonium Salts</b> Introduction, Methods of prearation, Diazonium salt, Reactions.
	B.Sc-III	XVI	.....Synthetic Routes of nanomaterials: Top-down and bottom-up approaches. Synthesis methods: Sol-gel, precipitation, chemical reduction, chemical vapor deposition, hydrothermal, electrodeposition. Characterization of nanomaterials: X-Ray diffractometer, Scanning Electron Microscope, Transmission electron microscope. Applications
	Practical		B.Sc-III- colorimetry I,II,



			B.Sc-II- Revision
jun & july 2022	Practical Exams of B.Sc.-II, III		

  
**Head**  
**Department Of Chemistry**  
**P. V. P. Mahavidyalaya,**  
**K.Mahankal,Dist-Sangli**

Mr. Avinash Ashok Kamble



# ANNUAL TEACHING PLAN

(Academic Year : 2022-2023)

Dr. Kore Gurupad Dundappa

Associate Professor,

Dept. of Chemistry

Class - B. Sc. I, II & III

Month	Class	Course No.	Units to be completed
August	B. Sc. I	I	<p><b>Chemical Bonding and Molecular structure (A) Ionic Bonding (07)</b></p> <p>2:1 Definition and formation of ionic bond. General characteristics of ionic bonding.</p> <p>2:2 Energetic in Ionic bond formation</p> <p>2:3 Born-Haber cycle for NaCl and its applications</p> <p>2:4 Fajan's Rule, Applications of Fajan's rule</p> <ul style="list-style-type: none"> <li>• Polarizing power and polarizability</li> <li>• Ionic character in covalent compounds</li> <li>• Bond moment, dipole moment and percentage ionic character</li> </ul> <p>Practicals B.Sc. I:-</p> <p>1. Introductions &amp; Instructions to handle Instruments &amp; glass wares etc.</p>
September	B Sc.I	I	<ul style="list-style-type: none"> <li>• Polarizing power and polarizability</li> <li>• Ionic character in covalent compounds</li> <li>• Bond moment, dipole moment and percentage ionic character</li> </ul> <p>Practical B.Sc. I:-</p> <p>2. Volumetric Estimation of <math>KMnO_4</math></p> <p>3. Volumetric Estimation of FAS</p>
			<b>Unit III: Chemical Bonding and Molecular structure (B)</b>



October	B.Sc.I	I	<b>Valence bond theory (VBT). (07)</b> 3.1 Concept of hybridization, different types of hybridization and geometry of following molecules, • Linear geometry- $\text{BeCl}_2$ ( $\text{sp}^3$ hybridization ) • Planer trigonal geometry- $\text{BF}_3$ ( $\text{sp}^2$ hybridization ) Practicals B Sc. I :- 4. . Water Analysis 5. Paper Chromatography
October	B.Sc. III	IX	<b>Metal Ligand bondingin Transition Metal Complexes</b> Introduction
November	B.Sc I	I	•Tetrahedral geometry- $\text{SiCl}_4$ ( $\text{sp}^3$ hybridization ) •Trigonal bipyramidal geometry- $\text{PCl}_5$ ( $\text{sp}^3$ hybridization ) •Octahedral geometry- $\text{SF}_6$ ( $\text{sp}^3\text{d}^2$ hybridization ) •Pentagonal bipyramidal geometry- $\text{IF}_7$ ( $\text{sp}^3\text{d}^3$ hybridization ) <b>Practicals B.Sc.I:-</b> 7.Determination of Equivalent wt of metal. 8.Heat of Ionization 9.Chemical Kinetics.II
November	B.Sc. III	IX	2.1Crystal field theory (CFT) 2.1.1Introduction: Shapes of d-orbitals, Basic assumptions of CFT. 2.1.2Crystal field splitting of d-orbital of metal ion in octahedral, tetrahedral, square Planar complexes and John-Teller distortion. 2.1.3Factors affecting the Crystal field splitting. 2.1.4 High spin and low spin octahedral complexes w.r.t.Co(II). 2.1.5Crystal Field stabilization energy (CFSE), Calculation with respect to octahedral complexes only. 2.1.6Limitations of CFT. 2.2Molecular orbital theory(MOT). 2.2.1 Introduction. 2.2.2MOT of octahedral complexes with sigma bonding such as $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ , $[\text{CoF}_6]^{3-}$ , $[\text{Co}(\text{NH}_3)_6]^{3+}$ . 2.2.3 Merits and demerits of MOT. <b>Practical B.Sc.III:-</b> 1. Gravimetric Estimation of Iron 2. Gravimetric Estimation of Barium
December	B.Sc. I	I	<b>Chemical Bonding and Molecular structure (C) Molecular orbital theory (MOT). (07)</b> 4.1LCAO method, formation of bonding, antibonding and



ber			<p>nonbonding molecular orbitals.</p> <p>4.2 Conditions for successful overlap, Types of overlaps-S-S, S-px, Px-Px, Py-Py and Pz-Pz overlaps.</p> <p>4.3 Bond order and its significance.</p> <p><b>Practical B.Sc.I:-</b></p> <p>10. Viscosity</p> <p>11. Chemical Kinetics I</p>
December	B.Sc. III	IX	<p><b>Metals, Semiconductors and Super conductors.[9]</b></p> <p>Basis of band theory</p> <p>3.5 Semiconductors - Types-intrinsic and extrinsic and applications of semiconductors.</p> <p>3.6 Superconductors: Ceramic superconductors-Preparation and structures of mixed oxide <math>YBa_2Cu_3O_{7-x}</math>.</p> <p>3.7 Applications of superconductors.</p> <p><b>Practical B.Sc.III:-</b></p> <p>3. Preparation -1</p> <p>4. Preparation -2</p>
January	B.Sc. I	I	<p>4.4 Energy level sequence for molecular orbitals when <math>n=1</math> &amp; <math>2</math>.</p> <p>4.5 MO diagrams for homonuclear diatomic molecule of 1<sup>st</sup> &amp; 2<sup>nd</sup> period Elements (He<sub>2</sub>, Li<sub>2</sub>, B<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>).</p> <p>4.6 Molecular orbital diagrams for heteroatomic diatomic molecules. (CO, NO)</p> <p><b>Practical B.Sc.I:-</b></p> <p>12. Organic Qualitative Analysis - Introduction</p> <p>13. Organic Spotting no. 1</p>
January	B.Sc. III	IX	<p><b>Organometallic Chemistry.[4]</b></p> <p>4.1 Definition, Nomenclature for organometallic compounds.</p> <p>4.2 Synthesis and structural study of alkyland aryl compounds of Be and Al.</p> <p>4.3 Mononuclear carbonyls - Nature of bonding in simple mononuclear carbonyls.: <math>[Ni(CO)_4]</math>, <math>[Fe(CO)_5]</math>, <math>[Cr(CO)_6]</math>.</p> <p><b>Catalysis (05)</b></p> <p>5.1 Introduction</p> <p>5.2 Classification of catalytic reaction-Homogeneous and Heterogeneous</p> <p>5.3 Types of Catalysis.</p> <p>5.4 Characteristics of catalytic reactions.</p> <p>5.5 Mechanism of catalysis</p> <p><b>Practical B.Sc.III:-</b></p>



			<p>5. Preparation -3</p> <p>6. Preparation -4</p>
Feb.	B Sc. II	VII	<p><b>Co-ordination chemistry (10)</b></p> <p>1.1 Introduction-Definition and formation of co-ordinate covalent bond in <math>BF_3-NH_3</math>, <math>[NH_4]^+</math> and <math>H_2O</math></p> <p>1.2 Distinguish between double salt and complex salt</p> <p>1.3 Werner's theory-</p> <p>1.3.1. Postulates</p> <p>1.3.2. The theory as applied to cobalt amines viz. <math>CoCl_3.6NH_3</math>, <math>CoCl_3.5NH_3</math>, <math>CoCl_3.4NH_3</math>, <math>CoCl_3.3NH_3</math></p> <p>1.4 Description of the terms-ligand, co-ordination number, co-ordination sphere, Effective atomic number</p> <p>1.5 IUPAC nomenclature of coordination compounds.</p> <p>1.6 Isomerism in complexes with C.N. 4 and 6</p> <p>1.6.1 Geometrical Isomerism</p> <p>1.6.2 Optical Isomerism</p> <p>1.6.3 Structural Isomerism-Ionisation Isomerism, Hydrate Isomerism, Coordination Isomerism, Linkage Isomerism and Co-ordination position Isomerism</p> <p>1.7 Valence bond theory of transition metal complex with respect to, C.N.4, complexes of Cu and Ni C.N.6 complexes of Fe and Co</p>
Feb.	B.Sc. III	XIII	<p><b>Nuclear Chemistry [05]</b></p> <p>2.1 Nuclear reactions and energetic of nuclear reactions.</p> <p>2.2 Types of nuclear reactions</p> <p>i. Artificial transmutation.</p> <p>ii. Artificial radioactivity.</p> <p>iii. Nuclear fission and its application in heavy water nuclear reactor.</p> <p>iv. Nuclear fusion.</p> <p>2.3 Use of Thorium, Uranium and Plutonium in atomic energy</p> <p>2.4 Applications of radio-isotopes as tracers.</p> <p>i. Chemical investigation-Esterification.</p> <p>ii. Structural determination- Phosphorus penta chloride.</p> <p>iii. Analytical Chemistry-Isotopic dilution method for determination of volume of blood Actinides</p> <p>Practical B.Sc.III:-</p> <p>7. Preparation</p> <p>Practical B.Sc.I:-</p> <p>14. Organic Spotting -2</p> <p>15. Organic Spotting -3</p> <p>16. Organic Spotting -4</p>



March	B.Sc. II	VII	<p><b>Chelation (05)</b></p> <p>2.1 A brief introduction with respect to ligands, chelating agent, chelation and metal chelates.</p> <p>2.2 Structural requirements of chelate formation</p> <p>2.3 Difference between metal chelate and metal complex</p> <p>2.4 Classification of chelating agents (with specific illustration of bidentate chelating agents)</p> <p>2.5 Application of chelation with respect to chelating agents-EDTA and DMG</p> <p><b>Chemistry of elements of 3d series elements (06)</b></p> <p>4.1 Position of elements in periodic table</p> <p>4.2 Characteristics of d-block elements with special reference to</p> <p>i) Electronic structure</p> <p>ii) Oxidation states, stability of oxidation states of Fe with respective to Latimer diagram</p>
March	B.Sc. III	XII	<p><b>Chemistry of f-block elements</b></p> <p>3.1 Introduction</p> <p>3.2 Occurance</p> <p>3.3 Electronic Configuration</p> <p>3.4 Oxidation State</p> <p>3.5 Lanthanide Contraction</p> <p>3.6 Separation of Lanthanons by Ion exchange method</p> <p>3.7 Position in periodic table.</p> <p>3.8 Electronic configuration.</p> <p>3.9 General methods of preparation of transuranic elements.</p> <p>i. Neutron capture—followed by <math>\beta</math> decay.</p> <p>ii. Accelerated projectile bombardment.</p> <p>iii. Heavy ion bombardment.</p> <p>3.10 IUPAC nomenclature of the super heavy elements with atomic number (Z) greater than 100</p> <p>Practical B.Sc.III:-</p> <p>8. Percentage Purity -1</p> <p>9. Percentage Purity -2</p> <p>10. Titrable acidity of Milk</p> <p>Practical B.Sc.I:-</p> <p>17. Organic Spotting -5</p> <p>18. Organic Spotting -6</p>
April	B.Sc. II	VII	<p>iii) Magnetic character</p> <p>iv) Colored ions</p> <p>v) Complex formation</p> <p><b>Inorganic semi-micro qualitative analysis (08)</b></p> <p>5.1 Theoretical principles involved in qualitative analysis.</p>



			<p>5.2 Applications of solubility product and common ion effect in separation of cations in to groups.</p> <p>5.3 Application of complex formation in</p> <p>a) Separation of II group into II A and II B sub-groups.</p> <p>b) Separation of Copper from Cadmium.</p> <p>c) Separation of Cobalt from Nickel.</p> <p>d) Separation of Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>.</p> <p>e) Detection of NO<sub>2</sub>, NO<sup>-</sup> (Brown ring test).</p> <p>5.4 Application of oxidation and reduction in</p> <p>a) Separation of Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup> in mixture) Separation of NO<sub>2</sub> and NO<sub>3</sub> in mixture.</p> <p>5.5 Spot test analysis.</p>
April	B.Sc. III	XIII	<p><b>Iron and Steel. [07]</b></p> <p>4.1 Occurrence and ores of iron.</p> <p>4.2 Definition of the Terms-Ore, Mineral, Slag, Flux, Gangue, Matrix, Calcinations, Reduction, Roasting, Smelting and Leaching.</p> <p>4.3 Extraction of iron by Blast furnace.</p> <p>4.4 Steel: Definition and types.</p> <p>4.5 Conversion of cast iron into steel by</p> <p>i. Bessemer process.</p> <p>ii. L.D. process.</p> <p>4.6 Heat treatment on steel</p> <p><b>Bio-inorganic Chemistry. [05]</b></p> <p>5.1 Introduction.</p> <p>5.2 Essential and trace elements in biological process.</p> <p>5.3 Metalloporphyrins with special reference to hemoglobin and myoglobin.</p> <p>5.4 Biological role of alkali and alkaline earth metal ions with special reference to Na<sup>+</sup>, K<sup>+</sup> and Ca<sup>2+</sup></p>
May			<b>University Exam</b>

*[Signature]*  
Head

Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist-Sangli



## ANNUAL TEACHING PLAN

(Academic Year: 2022-2023)

**Mr. Avinash Ashok Kamble**

Assistant Professor

Dept. of Chemistry

Month	Class	Paper No.	Unit to be completed
Aug	B.Sc-III	XII	<b>Unit- Manufacture of Industrial Heavy Chemicals</b> 2.1 Introduction Manufacture of Ammonia (NH <sub>3</sub> ) Manufacture of Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> ) Manufacture of Nitric acid (HNO <sub>3</sub> ) Manufacture of Sodium carbonate (Na <sub>2</sub> CO <sub>3</sub> )
	B.Sc-II	V	<b>Unit- Electrolytic Conductivity</b> -Introduction, Types of conductors, Conductivity, Equivalent and Molar conductivity and their variation with dilution for weak and strong electrolytes in aqueous solution.
Sept	Practical		<b>B.Sc-III</b> Chemical kinetics I,II <b>B.Sc-II</b> Gravimetric estimation of Ba Gravimetric estimation of Fe
Sept	B.Sc-III	XII	<b>Unit. Sugar Industry</b> Introduction. Manufacture of cane sugar in India: Extraction of juice, Clarification, Concentration, crystallization, centrifugation and other details of industrial process. By products of sugar industry.
	B.Sc-II	V	Unit- I Electrolytic Conductivity- Equivalent conductivity at infinite dilution, Measurement of conductance by using Wheatstone bridge. Kohlrausch law of independent migration of ions and its applications such as Ionic mobility, determination of degree of ionization of weak electrolyte,
		Practical	<b>B.Sc-III</b> Chemical kinetics III, IV <b>B.Sc-II</b> Inorganic Preparation I,II Titrimetric Analysis I,II
	B.Sc-III	XII	<b>Unit. Nanomaterials</b> Introduction of nanotechnology, terminology and history, optical properties, characterization and fabrication, Applications.
	B.Sc-II	V	<b>Unit- Electrolytic Conductivity</b> - solubility products of sparingly



Oct			soluble salts, ionic product of water, hydrolysis constant of salt. Conductometric titrations (only acid base titrations). Advantages of conductometric titrations. Transference number, Hittorf's rule, determination of transport number using Moving boundary method, factors affecting transport numbers. Numerical problems. Introduction, Third order reactions: derivation of rate constant, characteristics and examples of third order reaction. Theories of reaction rates as Collision theory and Transition state theory
			B.Sc-III Solubility, Adsorption B.Sc-II Semi-micro qualitative analysis
Oct	B.Sc-III	XII	<b>Unit-Corrosion and passivity</b> Introduction, electrochemical theory of corrosion, factors affecting on corrosion, Methods of protection of metal from corrosion, passivity.
	B.Sc-II	V	<b>Unit- Nuclear Chemistry</b> Introduction, Types of Nuclear radiation, properties of $\alpha$ , $\beta$ and $\gamma$ radiations, Detection and measurement of nuclear radiations by Scintillation and Geiger muller counter methods, radioactive equilibrium and range of $\alpha$ -particles, Geiger Nuttal relations, determination of radioactive constant.
		Practical	B.Sc-III Conductometry- I,II,III B.Sc-II Organic qualitative analysis
Nov	B.Sc-III	XII	<b>Unit-Soaps and detergents</b> Introduction, Soaps, Manufacture of soap, Detergents, Comparison between soap and detergent.
	B.Sc-II	V	<b>Unit- Physical Properties of Liquids</b> Introduction, Classification of physical properties, Surface tension and its determination using Stalagmometric and differential capillary rise methods, Viscosity and its determination using Ostwald's viscometer, Refractive index (Snell's law), Specific and Molecular refractivities and its determination using Abbe's refractometer.
	B.Sc-II	V	<b>Unit – Surface Chemistry</b> Introduction, Adsorption as a surface phenomenon, Definition of adsorption, adsorbent, adsorbate, adsorbent. factors affecting adsorption, Types of adsorption, Distinction between physical and chemical adsorption, Adsorption isotherms: Freundlich adsorption isotherm, Langmuir adsorption isotherm. Types of physical adsorption isotherms, applications of adsorption.
	Practical		B.Sc-III



			Conductometry IV, v Potentiometry I,II B.Sc-II Organic Estimation I,II Organic preparation I,II
Dec	University Exam		
Jan	B.Sc-II	VIII	<b>Unit-Stereochemistry</b> Conformational isomerism – Introduction. Representation of conformations of ethane by using Saw- Horse, Fischer (dotted line wedge) and Newmann’s projection formulae. Conformations and conformational analysis of ethane and n-butane by Newmann’s Projection formula with the help of energy profile diagrams. Cycloalkanes relative stability - Baeyer’s strain theory, Theory of strainless rings. Conformations and stability of cyclohexane and monosubstituted cyclohexanes Cyclohexanol, bromocyclohexane and methyl cyclohexane. Locking of conformation in t-butyl cyclohexane.
	B.Sc-III	XVI	<b>Unit.Theory of titrimetric Analysis</b> Introduction Acid-base indicators Theory of indicators w.r.t. Ostwald’s ionization theory and quinoid theory Neutralization curves and choice of indicators, complexometric titrations.
		Practical	B.Sc-III- Potentiometry ,III,IV B.Sc-II- Chemical kinetics I,II,III,IV
Feb	B.Sc-II	VIII	<b>Unit: Carbonyl Compounds- Aldehydes and Ketone</b> Introduction, Nomenclature, structure. Reactivity of Carbonyl group, mechanism of Nucleophilic addition to Carbonyl group Reactions: mechanism and application of Aldol condensation, Perkin reaction, Cannizaros reaction, Knoevenagel condensation, Reformatsky reaction.
	B.Sc-III		<b>Unit Potentiometric titrations</b> Introduction, Determination of pH., Study of Quinhydrone and Glass electrodes and their use in determination of pH., Potentiometric titrations: Classical and analytical methods for locating end points. Acids-Bases titration with suitable example. Redox titration with suitable example. Precipitation titration with suitable example.



			Basic circuit of direct reading potentiometer. Advantages of potentiometric titrations.
	Practical	Practical	B.Sc-III- colorimetry I,II and pH metry- I B.Sc-II- Conductometry I,II,III
March	B.Sc-I	VIII	<b>Unit : Carbohydrates</b> Classification of carbohydrates, General properties of glucose and fructose, their open chain structure. Epimers, mutarotation and anomers. Determination of configuration of Glucose (Fischer proof). Ring structure of glucose Determination of size of the ring of Glucose by methylation method..Haworth projections.Cyclic structure of fructose.Linkage between monosachharides, structure of disacharrides (sucrose, maltose, lactose) andpolysacharrides (starch and cellulose) excluding their structure elucidation.
	B.Sc-III	XVI	<b>Unit-Chromatography</b> Introduction, classification. Column chromatography: Introduction, types, Principle of adsorption column chromatography, solvent system, stationary phases, Methodology- Column packing, gas chromatography.
	Practical		B.Sc-III- Refractometry I,II B.Sc-II- Refractometry I,II ,viscosity
Apr	B.Sc-II	VIII	<b>Unit 2: Amines and Diazonium Salts</b> Introduction, Classification, Nomenclature, structure. Methods of preparation: a) From Alkyl halide by Amonolysis, b) By Reduction of Nitriles or Cyanides, c)From Unsubstituted amides (Hoffmann degradation), d) By Gabriel Synthesis ( From Phthalamide). Reactions: Carbylamine reaction, Schotten-Baumann reaction, Electrophilic substitution (Aniline), Nitration, Bromination, Sulphonation.Diazonium salt:Introduction, Preparation of Benzene diazonium chloride. Reactions: Replacement by Halogen(Sandmeyer), Replacement by Iodine, Replacement by -OH, C and N Coupling reactions: Synthesis of Methyl orange and Congo red.Reduction of BDC.
	B.Sc-III	XVI	<b>Unit Flame Photometry</b> 2.1 Introduction. General principles of flame photometry.Instrumentation: Block diagram, Burners (Premix and Lundergraph burners), mirror, slits, filters, detector (Photomultiplier tube). Effect of solvent in



		<p>flame photometry. Experimental procedure of analysis (Standard addition and internal standard). Interferences and Factors that influence the intensity of emitted radiation in a flame photometer. Applications of flame photometry in real sample analysis. Limitations of flame photometry.</p> <p><b>Unit-Colorimetry and Spectrophotometry</b> 3.1 Theory of colorimetry and spectrophotometry. Lambert Beer's law, deviation from Beer's law. Terms used in colorimetry and spectrophotometry. Classification of methods of 'colour' measurement or comparison. Photoelectric colorimeter method—Single beam photo-electric colorimeter. Spectrophotometer method—Single beam direct reading spectrophotometer. Determination of unknown concentration by using concentration-absorbance plot. Applications of colorimetry and spectrophotometry.</p>
	Practical	B.Sc-III- Project B.Sc-II- Conductometry I,II,III
May	Practical Exams of B.Sc.-I, II, III	

  
Head

Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist-Sangli



Shikshan Prasarak Sanstha's  
**Padmabhushan Vasantrodada Patil Mahavidyalaya, Kavathe Mahankal.**

**DEPARTMENT OF CHEMISTRY**

Annual Teaching Plan  
 Academic Year 2023-2024

Name : Mr. S. V. Patil

Month	Class	Paper	Unit / Points
July	B.Sc. I	Theory II	Unit III: Aromaticity: Introduction, Characteristics properties of organic compounds, Meaning of terms: Aromatic, Non aromatic, Antiaromatic, Pseudoaromatic, Structure of Benzene: Kekule structure, Resonance structure, M.O. picture,
		Practical	General instruction & introduction to the lab safety
	B.Sc. III	Theory X	1. Introduction to Spectroscopy 2. UV-Vis Spectroscopy
August	B.Sc. I	Theory II	Unit III: Aromaticity: Modern theory of Aromaticity, Mechanism of Electrophilic substitution reactions: Nitration, Sulphonation, Halogenation and Friedel craft reaction
		Practical	1. To prepare standard 0.1 N KMnO <sub>4</sub> solution and to determine the strength of given oxalic acid solution. 2. To determine quantity of Fe(II) ions from the given solutions by titrating it with 0.1 N K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> solution by using internal indicator 3. To estimate amount of Cu(II) ions by iodometric titration by using Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> solution.
	B.Sc III	Theory X	Unit 3. IR Spectroscopy, <b>Home Assignment</b>
		Practical	Organic Qualitative analysis Separation of binary mixture and Identification of one component. Nature 1) Solid – Solid : 4 mixtures 2) Solid – Liquid : 2 mixtures
September	B.Sc. I	Theory II	Unit IV: Heterocyclic Compounds Introduction, Classification and Nomenclature of heterocyclic compounds., <b>Home Assignment</b>
		Practical	1) Quality control-To determine percentage purity of the given sample of soda ash (Na <sub>2</sub> CO <sub>3</sub> ) by titrimetric method. 2) Chromatography: Separation and identification of cations by Paper Chromatography technique 3) Spot Test: Identify the metal ions by spot test method.
		Theory X	Unit 4. NMR Spectroscopy, <b>Unit Test</b>



	B. Sc. III	Practical	<b>Organic Qualitative analysis</b> Separation of binary mixture and Identification of one component. Liquid Liquid 2 Mixture <b>Organic Preparations:</b> 1. Multicomponent reaction - Preparation of Dihydropyrimidone. 2. Radical coupling reaction - Preparation of 1,1,2 bis-2naphthol. 3. Base catalyzed Aldol condensation- Preparation of Dibenzal propanone. 4. Diels Alder reaction- Reaction between Furan and Maleic acid
October	B.Sc. I	Theory II	Nitrogen Heterocycles: a) Pyrrole:- Introduction, Synthesis, Physical and chemical properties. b) Pyridine:- Introduction, Synthesis, Physical and chemical properties.
		Practical	Estimations : i) Estimation of Acetamide. ii) Estimation of Aspirin tablet., Organic Qualitative Analysis Compound No. 1
	B.Sc III	Theory II	5. Mass spectroscopy 6. Combined Problems based on UV-Vis, IR, NMR and Mass Spectral data
		Practical	Organic Estimations: 1. Estimation of sucrose 2. Saponification value of oil. 3. To determine the amount of acid and amide present in the given mixture of acid and amide.
November	B.Sc. I		Diwali Vacation & University exams
	B.Sc. III		Diwali Vacation & University exams
December	B.Sc. I	Practical	Organic Qualitative Analysis Compound No. 2 to 5
	B.Sc. II	Theory VIII	Amines and Diazonium Salts: <span style="float: right;">2.1</span> Amines
		Theory XIV	1. Reagents and Reactions in Organic Synthesis
	B.Sc. III	Practical	<b>Organic Estimations</b> 1. Determination of Molecular weight of monobasic/dibasic acid by volumetric method. 2. Estimation of unsaturation –to estimate the percentage purity of given olefinic compound by bromination method., <b>Organic Preparations</b> 1. Benzil-Benzilic acid rearrangement reaction
January	B.Sc. I	Practical	1) Determination of heat of ionization of weak acid by using polythene bottle. 2) Determination of Surface tension of the given liquids by Stalagmometer. 3) Determination of equivalent weight of Mg by eudiometer.
	B.Sc. II	Theory VIII	Amines and Diazonium Salts: <span style="float: right;">2..2</span> Diazonium Salts
		Theory XIV	2. Retrosynthesis, 3. Electrophilic addition to $>C=C<$ and $-C\equiv C-$ bond



	B.Sc. III	Practical	1. The study of energy of activation of first order reaction i.e. hydrolysis of methyl acetate in presence of 0.5 N HCl / 0.5 N H <sub>2</sub> SO <sub>4</sub> . 2. The study of energy of activation of second order reaction i.e. reaction between K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> and KI (Equal concentrations). 3. The study of energy of activation of second order reaction i.e. reaction between K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> and KI (Unequal concentrations).
February	B.Sc. I	Practical	1) Determination of viscosity of given liquids A and B 2) To study the velocity constant of hydrolysis of methyl acetate in presence HCl/ H <sub>2</sub> SO <sub>4</sub> .
	B.Sc. II	Theory VIII	Carbonyl Compounds- Aldehydes and Ketones 4.1 Introduction, Nomenclature of aliphatic and aromatic aldehydes and ketones. 4.2 Structure and reactivity of Carbonyl group.
		Theory XIV	4.Natural Products, <b>Home Assignment</b>
	B.Sc. III	Practical	3. The study of energy of activation of second order reaction i.e. reaction between K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> and KI (Unequal concentrations). 4. To study the hydrolysis of methyl acetate by using its two concentrations in presence of 0.5 N HCl and hence find velocity constant of the reaction.
March	B.Sc. I	Practical	Submission/ Practical Examination
	B.Sc. II	Theory VIII	Mechanism and applications of ----- i) Aldol condensation, ii) Claisen and Benzoin Condensation, iii) Perkins reaction,
		Theory XIV	5.Pharmaceuticals <b>Unit Test</b>
	B.Sc. III	Practical	Submission/ Practical Examination
April/ May			University Examination

*Beatu*  
(Mr. S.V. Patil)

*Beatu*  
**Head**  
**Department Of Chemistry**  
**P. V. P. Mahavidyalaya,**  
**K.Mahankal.Dist-Sangli**



Shikshan Prasarak Sanstha's  
 Padmabhushan Vasantrodada Patil Mahavidyalaya, Kavathe Mahankal.  
**DEPARTMENT OF CHEMISTRY**  
 Annual Teaching Plan  
 Academic Year 2023-2024

Name : Dr. G. D. Kore

Month	Class	Paper	Unit / Points
July	B.Sc. I	Theory I	Unit II: Chemical Bonding and Molecular Structure: Ionic Bonding 2.1 Types of Chemical Bonds: a) Ionic Bond b) Covalent Bond c) Coordinate bond d) metallic bond e) Hydrogen Bond f) Van-der Waals force. 2.2 Definition and formation of ionic bond. General characteristics of ionic bonding 2.3 Energetic in ionic bond formation.
		Practical	General instruction & introduction to the lab safety
	B.Sc. III	Theory IX	Unit 1. Acids, Bases and Non aqueous Solvents
August	B.Sc. I	Theory I	Unit II: Chemical Bonding and Molecular Structure: Ionic Bonding 2.4 Born-Haber cycle for $\text{NaCl}$ and its applications. 2.5 Fajan's Rule, Applications of Fajan's rule for, i) Polarizing power and polarizability ii) Ionic character in covalent compounds iii) Bond moment, dipole moment and percentage ionic character
		Practical	1. To prepare standard 0.1 N $\text{KMnO}_4$ solution and to determine the strength of given oxalic acid solution. 2. To determine quantity of $\text{Fe(II)}$ ions from the given solutions by titrating it with 0.1 N $\text{K}_2\text{Cr}_2\text{O}_7$ solution by using internal indicator 3. To estimate amount of $\text{Cu(II)}$ ions by iodometric titration by using $\text{Na}_2\text{S}_2\text{O}_3$ solution.
	B.Sc. III	Theory IX	Unit 2. Metal Ligand bonding in Transition Metal Complexes, Home Assignment
		Practical	G1. Gravimetric estimation of iron as ferric oxide ( $\text{Fe}_2\text{O}_3$ ).. G3. Gravimetric estimation of barium as barium sulphate ( $\text{BaSO}_4$ )
September	B.Sc. I	Theory I	Unit III: Chemical Bonding and Molecular structure :Valence bond theory (VBT). 3.1 VSEPR Theory. 3.2 Concept of hybridization, different types of hybridization and geometry of following molecules, i) Linear geometry- $\text{BeCl}_2$ (sp hybridization) ii) Planar trigonal geometry, Home Assignment
		Practical	1) Quality control-To determine percentage purity of the given sample of soda ash ( $\text{Na}_2\text{CO}_3$ ) by titrimetric method. 2) Chromatography: Separation and identification of cations by Paper Chromatography technique 3) Spot Test: Identify the metal ions by spot test method.
		Theory IX	Unit 3. Metals, Semiconductors and Superconductors, Unit Test



	B. Sc. III	Practical	G5.Gravimetric estimation of nickel as bis (dimethylglyoximate) nickel (II) G6.Gravimetric estimation of aluminium as aluminium oxinate potassium tris (8-hydroxy quinolato) aluminium (III)
October	B.Sc. I	Theory I	Unit III: Chemical Bonding and Molecular structureiii) Tetrahedral geometry- SiCl <sub>4</sub> (sp <sup>3</sup> hybridization) iv) Trigonal bipyramidal geometry- PCl <sub>5</sub> (sp <sup>3d</sup> hybridization) v) Octahedral geometryvi) Pentagonal bipyramidal geometry
		Practical	Estimations : i) Estimation of Acetamide. ii) Estimation of Aspirin tablet., Organic Qualitative AnalysisCompound No. 1
	B.Sc III	Theory IX	Unit.4. Organometallic Chemistry. Unit 5. Catalysis P1. Preparation of potassium trioxalato aluminate (III). P2. Preparation of Tetra ammine copper (II) chloride. P3. Preparation of tris(thiourea) copper (I) sulphate. P4. Preparation of potassium trioxalato ferrate (III). P5. Preparation of chloropenta-ammine cobalt (III) chloride. P6. Preparation of ammonium diamminetetra-thiocyanato chromate (III)
November	B.Sc. I		Diwali Vacation & University exams
	B.Sc. III		Diwali Vacation & University exams
December	B.Sc. I	Practical	Organic Qualitative AnalysisCompound No. 2 to 5
	B.Sc. II	Theory VII	Unit 2: Chelation 2.1 A brief introduction with respect to ligands, chelating agent, chelation and metal chelates. 2.2 Structural requirements of chelate formation 2.3 Difference between metal chelate and metal complex
	B.Sc. III	Theory XIII	Unit 1. Coordination Chemistry A. Inorganic Reaction mechanism B. Thermodynamic and Kinetic aspects of metal complexes
		Practical	V1. Determination of percentage purity of ferrous ammonium sulphate. Determination of amount of aluminum in the given solution of potash alum. V7. Determination of titrable acidity in the given sample of milk or lassi. V8. Determination of percentage purity of boric acid using supplied sodium hydroxide V2. Determination of percentage purity of tetrammine copper (II) sulphate.
B.Sc. I	Practical	1) Determination of heat of ionization of weak acid by using polythene bottle. 2) Determination of Surface tension of the given liquids by Stalagmometer. 3) Determination of equivalent weight of Mg by eudiometer.	
B.Sc. II	Theory VII	2.4 Classification of chelating agents (with specific illustration of bidentate chelating agents) 2.5 Application of chelation with respect to chelating agents - EDTA and DMG	
		Theory XIII	Unit 2. Nuclear Chemistry Unit 5. Bio-inorganic Chemistry.



January	B.Sc. III	Practical	V10. Determination of amount of sodium present in the given solution of common salt using cation exchange resin (By Acid Base titration). V11. Determination of amount of magnesium in the given solution containing (Mg <sup>2+</sup> and Zn <sup>2+</sup> ) using anion exchange resin and standard solution of EDTA <b>Potentiometry</b> 1. Titration of strong acid with strong alkali. 2. Preparation of buffer solution and determination of their pH 3. Determination of standard electrode potential of Zn/Zn <sup>++</sup> , Cu/Cu <sup>++</sup>
February	B.Sc. I	Practical	1) Determination of viscosity of given liquids A and B 2) To study the velocity constant of hydrolysis of methyl acetate in presence HCl/H <sub>2</sub> SO <sub>4</sub> .
	B.Sc. II	Theory VII	Unit 3: Chemistry of Elements of 3d Series Elements 3.1 Position of elements in periodic table 3.2 Characteristics of d-block elements with special reference to i) Electronic structure ii) Oxidation states, stability of oxidation states of Fe with respect to Latimer diagram
	B.Sc. III	Theory XIII	Unit 3. Chemistry of f- Block Elements, A. Lanthanides B. Actinides, Home Assignment
		Practical	<b>B. Conductometry</b> 1. Titration of a mixture of weak acid and strong acid with strong alkali 2. To study the effect of substituent on dissociation constant of weak acid with respect to acetic acid and monochloroacetic acid 3. To determine the normality of citric acid in lemon by titrating it against standard 0.2 N NaOH solution by conductometric method <b>C. Refractometry</b> . 1. To determine the percentage composition of unknown mixture by (i) graphical method and (ii) by composition law <b>D. Colorimetry</b> . 1. To verify Lambert – Beer's law using CuSO <sub>4</sub> solution. 2. To estimate of Fe <sup>+++</sup> ions by thiocyanate method.
March	B.Sc. I	Practical	Submission/ Practical Examination
	B.Sc. II	Theory VII	Unit 3: Chemistry of Elements of 3d Series Elements iii) magnetic characteristics iv) Colored ions v) Complex formation.
	B.Sc. III	Theory XIII	Unit 4. Iron and Steels, Unit Test
Practical		Submission/ Practical Examination	
April/ May			University Examination

Dr. G.D. Kore

*(Signature)*  
Head  
Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist-Sangli



Shikshan Prasarak Sanstha's  
 Padmabhushan Vasantrodada Patil Mahavidyalaya, Kavathe Mahankal.

## DEPARTMENT OF CHEMISTRY

Annual Teaching Plan  
 Academic Year 2023-2024

Name : Mr. A.A. Kambje

Month	Class	Paper	Unit / Points
July	B.Sc. III	Theory XII	<b>Unit 1. Theory of Gravimetric Analysis</b> 1.1 Introduction. 1.2 Gravimetric analysis by precipitation: nucleation, crystal growth, digestion/ageing, filtration, drying, ignition, weighing. 1.3 Optimum conditions for good precipitation. 1.4 Physical nature of precipitate. 1.5 Purity of precipitate: 1.6 Organic precipitants and their applications.
August	B.Sc. II	Practical	1) To study the hydrolysis of methyl acetate in presence of HCl and H <sub>2</sub> SO <sub>4</sub> and to determine the relative strength of acids. 2) To study the effect of acid strength on hydrolysis of an ester by using 0.5M HCl and 0.25M HCl. 3) To study the reaction rate of hydrolysis of an ethyl acetate by an alkali. 4) To study the reaction between potassium persulphate and Potassium iodide in Solution with unequal concentration of the reactants. 5) To determine the degree of dissociation and dissociation constant of acetic acid at various dilutions and to verify Ostwald's dilution law conductometrically.
	B.Sc III	Theory XII	<b>Unit 2. Flame Photometry</b> 2.1 Introduction. 2.2 General principles of flame photometry. 2.3 Instrumentation. 2.4 Effect of solvent in flame photometry 2.5 Experimental procedure of analysis (Standard addition and internal standard). 2.6 Interferences and Factors 2.7 Applications of flame photometry in real sample analysis. 2.8 Limitations of flame photometry.
		Practical	Organic Qualitative analysis Separation of binary mixture and Identification of one component. Nature 1) Solid – Solid : 4 mixtures 2) Solid – Liquid : 2 mixtures
	B.Sc. II	Practical	6) To determine the normality of the given strong acid by titrating it against the strong alkali conduct metrically. 7) To determine the normality of the given weak acid by titrating it against the strong alkali conductometrically. 8) To determine the percentage composition of a given liquid mixture by viscosity method (Density data to be given). 9) To determine the specific and molar refractions of benzene, toluene and xylene 10) To determine the specific rotation and unknown concentration of sugar solution



September

B. Sc. III	Theory XII	<b>Unit 3. Colorimetry and Spectrophotometry</b> 3.1 Theory of colorimetry and spectrophotometry. 3.2 Lambert Beer's law, deviation from Beer's law. 3.3 Terms used in colorimetry and spectrophotometry. 3.4 Classification of methods of 'colour' measurement or comparison. 3.5 Photoelectric colorimeter method—Single beam photo-electric colorimeter. 3.6 Spectrophotometer method—Single beam direct reading spectrophotometer. 3.7 Determination of unknown concentration by using concentration-absorbance plot. 3.8 Applications of colorimetry and spectrophotometry.
	Practical	

October

B.Sc. II	Practical	i) Gravimetric estimation of iron as Fe <sub>2</sub> O <sub>3</sub> from a solution containing Ferrous ammonium sulphate and free sulphuric acid. ii) Gravimetric estimation of barium as BaSO <sub>4</sub> from a solution containing barium chloride and free hydrochloric acid. iii) Gravimetric estimation of nickel as Ni(DMG) <sub>2</sub> from a solution containing NiSO <sub>4</sub> .7H <sub>2</sub> O and free sulphuric acid.
B.Sc. III	Theory XII	Unit 4. Potentiometric titrations 4.1 Introduction. 4.2 Determination of pH. 4.3 Study of Quinhydrone and Glass electrodes and their use in determination of pH. 4.4 Potentiometric titrations: Classical and analytical methods for locating end points. 4.5 Acids- Bases titration with suitable example.
	Practical	Organic Estimations: 1. Estimation of sucrose 2. Saponification value of oil. 3. To determine the amount of acid and amide present in the given mixture of acid and amide.

November

B.Sc. II		Diwali Vacation & University exams
B.Sc. III		Diwali Vacation & University exams

December

B.Sc. II	Practical	i) Preparations of sodium cuprous thiosulphate ii) Preparation of tris (ethylene diamine) nickel (II) thiosulphate iii) Preparation of hexammine nickel (II) chloride iv) Preparation of tetrammine copper (II) sulphate. 3) Semi-micro Qualitative Analysis
B.Sc. III	Theory XVI	Unit 5. Nanotechnology 5.1 Introduction 5.2 Optical properties of Nanomaterial's 5.3 Synthetic Routes of nanomaterials:5.4 Synthesis methods: . 5.5 Characterization of nanomaterials:5.6 Applications of nanotechnology. <b>SEMINARS</b>
	Practical	<b>Organic Estimations</b> 1. Determination of Molecular weight of monobasic/dibasic acid by volumetric method. 2. Estimation of unsaturation –to estimate the percentage purity of given olefinic compound by bromination method., <b>Organic Preparations</b> 1. Benzil-Benzilic acid rearrangement reaction



January	B.Sc. II	Practical	i) Fertilizer analysis: To determine percentage of nitrogen in the given sample of a nitrogenous fertilizer (ammonium sulphate). ii) Analysis of Synthetic /Commercial Sample: To estimate Magnesium from talcum powder. iii) Determination of alkali content from antacid tablet using HCl solution . iv) Estimation of Calcium from chalk: v) Determination of total hardness of water using 0.01M EDTA solution.
	B.Sc. III	Theory XVI	Unit 1. Sugar Industry 1.1 Introduction. 1.2 Manufacture of cane sugar in India: 1.3 Byproducts of sugar industry. 1.4 Manufacture of Ethyl Alcohol from Molasses: by Fermentation
		Practical	1. The study of energy of activation of first order reaction i.e. hydrolysis of methyl acetate in presence of 0.5 N HCl / 0.5 N H <sub>2</sub> SO <sub>4</sub> . 2. The study of energy of activation of second order reaction i.e. reaction between K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> and KI (Equal concentrations). 3. The study of energy of activation of second order reaction i.e. reaction between K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> and KI (Unequal concentrations).
February	B.Sc. II	Practical	1) Organic Qualitative Analysis 1-8
	B.Sc. III	Theory XVI	Unit 2. Manufacture of Industrial Heavy Chemicals 2.1 Introduction 2.2 Manufacture of Ammonia (NH <sub>3</sub> ) 2.3 Manufacture of Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> ). 2.4 Manufacture of Nitric acid (HNO <sub>3</sub> ) 2.5 Manufacture of Sodium carbonate (Na <sub>2</sub> CO <sub>3</sub> ). , <b>Home Assignment</b>
		Practical	3. The study of energy of activation of second order reaction i.e. reaction between K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> and KI (Unequal concentrations). 4. To study the hydrolysis of methyl acetate by using its two concentrations in presence of 0.5 N HCl and hence find velocity constant of the reaction.
March	B.Sc. II	Practical	ii) Estimation of vitamin C. iii) Estimation of Phenol by Bromination method iv) Estimation of formaldehyde by sodium sulphite method v) Estimation of ester. II) Organic preparations i) p-nitro acetanilide from acetanilide. ii) Acetanilide from aniline using anhydrous ZnCl <sub>2</sub> and Zn dust. iii) Phthalimide from phthalic anhydride. iv) Benzoic acid from benzamide
	B.Sc. III	Theory XVI	Unit 4. Petroleum industry and eco-friendly fuels A) Petroleum industry Introduction, occurrence, composition of petroleum, resources, processing of petroleum, calorific value of fuel, cracking, octane rating (octane number), cetane <b>Unit Test</b>
		Practical	Submission/ Practical Examination
April/ May			University Examination

Mr. A. A. Kamble

Head  
Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist-Sangli



Shikshan Prasarak Sanstha's  
Padmabhushan Vasantrodada Patil Mahavidyalaya, Kavathe Mahankal.

**DEPARTMENT OF CHEMISTRY**

Annual Teaching Plan  
Academic Year 2023-2024

**Name : Mr. A. S. Pawar**

Month	Class	Paper	Unit / Points to be covered
July	B.Sc. I	Theory I	<b>Unit V: P-Block Elements</b> (Group 13, 14, 15 ) 5.1 Position of elements in periodic table. 5.2 Characteristics of group 13th, 14th and 15th elements with special reference to electronic configuration and periodic properties. 5.3 Compounds of group 13th, 14th and 15th elements. 5.3.1 Boron -diborane.
		Practical	General instruction & introduction to the lab safety
	B.Sc. II	Theory V	<b>Unit 1: Electrolytic Conductivity</b> 1.1 Introduction, Migration of ions. 1.2 Hittorf's rule, Transference number, d 1.3 Kohlrausch law . 1.4 Conductometric titrations . Advantages of conductometric titrations. 1.5 Numerical problems
	B.Sc. III	Theory XI	<b>Unit 3. Photochemistry</b> 3.1 Introduction, Difference between thermal and photochemical processes. 3.2 Laws of photochemistry: 3.3 Quantum yield, 3.4 Factors affecting Quantum yield
	B.Sc. I	Theory I	<b>Unit V: P-Block Elements</b> (Group 13, 14, 15 ) 5.3.2 Allotropes of carbon and phosphorus. 5.3.3 Oxides of Nitrogen <b>Unit I: Fundamentals of Organic Chemistry</b> Introduction, Curved arrow notations, Cleavage of Bonds: Homolysis and Heterolysis. Organic molecular species: Nucleophiles and electrophiles. Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyper conjugation effect, <b>Home Assignment</b>
		Practical	1. To prepare standard 0.1 N KMnO <sub>4</sub> solution and to determine the strength of given oxalic acid solution. 2. To determine quantity of Fe( II )ions from the given solutions by titrating it with 0.1 N K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> solution by using internal indicator 3. To estimate amount of Cu (II) ions by iodometric titration by using Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> solution.



August


August	B.Sc. II	Theory V	<p><b>Unit 2: Thermodynamics</b> 2.1 Introduction, Concept of Entropy: Definition, mathematical expression, unit. 2.2 Physical significance of Entropy. 2.3 Entropy changes for reversible and irreversible processes in isolated systems. 2.4 Entropy changes for an ideal gas as a function of V &amp; T and as function of P &amp; T. 2.5 Entropy change in mixing of gases. 2.6 Entropy change in phase transformations. 2.7 Third law of thermodynamics, 2.8 Numerical problems. <b>Unit 3: Chemical kinetics</b> 3.1 Introduction. 3.2 Third order reactions. <b>Home Assignment</b></p>
	B.Sc III	Theory XI	<p><b>Unit 3. Photochemistry</b> 3.5 Photosensitized reactions. 3.6 Photodimerisation of anthracene, decomposition of HI and HBr. 3.7 Jablonski diagram 3.8 Chemiluminescence, Electroluminescence and Bioluminescence. 3.9 Numerical problems</p>
		Practical	<p>G1.Gravimetric estimation of iron as ferric oxide (Fe<sub>2</sub>O<sub>3</sub> ).. G3. Gravimetric estimation of barium as barium sulphate(BaSO<sub>4</sub>)</p>
September	B.Sc. I	Theory I	<p><b>Unit I: Fundamentals of Organic Chemistry</b> Intermediates: Generation, Structure, Stability and Reactions of Carbocations, Carbanions, Carbon free radicals, Carbene and Nitrene.</p>
		Practical	<p>1) Quality control-To determine percentage purity of the given sample of soda ash (Na<sub>2</sub>CO<sub>3</sub>) by titrimetric method. 2) Chromatography: Separation and identification of cations by Paper Chromatography technique 3) Spot Test: Identify the metal ions by spot test method.</p>
	B.Sc. II	Theory V	<p><b>Unit 3: Chemical kinetics</b> 3.3 Determination of order of reaction 3.4 Effect of temperature on rate of reaction, Arrhenius equation. Concept of energy of activation. 3.5 Numerical problems. <b>Unit 5: Surface Chemistry</b> 5.1 Introduction, 5.2 Factors affecting adsorption, Types of adsorption, Distinction between physical and chemical adsorption, 5.3 Adsorption isotherms: 5.4 Applications of adsorption.</p>
	B. Sc. III	Theory XI	<p><b>Unit 4. Solutions</b> 4.1 Introduction. 4.2 Ideal solutions, Raoult's law, Vapour pressure of ideal and non ideal solutions of miscible liquids. 4.3 Composition of liquid and vapour, vapour pressure and boiling point diagrams of miscible liquids. <b>Unit Test,</b></p>
		Practical	<p>G5.Gravimetric estimation of nickel as bis (dimethylglyoximato) nickel (II) G6.Gravimetric estimation of aluminium as aluminium oxinate potassium tris (8-hydroxy quinolato) aluminium (III)</p>



October	B.Sc. I	Theory I	<b>Unit II: Stereochemistry</b> Introduction, Types of Stereoisomerism, Representation of organic molecules using Wedge, Fischer, Sawhorse and Newman formula, Optical Isomerism: Concept of Chirality, Elements of Symmetry, Optical Isomerism in tartaric acid, 2, 3 Dihydroxybutanoic acid, Enantiomerism, Diastereomerism and Meso compounds, Geometrical isomerism in C=C, C=N and alicyclic compounds. Nomenclature of stereoisomers: D and L, Erythro and Threo, R and S, E and Z. <b>Unit Test</b>
		Practical	Organic Estimations : i) Estimation of Acetamide. ii) Estimation of Aspirin tablet., Organic Qualitative Analysis Compound No. 1
	B.Sc. II	Theory V	<b>Unit 4: States of Matter</b> 4.1 Introduction, 4.2 Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. 4.3 Ideal and Non ideal gases, 4.4 Van der Waals equation of state for real gases. . 4.5 Critical Phenomena: PV-isotherms of real gases 4.6 Liquid crystals: Difference between liquid crystal, solid and liquid. 4.7 Classification, . 4.8 Thermography and seven segment cell. 4.9 Numerical Problems. <b>Unit Test</b>
	B.Sc III	Theory XI	<b>Unit 4. Solution</b> 4.4 Solubility of partially miscible liquids. i. Maximum solution temperature type: Phenol – water system. ii. Minimum solution temperature type: Triethyl amine – water system. iii. Maximum and minimum solution temperature type: Nicotine – water system. Distillation of partially miscible liquid pairs. 4.5 Vapour pressure and distillation of immiscible liquids, steam distillation. <b>Instrument Operation</b>
		Practical	P1. Preparation of potassium trioxalato aluminate (III). P2. Preparation of Tetra ammine copper (II) chloride. P3. Preparation of tris(thiourea) copper (I) sulphate. P4. Preparation of potassium trioxalato ferrate (III). P5. Preparation of chloropenta-ammine cobalt (III) chloride. P6. Preparation of ammoniumdiamminetetraethiocyanato chromate
	November	B.Sc. I	
B.Sc. II			Diwali Vacation & University exams
B.Sc. III			Diwali Vacation & University exams
	B.Sc. I	Theory III	<b>Unit 1: Basic Mathematical Concepts</b> 1.1 Logarithm: Basic rules and calculations. 1.2 Graph - Quadrants, drawing of linear graph, Slopes and Intercept. 1.3 Derivative and Integration: Basic rules <b>Unit 3: Chemical Kinetics</b> 3.1 Introduction, rate of reaction, definition, and units of rate constant. 3.2 Factors affecting rate of reaction. 3.3 Order and Molecularity of reaction



December	B.Sc. II	Practical	Organic Qualitative Analysis Compound No. 2 to 5
		Theory VII	<b>Unit 1: Co-ordination Chemistry</b> 1.1 Introduction- 1.2 Terminology- Description of the terms 1.3 Effective atomic number rule. 1.4 Distinguish between double salt and complex salt. 1.5 Werner's theory 1.6 IUPAC nomenclature of coordination compounds. 1.7 Isomerism in complexes 1.8 Valence bond theory of transition metal complexes
	B.Sc. III	Theory XIII	<b>Unit 4. Chemical Kinetics</b> 4.1 Introduction. 4.2 Simultaneous reactions such as i. Opposing reaction: (Derivation of rate equation for first order opposed by first order expected). ii. Side reaction. iii. Consecutive reactions. iv. Chain reaction. v. Explosive reaction, <b>Industrial Visit</b>
		Practical	V1. Determination of percentage purity of ferrous ammonium sulphate. Determination of amount of aluminum in the given solution of potash alum. V7. Determination of titrable acidity in the given sample of milk or lassi. V8. Determination of percentage purity of boric acid using supplied sodium hydroxide V2. Determination of percentage purity of tetrammine copper (II) sulphate. <b>Project Work</b>
	B.Sc. I	Theory III	<b>Unit 3: Chemical Kinetics</b> 3.4 First order reaction: Derivation of rate constant. Characteristics of the first order reaction. 3.5 Pseudo- first order reactions 3.6 Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. 3.7 Examples of Second order reaction: 3.8 Characteristics of Second order reactions. 3.9 Numerical problems. <b>Home Assignments</b>
		Practical	1) Determination of heat of ionization of weak acid by using polythene bottle. 2) Determination of Surface tension of the given liquids by Stalagmometer. 3) Determination of equivalent weight of Mg by eudiometer.

  
 Mr. A.S. Pawar

  
 Head  
 Department of Chemistry  
 P. V. P. Mahavidyalaya,  
 K. Mahankal, Dist. Sangli



January


B.Sc. II	Theory VII	<p><b>Unit-4. Chemistry of 4f Elements (Lanthanides)</b>            4.1 Position of lanthanides in periodic table 4.2 Occurrence 4.3 Characteristics of 4f elements with special reference to 4.3.1 Electronic configuration 4.3.2 Oxidation states 4.3.3 Magnetic properties 4.3.4 Lanthanide contraction 4.4 Separation of lanthanides <b>Unit-5. Inorganic Semi-micro Qualitative Analysis</b> 5.1 Theoretical principles involved in qualitative analysis. 5.2 Applications of solubility product and common ion effect in separation of cations into groups. 5.3 Applications of complex formation . 5.4 Application of oxidation and reduction b) Separation of NO<sub>2</sub><sup>-</sup> and NO<sub>3</sub><sup>-</sup> in mixture. 5.5 Spot test analysis. <b>Fertilizers Survey</b></p>
B.Sc. III	Theory XV	<p><b>Unit 4. Chemical Kinetics.</b> 4.2 Simultaneous reactions such as ii. Side reaction. iii. Consecutive reactions. iv. Chain reaction. v. Explosive reaction</p>
	Practical	<p>V10. Determination of amount of sodium present in the given solution of common salt using cation exchange resin (By Acid Base titration).            V11. Determination of amount of magnesium in the given solution containing (Mg<sup>2+</sup> and Zn<sup>2+</sup>) using anion exchange resin and standard solution of EDTA  <b>Potentiometry</b> 1. Titration of strong acid with strong alkali. 2. Preparation of buffer solution and determination of their pH 3. Determination of standard electrode potential of Zn/Zn<sup>++</sup>, Cu/Cu<sup>++</sup></p>
B.Sc. I	Theory III	<p><b>Unit 5: Electrochemistry</b> 5.1 Introduction, types of cell, phenomenon of electrolysis, Faradays Laws of electrolysis. 5.2 Types of conductors. 5.3 Explanations of Conductance, specific conductance, equivalence and molecular conductance. 5.4 Variation of specific conductance, equivalence and molecular conductance with dilution, equivalent conductance at infinite dilution. 5.5 Dipping type of conductivity cell, 5.6 Measurement of conductance by Wheatstone bridge. 5.7 Cell constant and its determination. 5.8 Numerical problems. <b>Home Assignments</b></p>
	Practical	<p>1) Determination of viscosity of given liquids A and B 2) To study the velocity constant of hydrolysis of methyl acetate in presence HCl/ H<sub>2</sub>SO<sub>4</sub>.</p>




February	B.Sc. II	Theory VII	<p><b>Unit 1: Carboxylic Acids and Their Derivatives.</b>            1.1 Monocarboxylic acids: 1.2 Halo acids: 1.3 Hydroxy acids: 1.4 Di carboxylic acids: 1.5 Carboxylic acid derivatives.      <b>Unit 3:</b>  <b>Carbohydrates</b> 3.1 Introduction. 3.2 Classification of carbohydrates 3.3 Physical properties of glucose and fructose. 3.4 Killiani's synthesis of Glucose 3.6 Cyclic structure of Fructose 3.7 Structures of Disachharides . 3.8 Structures of Polysachharides: a) Starch b) Cellulose <b>Group Discussion</b></p>
	B.Sc. III	Theory XIII	<p><b>Unit 5 Distribution law</b> 5.1 Introduction, solute, solvent and solution, miscible and immiscible liquids. 5.2 Nernst distribution law and its limitations. 5.3 Modification of distribution law with respect to change in molecular state of solution</p>
Practical		<p><b>B. Conductometry</b> 1. Titration of a mixture of weak acid and strong acid with strong alkali 2. To study the effect of substituent on dissociation constant of weak acid with respect to acetic acid and monochloroacetic acid 3. To determine the normality of citric acid in lemon by titrating it against standard 0.2 N NaOH solution by conduct metric method  <b>C. Refractometry.</b> 1. To determine the percentage composition of unknown mixture by (i) graphical method and (ii) by composition law <b>D. Colorimetry.</b> 1. To verify Lambert – Beer's law using CuSO<sub>4</sub> solution. 2. To estimate of Fe<sup>+++</sup> ions by thiocyanate method.</p>	
March	B.Sc. I	Theory III	<p><b>Unit 5 Distribution law</b> 5.4 Applications of the distribution law i. Process of extraction (derivation expected). ii. Determination of solubility of solute in particular solvent. iii. distribution indicators. iv. determination of molecular weight of solute in different solvents. 5.5 Numerical problems. , <b>SEMINARS</b></p>
		Practical	Submission/ Practical Examination
	B.Sc. II	Theory VII	<p><b>Unit 5: Stereochemistry</b>            5.1 Conformational isomerism – Introduction. 5.2 Representation of conformations of ethane 5.3 Conformations and conformational analysis of ethane and n-butane 5.4 Relative stability cycloalkanes . 5.5 Conformations and stability of cyclohexane 5.6 Conformation and stability of methyl cyclohexane. 5.7 Locking of conformation in t-butyl cyclohexane. <b>Unit Test</b></p>



	B.Sc. III	<b>Unit 2: Thermodynamics</b> 2.1 Introduction, Basic terms used in thermodynamics, Zeroth law of thermodynamics 2.2 First law of thermodynamics. 2.3 Spontaneous and non-spontaneous processes, Second law of thermodynamics. 2.4 Heat engine, Carnot's Cycle and efficiency of heat engine. 2.5 Numerical Problems. <b>Unit Test</b>
	Practical	Submission/ Practical Examination
April/ May		University Examination

  
Mr. A.S. Pawar

  
Head  
Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist. Sangli



**Shikshan Prasarak Sanstha's  
Padmabhushan Vasantrodada Patil Mahavidyalaya, Kavathe Mahankal.**

**DEPARTMENT OF CHEMISTRY**

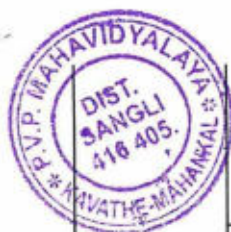
Annual Teaching Plan  
Academic Year 2023-2024

**Name : Dr. R. S. Sutar**

Month	Class	Paper	Unit / Points
July	B.Sc. I	Theory I	<b>Unit 1. Atomic Structure and Periodicity of Elements</b> 1.1 Atomic Structure. 1.2 Bohr's theory of Hydrogen atom and its limitations. 1.3 Wave particle duality. 1.4 Heisenberg uncertainty principle. 1.5 Quantum numbers and their significance. 1.6 Shapes of s, p and d atomic orbitals. 1.7 Electrons filling rules in various orbitals: a) Aufbau's principle, b) Hund's rule of maximum multiplicity, c) Pauli's exclusion principle.
	B.Sc. II	Theory VI	<b>Unit 3. Corrosion and Electroplating</b> <b>A) Corrosion:</b> 3.1 Introduction of corrosion. 3.2 Electrochemical theory of corrosion. 3.3 Factors affecting corrosion, i) Position of metals in the electrochemical series on the basis of standard reduction potential. ii) Purity of metal. iii) Effect of moisture. iv) Effect of Oxygen (Differential aeration principle). v) Hydrogen over voltage.
August	B.Sc. I	Theory I	<b>Unit 1. Atomic Structure and Periodicity of Elements</b> 1.8 Electronic configuration of elements. Stability of empty, half-filled and completely filled orbitals. 1.9 Periodicity of the elements: General discussion of the following properties of the elements with reference to s block elements: a) electronic configuration, b) atomic radii, c) ionic radii, d) ionization energy, e) electron affinity, f) electronegativity, g) metallic characters, h) reactivity, i) oxidation state, j) melting and boiling points, k) chemical
	B.Sc. II	Practical	1) To study the hydrolysis of methyl acetate in presence of HCl and H <sub>2</sub> SO <sub>4</sub> and to determine the relative strength of acids. 2) To study the effect of acid strength on hydrolysis of an ester by using 0.5M HCl and 0.25M HCl. 3) To study the reaction rate of hydrolysis of an ethyl acetate by an alkali. 4) To study the reaction between potassium persulphate and Potassium iodide in Solution with unequal concentration of the reactants. 5) To determine the degree of dissociation and dissociation constant of acetic acid at various dilutions and to verify Ostwald's dilution law conductometrically.



		Theory VI	<b>Unit 3. Corrosion and Electroplating</b> 3.4 Methods of protections of metals from corrosion. a) Making metal cathodic. b) Controlling external condition. c) Coating galvanising d) Tinnig. e) electroplating. f) Organic coating. <b>B)</b> <b>Electroplating:</b> 3.5 Electrolysis, Faraday's law and Current efficiency. 3.6 Basic principle of electroplating. 3.7 Cleaning of articles. 3.8 Electroplating of Chromium. 3.9 Anodising
	B.Sc III	Practical	Organic Qualitative analysis Separation of binary mixture and Identification of one component. Nature 1) Solid – Solid : 4 mixtures 2) Solid – Liquid : 2 mixtures
September	B.Sc. I	Theory I	<b>Unit 4. Acids and Bases</b> 4.1 Introduction of acids & bases. 4.2 Theories of acids and bases, a) Arrhenius concept b) Bronsted-Lowry concept, c) Lewis concept, d) Lux-Flood concept ( Definitions and examples only)
	B.Sc. II	Practical	6) To determine the normality of the given strong acid by titrating it against the strong alkali conduct metrically. 7) To determine the normality of the given weak acid by titrating it against the strong alkali conductometrically. 8) To determine the percentage composition of a given liquid mixture by viscosity method (Density data to be given). 9) To determine the specific and molar refractions of benzene, toluene and xylene 10) To determine the specific rotation and unknown concentration of sugar solution
	B. Sc. II	Theory VI	<b>Unit 4. Chromatographic Techniques</b> 4.1 Introduction. 4.2 Classification of chromatographic methods. 4.3 Column chromatography. a) Introduction. b) Types of column chromatography. c) Principle of column chromatography. d) Methodology.
	B.Sc III	Practical	Organic Qualitative analysis Separation of binary mixture and Identification of one component. Nature 2) Solid – Liquid : 2 mixtures
October	B.Sc. I	Theory I	<b>Unit 4. Acids and Bases</b> 4.3 Hard & soft acids & bases. i) Classification of acids and bases as hard, soft & borderline, ii) Pearson's HSAB concept, iii) Acid-base strength & hardness-softness, iv) Applications & limitations of HSAB concept
	B.Sc. II	Practical	i) Gravimetric estimation of iron as $\text{Fe}_2\text{O}_3$ from a solution containing Ferrous ammonium sulphate and free sulphuric acid. ii) Gravimetric estimation of barium as $\text{BaSO}_4$ from a solution containing barium chloride and free hydrochloric acid. iii) Gravimetric estimation of nickel as $\text{Ni}(\text{DMG})_2$ from a solution containing $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ and free sulphuric acid.



		Theory VI	<b>Unit 4. Chromatographic Techniques</b> 4.4 Ion-exchange chromatography. a) Introduction. b) Types of Ion-exchange chromatography. c) Principle of Ion-exchange chromatography. d) Methodology. e) Applications
	B.Sc. III	Practical	Organic Estimations: 1. Estimation of sucrose 2. Saponification value of oil. 3. To determine the amount of acid and amide present in the given mixture of acid and amide.
November	B.Sc. I		Diwali Vacation & University exams
	B.Sc. II		Diwali Vacation & University exams
	B.Sc. III		Diwali Vacation & University exams
December	B.Sc. I	Theory IV	<b>Unit 1. Introduction to analytical Chemistry</b> 1.1 Introduction. 1.2 Importance of analysis. 1.3 Analytical processes (Qualitative and Quantitative). 1.4 Methods of analysis (Only classification). 1.5 Sampling of solids, liquids and gases. 1.6 Errors, types of errors (determinate and indeterminate), methods of expressing accuracy (Absolute and relative error). 1.7 Significant figures, mean, median, standard deviation (Numerical problems expected).
	B.Sc. II	Practical	i) Preparations of sodium cuprous thiosulphate ii) Preparation of tris (ethylene diamine) nickel (II) thiosulphate iii) Preparation of hexammine nickel (II) chloride iv) Preparation of tetrammine copper (II) sulphate. 3) Semi-micro Qualitative Analysis
	B.Sc. III	Practical	<b>Organic Estimations</b> 1. Determination of Molecular weight of monobasic/dibasic acid by volumetric method. 2. Estimation of unsaturation –to estimate the percentage purity of given olefinic compound by bromination method., <b>Organic Preparations</b> 1. Benzil- Benzilic acid rearrangement reaction
January	B.Sc. I	Theory IV	<b>Unit 2. Fundamentals of Industrial Chemistry and IPR</b> 2.1 Difference between classical and industrial chemistry, Raw materials for chemical industry, Material safety data sheets (MSDS). 2.2 Definition and Explanation of terms - Molecular weight, Equivalent weight, Molarity, Normality, Molality, Molarity of mixed solution, Acidity of base, Basicity of acid, ppt, ppm, ppb solutions, Mole Fraction, Weight fraction, Percentage composition by W/W, W/V, V/V, Problems based on Normality, Molarity, mole fraction, mixed solution, etc. 2.3 IPR- Introduction to IPR and its significance in presence scenario.
	B.Sc. II	Practical	i) Fertilizer analysis: To determine percentage of nitrogen in the given sample of a nitrogenous fertilizer (ammonium sulphate). ii) Analysis of Synthetic /Commercial Sample: To estimate Magnesium from talcum powder. iii) Determination of alkali content from antacid tablet using HCl solution . iv) Estimation of Calcium from chalk: v) Determination of total hardness of water using 0.01M EDTA solution.



	B.Sc. III	Practical	1. The study of energy of activation of first order reaction i.e. hydrolysis of methyl acetate in presence of 0.5 N HCl / 0.5 N H <sub>2</sub> SO <sub>4</sub> . 2. The study of energy of activation of second order reaction i.e. reaction between K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> and KI (Equal concentrations). 3. The study of energy of activation of second order reaction i.e. reaction between K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> and KI (Unequal concentrations).
February	B.Sc. I	Theory IV	<b>Unit 3. Chromatography</b> 3.1 Introduction, Basic Principle of Chromatography, Basic terms, Classification of Chromatography 3.2 Paper Chromatography-Principle, Methodology-types of papers and treatment, sample loading, choice of solvent, development-ascending, descending, circular, location of spots, determination of R <sub>f</sub> value, Applications, advantages and disadvantages 3.3 Thin layer chromatography-Principle, Solvent system, stationary phases, preparation of TLC plate, Detecting reagents, methodology-sample loading, development, detection of spot, R <sub>f</sub> value, Applications, advantages and disadvantages 3.4 Comparison of paper chromatography and TLC.
	B.Sc. II	Practical	1) Organic Qualitative Analysis 1-8
	B.Sc. III	Practical	3. The study of energy of activation of second order reaction i.e. reaction between K <sub>2</sub> S <sub>2</sub> O <sub>8</sub> and KI (Unequal concentrations). 4. To study the hydrolysis of methyl acetate by using its two concentrations in presence of 0.5 N HCl and hence find velocity constant of the reaction.
March	B.Sc. I	Theory IV	<b>Unit 4. Theory of titrimetric Analysis</b> 4.1 Introduction. 4.2 Acid-base indicators. 4.3 Theory of indicators w.r.t. Ostwald's ionization theory and quinoid theory. 4.4 Neutralization curves and choice of indicators for a. Strong acid-strong base b. Strong acid-weak base c. Strong base-weak acid 4.5 Complexometric titrations a. Introduction b. Types EDTA titrations c. Metallochromic indicators-Eriochrome black- T d. Indicator Action of Eriochrome black- T.
	B.Sc. II	Practical	ii) Estimation of vitamin C. iii) Estimation of Phenol by Bromination method iv) Estimation of formaldehyde by sodium sulphite method v) Estimation of ester. II) Organic preparations i) p-nitro acetanilide from acetanilide. ii) Acetanilide from aniline using anhydrous ZnCl <sub>2</sub> and Zn dust. iii) Phthalimide from phthalic anhydride. iv) Benzoic acid from benzamide
	B.Sc. III	Practical	Submission/ Practical Examination
April/ May			University Examination

*Ruthe*  
Dr. R. S. Sutar

*Ruthe*  
Head  
Department Of Chemistry  
P. V. P. Mahavidyalaya,  
K. Mahankal, Dist-Sangli