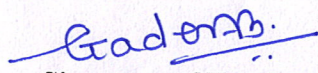



Rayat Shikshan Sanstha's,
Arts, Science and Commerce College, Mokhada
Mokhada Dist. Palghar 401604
Department of Chemistry
Annual Teaching Plan 2022-2023
Term -II

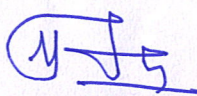
Name of Teacher: Dr. V. B. Gade
 Faculty: Science
 Department: Chemistry

Semester: IV & VI
 Subject: Chemistry-III & Analytical Chemistry

Department Chemistry		Semesters IV & VI		S Y. B. Sc. Paper-III (General Chemistry)	T. Y. B. Sc. Paper-IV (Analytical Chemistry)	
Class	Month	Week	Paper No.	Unit Name	Period allotted	Period required
S.Y. B.Sc. (Chem.)	Nov.	IV & V	III	Unit-I Methods of Separation	05 L	05 L
	Dec.	I to V	III	Unit-I Methods of Separation Unit-II Instrumental Methods II	13 L	13 L
	Jan.	I to V	III	Unit-II Instrumental Methods II Unit-III Statistical treatment of Analytical Data II	13 L	13 L
	Feb.	I to V	III	Unit-III Statistical treatment of Analytical Data II	11 L	11 L
	Mar.	I to V	III	Unit-III Statistical treatment of Analytical Data II	03 L	03 L
T.Y. B.Sc. (Chem.)	Nov.	IV & V	IV	Unit-I Electroanalytical Techniques	6 L	6 L
	Dec.	I to V	IV	Unit-I Electroanalytical Techniques Unit-II Methods of Separation II	18 L	18 L
	Jan.	I to V	IV	Unit-II Methods of Separation II Unit-III Food and Cosmetic Analysis	17 L	17 L
	Feb.	I to V	IV	Unit-III Food and Cosmetic Analysis Unit-IV Thermal Methods and Analytical Method Validation	16 L	16 L
	Mar.	I to V	IV	Unit-IV Thermal Methods and Analytical Method Validation	3 L	3 L


 Signature of Teacher


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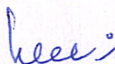
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Arts, Science and Commerce College, Mokhada
Mokhada Dist. Palghar 401604
Department of Chemistry
Annual Teaching Plan 2022-2023
Term -II

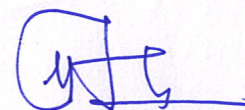
Name of Teacher: Dr. V. B. Gade
 Faculty: Science
 Department: Chemistry

Semester: IV & VI
 Subject: Chemistry-III & Analytical Chemistry

Department Chemistry		Semesters IV & VI		S Y. B. Sc. Paper-III (General Chemistry)	T. Y. B. Sc. Paper-IV (Analytical Chemistry)	
Class	Month	Week	Paper No.	Unit Name	Period allotted	Period required
S.Y. B.Sc. (Chem.)	Nov.	IV & V	III	Unit-I Methods of Separation	05 L	05 L
	Dec.	I to V	III	Unit-I Methods of Separation Unit-II Instrumental Methods II	13 L	13 L
	Jan.	I to V	III	Unit-II Instrumental Methods II Unit-III Statistical treatment of Analytical Data II	13 L	13 L
	Feb.	I to V	III	Unit-III Statistical treatment of Analytical Data II	11 L	11 L
	Mar.	I to V	III	Unit-III Statistical treatment of Analytical Data II	03 L	03 L
T.Y. B.Sc. (Chem.)	Nov.	IV & V	IV	Unit-I Electroanalytical Techniques	6 L	6 L
	Dec.	I to V	IV	Unit-I Electroanalytical Techniques Unit-II Methods of Separation II	18 L	18 L
	Jan.	I to V	IV	Unit-II Methods of Separation II Unit-III Food and Cosmetic Analysis	17 L	17 L
	Feb.	I to V	IV	Unit-III Food and Cosmetic Analysis Unit-IV Thermal Methods and Analytical Method Validation	16 L	16 L
	Mar.	I to V	IV	Unit-IV Thermal Methods and Analytical Method Validation	3 L	3 L


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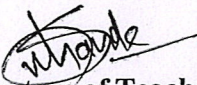


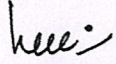
Department of Chemistry
Annual Teaching Plan: 2022-2023
Term -II

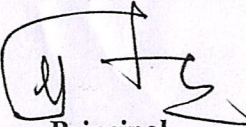
Name of Teacher: Prof. S. R. Vhande
Faculty: Science
Department: Chemistry

Semester: IV & VI
Subject: Chemistry & Foundation Course

Department Chemistry		Semesters IV & VI		S. Y. B. Sc. Paper-I (General Chemistry)	S. Y. B. Sc. Paper-IV (Foundation Course)	T. Y. B. Sc. Paper-III (Organic Chemistry)	
Class	Month	Week	Paper No.	Unit Name		Period allotted	Period required
S.Y. B.Sc. (Chem.)	Nov.	IV	I	Carboxylic acids		5L	5L
	Dec.	I & IV	I	and their derivatives, Sulphonic acids.		10L	10L
	Jan.	I to IV	I	Electrochemistry –II & Phase equilibria.		15L	15L
	Feb.	I to IV		Comparative chemistry of the transition metals & coordination chemistry		15L	15L
S.Y. B.Sc. (F.C)	Nov	IV	IV	Significant, contemporary Rights of Citizens,		04L	04L
	Dec.	I to IV	IV	Significant, contemporary Rights of Citizens,		08L	08L
	Jan.	I to IV	IV	Approaches to understanding Ecology		11L	11L
	Feb.	I to IV	IV	Science and Technology II, Introduction to Competitive Examinations.		15L	15L
	March	I	IV	Soft skills required for competitive examinations		07L	07L
T.Y. B.Sc. (Chem.)	Nov.	IV	III	Stereochemistry -II, Amino acids & Proteins		05L	05L
	Dec.	I to IV	III	Stereochemistry -II, Amino acids & Proteins		10L	10L
	Jan.	I to IV	III	Molecular rearrangement, Carbohydrates		15L	15L
	Feb.	I to IV	III	Spectroscopy- II, Nucleic acids		15L	15L
	March	I to IV	III	Polymer, Catalysis & Reagents		15L	15L


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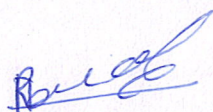
Department of Chemistry

Teaching plan-2022-23

Term-II

Name of the teacher- Prof. R. A. Kawale

Class	Month	Paper No.	Unit	Period allotted	Period required
F.Y.B.Sc.	November	Chem-II	Unit-1	03	03
	December		Unit-1	12	12
	January		Unit-2	11	11
	February		Unit-2 & Unit-3	11	11
	March		Unit-3	08	08
T.Y.B.Sc.	November	Inorganic Chemistry	Unit-1	7	7
	December		Unit-1 & 2	16	16
	January		Unit-2 & 3	17	17
	February		Unit-3 & Unit-4	16	16
	March		Unit-4	04	04



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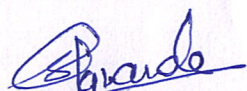
Department of Chemistry

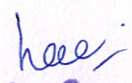
Teaching plan-2022-23

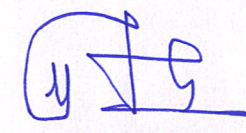
Term-II

Name of the teacher- Prof. A. J. Gavande

Class	Month	Paper No.	Unit	Period allotted	Period required
F. Y. B. Sc.	November	Chem-I	Unit-1	06	06
	December		Unit-1	09	09
	January		Unit-2	11	11
	February		Unit-2 & Unit-3	11	11
	March		Unit-3	08	08
T. Y. B. Sc.	November	Physical Chemistry	Unit-1	6	6
	December		Unit-1 & 2	14	14
	January		Unit-2 & 3	15	15
	February		Unit-3 & Unit-4	15	15
	March		Unit-4	10	10


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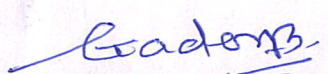


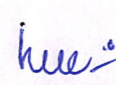
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Mokhada Dist. Palghar 401604
Department of Chemistry
Annual Teaching Plan 2022-2023
Term -I

Name of Teacher: Dr. V. B. Gade
Faculty: Science
Department: Chemistry

Semester: III & V
Subject: Chemistry-III & Analytical Chemistry

Department Chemistry		Semesters III & V		S Y. B. Sc. Paper-III (General Chemistry)	T. Y. B. Sc. Paper-IV (Analytical Chemistry)	
Class	Month	Week	Paper No.	Unit Name	Period allotted	Period required
S.Y. B.Sc. (Chem.)	July	I & IV	III	Unit-I Introduction to Analytical Chemistry and Statistical Treatment of Analytical Data	15 L	15 L
	Aug.	I to IV	III	Unit-II Classical Methods of Analysis	15 L	15 L
	Sept.	I to IV	III	Unit-III Instrumental Methods-I	15 L	15 L
T.Y. B.Sc. (Chem.)	Jun	IV to V	IV	Unit-I Introduction to quality concepts, chemical calculations and sampling	8 L	8 L
	July	I to IV	IV	Unit-I Introduction to quality concepts, chemical calculations and sampling Unit-II Classical Methods of Analysis (Titrimetry)	15 L	15 L
	Aug.	I to IV	IV	Unit-II Classical Methods of Analysis (Titrimetry) Unit-III Optical Methods	15 L	15 L
	Sept.	I to IV	IV	Unit-III Optical Methods Unit-IV Methods of separation-I	15 L	15 L
	Oct.	I to II	IV	Unit-IV Methods of separation-I	7 L	7 L


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Department of Chemistry / रसायनशास्त्र विभाग


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Arts, Science and Commerce College, Mokhada
Mokhada Dist. Palghar 401604
Department of Chemistry
Annual Teaching Plan 2022-2023
Term -I

Name of Teacher: Dr. V. B. Gade
Faculty: Science
Department: Chemistry

Semester: III & V
Subject: Chemistry-III & Analytical Chemistry

Department Chemistry		Semesters III & V		S Y. B. Sc. Paper-III (General Chemistry)	T. Y. B. Sc. Paper-IV (Analytical Chemistry)	
Class	Month	Week	Paper No.	Unit Name	Period allotted	Period required
S.Y. B.Sc. (Chem.)	July	I & IV	III	Unit-I Introduction to Analytical Chemistry and Statistical Treatment of Analytical Data	15 L	15 L
	Aug.	I to IV	III	Unit-II Classical Methods of Analysis	15 L	15 L
	Sept.	I to IV	III	Unit-III Instrumental Methods-I	15 L	15 L
T.Y. B.Sc. (Chem.)	Jun	IV to V	IV	Unit-I Introduction to quality concepts, chemical calculations and sampling	8 L	8 L
	July	I to IV	IV	Unit-I Introduction to quality concepts, chemical calculations and sampling Unit-II Classical Methods of Analysis (Titrimetry)	15 L	15 L
	Aug.	I to IV	IV	Unit-II Classical Methods of Analysis (Titrimetry) Unit-III Optical Methods	15 L	15 L
	Sept.	I to IV	IV	Unit-III Optical Methods Unit-IV Methods of separation-I	15 L	15 L
	Oct.	I to II	IV	Unit-IV Methods of separation-I	7 L	7 L

Gade V. B.
Signature of Teacher

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Y B
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Department of Chemistry
Annual Teaching Plan: 2022-2023
Term -I

Name of Teacher: Prof. S. R. Vhande

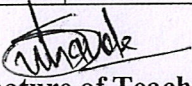
Semester: III & V

Faculty: Science

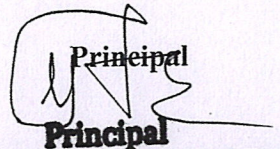
Subject: Chemistry & Foundation Course

Department: Chemistry

Department Chemistry		Semesters III & V		S Y. B. Sc. Paper-I (General Chemistry)		S. Y. B. Sc. Paper-III (Foundation Course)		T. Y. B. Sc. Paper-III (Organic Chemistry)	
Class	Month	Week	Paper No.	Unit Name		Period allotted	Period required		
S.Y. B. Sc. (Chem.) 301	July	I to IV	I	Reaction & reactivity of halogenated hydrocarbon Alcohol, Phenol & Epoxides		15 L	15 L		
	August	I & IV	I	Chemical Thermodynamics -II, Electrochemistry		15 L	15 L		
	Sept.	I to IV	I	Chemical Bonding		15 L	15 L		
S.Y. B. Sc. Foundation Course	July	I to IV	III	Human rights provisions, violations and redressal, soft skills for effective interpersonal communication		15 L	15 L		
	August	I to IV	III	Dealing with Environmental concerns		15 L	15 L		
	Sept.	I to IV	III	Science and Technology-I, Soft skills for effective Interpersonal communications		15 L	15 L		
T.Y. B. Sc. Organic Chem. (503)	June	III to IV	III	Mechanism of organic reactions		08 L	08 L		
	July	I to IV	III	Photochemistry, Stereochemistry-I, Agrochemical, Heterocyclic chemistry		15 L	15 L		
	August	I to IV	III	Heterocyclic chemistry, IUPAC Nomenclature, synthesis of organic compounds, spectroscopy		15 L	15 L		
	Sept..	I to IV	III	synthesis of organic compounds, spectroscopy-I		15 L	15 L		
	Oct.	I to II		Natural products		07 L	07 L		


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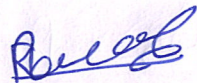
Department of Chemistry

Teaching plan-2022-23

Term-I

Name of the teacher- Prof. R. A. Kawale

Class	Month	Paper No.	Unit	Period allotted	Period required
F.Y.B.Sc.	July	II	Unit-1	14	14
	August		Unit-2	12	12
	September		Unit-2 & Unit-3	14	14
	October		Unit-3	05	05
T.Y.B.Sc.	June	III	Unit-1	10	10
	July		Unit-1 & 2	15	15
	August		Unit-2 & 3	15	15
	September		Unit-3 & Unit-4	15	15
	October		Unit-4	05	05

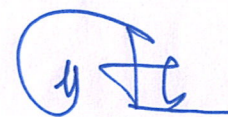


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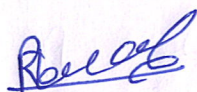
Department of Chemistry

Teaching plan-2022-23

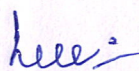
Term-I

Name of the teacher- Prof. R. A. Kawale

Class	Month	Paper No.	Unit	Period allotted	Period required
F.Y.B.Sc.	July	II	Unit-1	14	14
	August		Unit-2	12	12
	September		Unit-2 & Unit-3	14	14
	October		Unit-3	05	05
T.Y.B.Sc.	June	III	Unit-1	10	10
	July		Unit-1 & 2	15	15
	August		Unit-2 & 3	15	15
	September		Unit-3 & Unit-4	15	15
	October		Unit-4	05	05

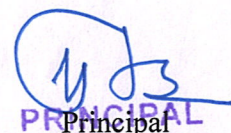


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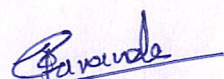
Department of Chemistry

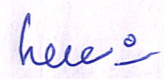
Teaching plan-2022-23


Term-I

Name of the teacher- Prof. A. J. Gavande

Class	Month	Paper No.	Unit	Period allotted	Period required
F.Y.B.Sc.	July	I	Unit-1	14	14
	August		Unit-2	12	12
	September		Unit-2 & Unit-3	14	14
	October		Unit-3	05	05
	July	F.C. I	Unit-1 & 2	15	15
	August		Unit-3 & 4	15	15
	September		Unit-4 & Unit-5	15	15
	October		Unit-6	15	15
T.Y.B.Sc.	June	I	Unit-1	10	10
	July		Unit-1 & 2	15	15
	August		Unit-2 & 3	15	15
	September		Unit-3 & Unit-4	15	15
	October		Unit-4	05	05


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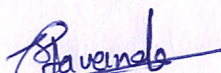
Department of Chemistry

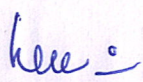
Teaching plan-2022-23

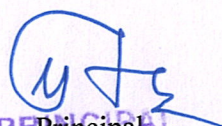
Term-I

Name of the teacher- Prof. A. J. Gavande

Class	Month	Paper No.	Unit	Period allotted	Period required
F.Y.B.Sc.	July	I	Unit-1	14	14
	August		Unit-2	12	12
	September		Unit-2 & Unit-3	14	14
	October		Unit-3	05	05
	July	F.C. I	Unit-1 & 2	15	15
	August		Unit-3 & 4	15	15
	September		Unit-4 & Unit-5	15	15
	October		Unit-6	15	15
T.Y.B.Sc.	June	I	Unit-1	10	10
	July		Unit-1 & 2	15	15
	August		Unit-2 & 3	15	15
	September		Unit-3 & Unit-4	15	15
	October		Unit-4	05	05


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Rayat Shikshan Sanstha's
Arts, Science and Commerce College, Mokhada
Teaching Plan 2021-22

Semester-V

Class-T. Y. B. Sc.

Subject: Inorganic Chemistry

Name of the teacher- R. A. Kawale

Month	Chapter Name	Content
July	1. Chemical Bonding And Solid State Chemistry (15L)	<p>1.1 Molecular Symmetry (7L) 1.1.1 Introduction and Importance. 1.1.2 Symmetry elements and symmetry operations. 1.1.3 Concept of a Point Group with illustrations using the following point groups: (i) $C_{\infty v}$ (HCl), (ii) $D_{\infty h}$ (H_2), (iii) C_{2v} (H_2O), (iv) C_{3v} (NH_3), (v) C_{2h} (trans-trichloroethylene), and (vi) D_{3h} (BCl_3).</p> <p>USCH502 I</p> <p>1.2 Molecular Orbital Theory for Polyatomic Species (5L) 1.2.1 Simple triatomic species: H_3^+ and H_3 (correlation between bond angle and Molecular orbitals). Term such as Walsh correlation diagram, Symmetry Adapted Linear Combinations (SALCs), Ligand Group orbitals (LGOs), transformation of atomic orbitals into appropriate symmetry types, expected to be discussed</p> <p>1.3 (3L) Other molecules (considering only σ-bonding): i) BeH_2, ii) H_2O, Explanation of terms viz. crystal lattice, lattice points, unit cells and lattice constants.</p>
August	2. Solid Materials (15L)	<p>2.1 Structures of Solids (10L) 2.1.1 Importance of solid state chemistry. 2.1.2 Classification of solids on the basis of bonding. 2.1.3 Closest packing of rigid spheres (hcp, ccp), packing density in simple cubic, bcc, fcc and hcp lattices (numerical problems expected). Point defects with respect to Frenkel and Schottky defects expected. 2.1.4 Structure metallic solids. 2.1.5 Tetrahedral and octahedral interstitial voids in ccp lattice, tetrahedral holes, limiting radius ratios for different coordination numbers and their significance, calculation of limiting radius ratio for coordination number 4.</p>

		<p>2.1.7 Structures of sodium chloride and cesium chloride.</p> <p>2.2 Superconductivity (05L)</p> <p>2.2.1 Superconductivity, Meissner effect.</p> <p>2.2.2 Different superconducting materials viz, conventional superconductors, organic superconductors, alkali metal fullerenes (A₃C₆₀) and high temperature Superconductors.</p> <p>2.2.3 Applications of superconducting materials.</p>
September	3. Chemistry of elements (15L)	<p>3.1 Inner transition elements (3L)</p> <p>3.1.1 Introduction: position of f-block elements and comparison between lanthanides and actinides</p> <p>3.1.2 The shapes of f-orbitals.</p> <p>3.1 Lanthanides Series (10L)</p> <p>3.2.1 Chemistry of lanthanides with reference to (i) lanthanide contraction, (ii) Oxidation states (iii) magnetic and spectral properties,</p> <p>3.2.2 Occurrence, extraction and separation of lanthanides by Solvent extraction. 3.2.3 Applications of lanthanides.</p> <p>3.3 Actinides Series (2L)</p> <p>3.3.1 Chemistry of Uranium and with reference to occurrence, extraction (solvent extraction method),</p> <p>3.3.2 Properties and applications.</p>
October	4. Solution Chemistry	<p>4.1 Acid-base Chemistry in Aqueous Medium (8L)</p> <p>4.1.1 Acidity of mono- and polyatomic cations.</p> <p>4.1.2 Basicity of mono- and polyatomic anions (discussion for 4.1.1 as well as 4.1.2 to Include Latimer equation and predominance diagrams).</p> <p>4.2 Chemistry in Non-aqueous 1 Solvents (7L)</p> <p>4.2.1 Classification of solvents and importance of non-aqueous solvents.</p> <p>4.2.2 Characteristics and study of liquid ammonia, dinitrogen tetroxide and acetic acid as non-aqueous solvents with respect to (i) acid-base reactions and (ii) redox reactions.</p>

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Teaching Plan 2021-22

Semester-III

Subject: Chemistry-II

Class-S. Y. B. Sc.

Name of the teacher- R. A. Kawale

Month	Chapter Name	Content
July	Unit I: Physical Chemistry 1.1 Chemical Kinetics-II (7L)	<p>1.1.1 Types of Complex Chemical reactions: Reversible or opposing, consecutive and parallel reactions (No derivations, only examples expected),</p> <p>Thermal chain reactions: H. and Br. reaction. (only steps involved, no kinetic expression expected).</p> <p>1.1.2 Effect of temperature on the rate of reaction, Arrhenius equation, Concept of energy of activation (Ea). (Numericals expected).</p> <p>1.1.3 Theories of reaction rates: Collision theory and activated complex theory of bimolecular reactions. Comparison between the two theories (Qualitative treatment only)</p>
August	1.2 Solutions: (8 L)	<p>1.2.1 Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law–non-ideal solutions. Vapour pressure-composition and temperature -composition curves of ideal and non-ideal solutions. Distillation of solutions. Lever rule. Azeotropes.</p> <p>1.2.2 Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids with respect to Phenol-Water , Triethanolamine – Water and Nicotine – Water systems</p> <p>1.2.3 Immiscibility of liquids- Principle of steam distillation.</p> <p>1.2.4 Nernst distribution law and its applications, solvent extraction.</p>
	Unit-II 2. Selected topics on p block elements (15L)	<p>2.1 Chemistry of Boron compounds</p> <p>2.1.1 Electron deficient compounds – BH₃, BF₃, BCl₃ with respect to Lewis acidity and applications.</p> <p>2.1.2 Preparation of simple boranes like diborane and tetraborane.</p> <p>2.1.3 Structure and bonding in diborane and tetraborane (2e-3c bonds)</p>



	2.2 Chemistry of Silicon and Germanium	<p>2.1.4 Synthesis of Borax.</p> <p>2.2.1 Silicon compounds: Occurrence, Structure and inertness of SiO_2</p> <p>2.2.2 Preparation of structure of SiCl_4</p> <p>2.2.3 Occurrence and extraction of Germanium</p> <p>2.2.4 Preparation of extra pure Silicon and Germanium</p>
September	2.3 Chemistry of Nitrogen family	<p>2.3.1 Trends in chemical reactivity - Formation of hydrides, halides, oxides with special reference to oxides of nitrogen.</p> <p>2.3.2 Oxides of nitrogen with respect to preparation and structure of NO, NO_2, N_2O and N_2O_4.</p> <p>2.3.3 Synthesis of ammonia by Bosch – Haber process.</p>
	Unit III: Organic Chemistry Carbonyl Compounds: [15L]	<p>3.1 Nomenclature of aliphatic, alicyclic and aromatic carbonyl compounds. Structure, reactivity of aldehydes and ketones and methods of preparation; Oxidation of primary and secondary alcohols using PCC, hydration of alkynes, action of Grignard reagent on esters, Rosenmund reduction, Gattermann – Koch formylation and Friedel Craft acylation of arenes</p> <p>3.2 General mechanism of nucleophilic addition, and acid catalyzed nucleophilic addition reactions.</p> <p>3.3 Reactions of aldehydes and ketones with NaHSO_3, HCN, RMgX, alcohol, amine, phenyl hydrazine, 2,4-Dinitrophenyl hydrazine, LiAlH_4 and NaBH_4.</p> <p>3.4 Mechanisms of following reactions: Benzoin condensation, Knoevenagel condensation, Claisen-Schmidt and Cannizzaro reaction.</p>
October	Carbonyl Compounds:	<p>3.5 Keto-enol tautomerism: Mechanism of acid and base catalysed enolization</p> <p>3.6 Active methylene compounds: Acetylacetone, ethyl acetoacetate diethyl malonate, stabilised enols. Reactions of Acetylacetone and ethyl acetoacetate (alkylation, conversion to ketone, mono- and dicarboxylic acid)</p>

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<p>January 10</p>	<p>6) Growing Social Problems in India:</p>	<p>a) Substance abuse- impact on youth & challenges for the future b) HIV/AIDS- awareness, prevention, treatment and services c) Problems of the elderly- causes, implications and response d) Issue of child labour- magnitude, causes, effects and response e) Child abuse- effects and ways to prevent f) Trafficking of women- causes, effects and response (15 lectures)</p>
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Rayat Shikshan Sanstha's
Arts, Science and Commerce College, Mokhada
Teaching Plan 2021-22

Semester-II

Class-F. Y. B. Sc.

Subject: FC-II

Name of the teacher- R. A. Kawale

Month	Chapter Name	Content
January	Unit 1 Globalisation and Indian Society:	Understanding the concepts of liberalization, privatization and globalization; Growth of information technology and communication and its impact manifested in everyday life; Impact of globalization on industry: changes in employment and increasing migration; Changes in agrarian sector due to globalization; rise in corporate farming and increase in farmers' suicides. (7 lectures)
February	Unit 2 Human Rights Unit 3 Ecology	Concept of Human Rights; origin and evolution of the concept; The Universal Declaration of Human Rights; Human Rights constituents with special reference to Fundamental Rights stated in the Constitution; (10lectures) Importance of Environment Studies in the current developmental context; Understanding concepts of Environment, Ecology and their interconnectedness; Environment as natural capital and connection to quality of human life; Environmental Degradation- causes and impact on human life; Sustainable development- concept and components; poverty and environment (10 lectures)
March	Unit 4 Understanding Stress and Conflict: Unit 5 Managing Stress and Conflict in Contemporary Society:	Causes of stress and conflict in individuals and society; Agents of socialization and the role played by them in developing the individual; Significance of values, ethics and prejudices in developing the individual; Stereotyping and prejudice as significant factors in causing conflicts in society. Aggression and violence as the public expression of conflict; (10 lectures) Types of conflicts and use of coping mechanisms for managing individual stress; Maslow's theory of self-actualisation; Different methods of responding to conflicts in society; Conflict-resolution and efforts towards building peace and harmony in society. (8 lectures)

April	Unit 6 Contemporary Societal Challenges:	a) Increasing urbanization, problems of housing, health and sanitation; b) Changing lifestyles and impact on culture in a globalised world. c) Farmers' suicides and agrarian distress. d) Debate regarding Genetically Modified Crops. e) Development projects and Human Rights violations. f) Increasing crime/suicides among youth.
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R. A. Kulkarni

(Mr. R. A. Kulkarni)

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Rayat Shikshan Sanstha's
Arts, Science and Commerce College, Mokhada

Teaching Plan 2021-22

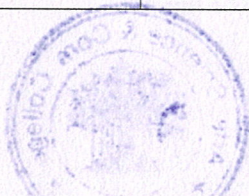
Semester-IV

Class-S. Y. B. Sc.

Subject: Chemistry-II

Name of the teacher- R. A. Kawale

Month	Chapter Name	Content
November	Unit I: Physical Chemistry 1.1 Solid State: (7L)	<p>1.1.1 Recapitulation of laws of crystallography and types of crystals</p> <p>1.1.2 Characteristics of simple cubic, face centered cubic and body centered cubic systems, interplanar distance in cubic lattice (only expression for ratio of interplanar distances are expected)</p> <p>1.1.3 Use of X-rays in the study of crystal structure, Bragg's equation (derivation expected), X-rays diffraction method of studying crystal lattice structure, structure of NaCl and KCl. Determination of Avogadro's number (Numericals expected)</p>
December	1.2 Catalysis: (8 L)	<p>1.2.1 Types of catalysis, catalytic activity, specificity and selectivity, inhibitors, catalyst poisoning and deactivation</p> <p>1.2.2 Mechanisms and kinetics of acid-base catalyzed reactions, effect of pH.</p> <p>1.2.3 Mechanisms and kinetics of enzyme catalyzed reactions (Michaelis-Menten equation)</p> <p>1.2.4 Effect of particle size and efficiency of nanoparticles as catalyst.</p>
January	Unit-II 2)ons in aqueous medium	<p>2.1. Acidity of Cations and Basicity of Anions</p> <p>i. Hydration of Cations; Hydrolysis of Cations predicting degree of hydrolysis of Cations- effect of Charge and Radius.</p> <p>ii. Latimer Equation. Relationship between pKa, acidity and z^2/r ratios of metal ions graphical Presentation</p> <p>iii. Classification of cations on the basis of acidity category – Non acidic, Moderately acidic, strongly acidic, very strongly acidic with pKa values range and examples</p> <p>iv. Hydration of Anions; Effect of Charge and Radius; Hydration of anions- concept, diagram classification on the basis of basicity</p>
February	2.2. Uses and Environmental Chemistry	<p>i. Physical properties of concentrated oxo acids like sulfuric, Nitric and Phosphoric acid</p>



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R. A. Kawale

	<p>of volatile Oxides and oxo-acids</p> <p>Unit III: Organic Chemistry Nitrogen containing compounds and heterocyclic compounds:</p>	<p>ii. Uses and environments aspects of these acids</p> <p>3.1 Amines: Nomenclature, effect of substituent on basicity of aliphatic and aromatic amines; 3.1.1. Preparation: Reduction of aromatic nitro compounds using catalytic hydrogenation, chemical reduction using Fe-HCl, Sn-HCl, Zn-acetic acid, reduction of nitriles, ammonolysis of halides, reductive amination, Hofmann bromamide reaction.</p> <p>3.1.2. Reactions- Salt Formation, N-acylation, N-alkylation, Hofmann's exhaustive methylation (HEM), Hofmann-elimination reaction, reaction with nitrous acid, carbylamine reaction, Electrophilic substitution in aromatic amines: bromination, nitration and sulphonation.</p>
<p>March</p>	<p>3.2 Diazonium Salts: (7 Lectures)</p> <p>3.3 Heterocyclic Compounds: (8 Lectures)</p>	<p>Preparation and their reactions/synthetic application - Sandmeyer reaction, Gattermann reaction, Gomberg reaction, Replacement of diazo group by -H, -OH. Azo coupling with phenols, naphthols and aromatic amines, reduction of diazonium salt to aryl hydrazine and hydroazobenzene</p> <p>3.3.1. Classification, nomenclature, electronic structure, aromaticity in 5-numbered and 6-membered rings containing one heteroatom;</p> <p>3.3.2. Synthesis of Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, and Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis),</p> <p>3.3.3. Reactivity of furan, pyrrole and thiophene towards electrophilic substitution reactions on the basis of stability of intermediate and of pyridine on the basis of electron distribution. Reactivity of pyridine towards nucleophilic substitution on the basis of electron distribution.</p> <p>3.3.4. Reactions of furan, pyrrole and thiophene: halogenation, nitration, sulphonation, Vilsmeier-Haack reaction, Friedel-Crafts reaction. Furan: Diels-Alder reaction, Ring opening. Pyrrole: Acidity and basicity of pyrrole. Comparison of basicity of pyrrole and pyrrolidine.</p> <p>3.3.5. Pyridine: Basicity. Comparison of basicity of pyridine, pyrrole and piperidine. Sulphonation of pyridine (with and without catalyst), reduction and action of sodamide (</p>

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Teaching Plan 2021-22

Semester-VI

Class-T. Y. B. Sc.

Subject: Inorganic Chemistry (USCH602)

Name of the teacher- R. A. Kawale

Month	Chapter Name	Content
November	Coordination Chemistry (15L) 1.1 Crystal Field Theory (CFT)	1.1.1 Basic tenets of Crystal field theory and effect of crystal field on central metal valence orbitals. 1.1.2 Splitting of <i>d</i> orbitals in octahedral, tetrahedral and square planar complexes. 1.1.3 Crystal field splitting energy for octahedral complexes and factors affecting the magnitude of Crystal field splitting energy. 1.1.4 Crystal field stabilization energy (CFSE), calculation of CFSE, for octahedral and tetrahedral complexes with <i>dⁿ</i> to <i>d¹⁰</i> metal ion configurations. 1.1.5 Effect of crystal field splitting on i) Ionic radius and ii) Lattice energy.
December	1.2 Molecular Orbital Theory (MOT) of Coordination Complexes 1.3 Electronic States and Terms for Polyelectronic Atoms	1.1.6 Theoretical failure of the CFT model. 1.1.7 Experimental evidence for covalence in co-ordination compounds.(i) ESR spectrum of [IrCl ₆] ²⁻ (ii) NMR spectrum of tris (acetyl acetanato) vanadium complex, (iii) Intensities of <i>d-d</i> transitions, and (iv) Nephelauxetic effect. Consequences of crystal field splitting on various properties such as ionic radii, hydration energy, lattice energy, enthalpies of formation, colour and magnetic properties. 1.2.1 Application to octahedral complexes in case of (i) [Ti(H ₂ O)] ³⁺ , (ii) Fluoro complexes of Fe(II) and Fe (III) and (iii) Cyano complexes of Fe(II) and Fe (III). 1.2.2 Effect of pi-bonding an ligand field splitting parameter in M→L and L→M interactions. 1.3.1 Introduction: electronic configuration and electronic states, Term symbols, coupling of spin momenta (Ms),orbital momenta (Ml)and spin- orbit

	<p>3.2 Organometallic compounds of transition metals (9L)</p>	<p>3.2.1 Synthesis , structure, reactions and of ferrocene. 3.2.2 Bonding in ferrocene on the basis of VBT. 3.2.3 Bonding in Re and Mo halide complexes.</p> <p>phosphate). Topical agents viz., (i) protectives and adsorbents (talc, calamine), (ii) antimicrobial agents (potassium permanganate, tincture iodine, boric acid) and astringents (alum).</p>
<p>March</p>	<p>Some Selected Topics (15L)</p> <p>4.1 Inorganic Polymers (3L)</p> <p>4.2 Characteristics and Treatment of Liquid Effluent (06L)</p> <p>4.3 Nanomaterials(04L)</p>	<p>4.1.1 Various methods of classification with examples. 4.1.2 Chemistry of borazine with reference to preparation , properties, structures, bonding and applications.</p> <p>4.2.2 Characterization of waste: biochemical oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), aerobic and anaerobic processes. 4.2.3 Removing of solid contaminants, physical and chemical principles such as coagulation, flocculation and sedimentation. 4.2.4 Primary,secondary and tertiary of liquid effluents.</p> <p>4.3.2 Introduction and importance of nanomaterials. 4.3.3 Properties (Comparison between bulk and nanomaterials): (i) Optical properties, (ii) Electrical conductivity, and (iii) Mechanical properties. 4.3.4 Forms of nanomaterials: nanofilms, nanolayers, nanotubes, nanowires, and nanoparticles. 4.3.5 Chemical methods of preparation: (i) Colloidal route, and (ii) Sol gel method. 4.5 Inorganic Pharmaceuticals (2L) 4.4.2 Gastrointestinal agents viz., (i) antacids (aluminium hydroxide, milk of magnesia, sodium bicarbonate and (ii) cathartics (magnesium sulphate and sodium</p>

		coupling or Russell-Saunders coupling. 1.3.2 Determination of Terms for p^2 electronic configuration (as in a carbon atom). 1.3.3 Terms and micro-states for transition metal atoms/ions.
January	<p>2. Properties of Coordination compounds (15L)</p> <p>2.1 Stability of Complexes (5L)</p>	<p>2.1.1 Thermodynamic stability and kinetic stability of complexes with examples.</p> <p>2.1.2 Stability constants: Stepwise and overall constants and their interrelationship.</p> <p>2.1.3 Factors affecting thermodynamic stability.</p> <p>2.1.4 Potentiometric method of determination of stability constants with example of silver-ammonia complex.</p>
	<p>2.2 Substitution Reactions in Octahedral Complexes (5L)</p>	<p>2.2.1 Introduction, types of reactions in complexes.</p> <p>2.2.2 Ligand substitution reactions: basic mechanisms.</p> <p>2.2.3 Inert and labile complexes and electronic configurations and lability of complexes.</p> <p>2.2.4 Acid hydrolysis, base hydrolysis and anation reactions.</p>
	<p>2.3 Electronic Spectra (5L)</p>	<p>2.3.1 Types of electronic transitions like intra-ligand transitions, charge transfer transitions and intra-metal transitions and ($d-d$ or ligand field transitions for transition metals).</p> <p>2.3.2 Rules for electronic transitions: Spin and Orbital or Laporte selection rules. Orgel Diagrams for D Terms (i.e., $d1$, $d4$ and $d6$, $d9$ electronic configurations) and its use in interpretation of visible electronic absorption spectra of these configurations.</p>
February	<p>Organometallic Chemistry (15L)</p> <p>3.1 Organometallic Compounds of main group metals (6L)</p>	<p>3.1.1 Introduction: General synthetic methods: (i) Oxidative addition, (ii) Metal-Metal exchange (Transmetallation), (iii) Carbanion-Halide exchange, (iv) Metal Hydrogen exchange and (v) Methylene insertion reactions.</p> <p>3.1.2 Chemical reactions: (i) Reactions with oxygen, (ii) Alkylation and arylation reactions (iii) Reactions with protic reagents and (iv) Complex formation reactions.</p>

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Mokhada Dist. Palghar

Annual Teaching Plan- 2021-22

Term-I

Name of Teacher: **Dr. D. R. Nagargoje**

Faculty: **Science**

Department: **Chemistry**

Department		Semesters		F. Y. B. Sc.		S. Y. B. Sc.		T. Y. B. Sc.	
Chemistry		III, IV, V, VI				Paper-III (Analytical Chemistry)		Paper-VI (Environmental Science & Pollution)	
Class	Month	Week	Paper no.	Unit		Period allotted	Period required		
S.Y.B.Sc.	Jul.	I to IV	III	Intorduction to Analytical Chemistry and Statistical Treatment of analytical data-I		15L	15L		
	Aug.	I to III	III						
	Sep.	I to IV	III	Classical Methods of Analysis		15L	15L		
	Oct.	I to IV	III	Instrumental Methods-I		15L	15L		
T.Y.B.Sc.	Jul.	I to IV	VI	Introduction to Environment & Pollution		15L	15L		
	Aug.	I to III	VI	Green Chemistry and Sustainability		15L	15L		
	Sep.	I to IV	VI	Alternate Energy Resources		15L	15L		
	Oct.	I to IV	VI	Applications of Analytical Methods		15L	15L		

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Signature of Teacher

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Annual Teaching Plan- 2021-22
Term-II

Name of Teacher: **Dr. D. R. Nagargoje**
Faculty: **Science**
Department: **Chemistry**

Department		Semesters		F. Y. B. Sc.		S. Y. B. Sc.		T. Y. B. Sc.	
Botany		III, IV, V & VI				Paper-III (Analytical Chemistry);		Paper-VI (Environmental Science & Pollution)	
Class	Month	Week	Paper no.	Unit		Period allotted	Period required		
S.Y.B.Sc.	Nov.	III & IV	III	Methods of separation		15L	15L		
	Dec.	I to III	III						
	Jan.	I to IV	III	Instrumental Methods-II		15L	15L		
	Feb.	I to IV	III	Statistical Treatment of analytical data --II		15L	15L		
T.Y.B.Sc.	Nov.	III & IV	VI	Business Analytics of Environment Testing		15L	15L		
	Dec.	I to III	VI	Ecological Testing		15L	15L		
	Jan.	I to IV	VI	Biodiversity Conservation and Ecotourism		15L	15L		
	Feb.	I to IV	VI	Climate Change		15L	15L		

Signature of Teacher

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Teaching Plan 2021-22

Semester-V

Class-T. Y. B. Sc.

Subject: Analytical Chemistry

Name of the teacher- Dr. V. B. Gade

Month	Chapter Name	Content
July	UNIT I :INTRODUCTION TO QUALITY CONCEPTS, CHEMICAL CALCULATIONS AND SAMPLING (6 UNITS)	1.1 Quality in Analytical Chemistry (05 L) 1.1.1 Concepts of Quality, Quality Control and Quality Assurance 1.1.2 1.1.2 Importance of Quality concepts in Industry 1.1.3 1.1.3 Chemical Standards and Certified Reference Materials; Importance in chemical analysis Quality of material: Various grades of laboratory reagents 1.2 Chemical Calculations (04 L) 1.3 Inter conversion of various concentration units. (Conversion of concentration from one unit to another unit with examples). 1.2.2 Percent composition of elements in chemical compounds 1.4 Sampling (06 L) 1.3.1 Purpose, significance and difficulties encountered in sampling 1.3.2 Sampling of solids: Sample size – bulk ratio, size to weight ratio, multistage and sequential sampling, size reduction methods, sampling of compact solids, equipments and methods of sampling of compact solids, sampling of particulate solids, methods and equipments used for sampling of particulate solids. 1.3.3 Sampling of liquids: Homogeneous and heterogeneous, Static and flowing liquids. 1.3.4 Sampling of gases: Ambient and stack sampling: Apparatus and methods for sampling of gases. 1.3.5 Collection, preservation and dissolution of the sample.
August	UNIT II : CLASSICAL METHODS OF ANALYSIS (TITRIMETRY) (6 UNITS)	2.1 Redox Titrations (08 L) 2.1.1 Introduction 2.1.2 Construction of the titration curves and calculation of Esystem in aqueous medium in case of: (1) One electron system (2) Multielectron system 2.1.3 Theory of redox indicators, Criteria for selection of an

		<p>indicator: Use of diphenyl amine and ferroin as redox indicators</p> <p>2.2 Complexometric Titrations (07 L)</p> <p>2.2.1 Introduction, construction of titration curve 2.2.2 Use of EDTA as titrant and its standardisation, absolute and conditional formation constants of metal EDTA complexes, Selectivity of EDTA as a titrant. Factors enhancing selectivity with examples. Advantages and limitations of EDTA as a titrant. 2.2.3 Types of EDTA titrations. 2.2.4 Metallochromic indicators, theory, examples and applications</p>
September	<p>UNIT III: OPTICAL METHODS(6 UNITS)</p>	<p>3.1 Atomic Spectroscopy: Flame Emission spectroscopy(FES) and Atomic Absorption Spectroscopy(AAS) (07 L)</p> <p>3.1.1 Introduction, Energy level diagrams, Atomic spectra, Absorption and Emission Spectra 3.1.2 Flame Photometry – Principle, Instrumentation (Flame atomizers, types of Burners, Wavelength selectors, Detectors) 3.1.3 Atomic Absorption Spectroscopy – Principle, Instrumentation (Source, Chopper, Flame and Electrothermal Atomiser) 3.1.4 Quantification methods of FES and AAS – Calibration curve method, Standard addition method and Internal standard method. 3.1.5 Comparison between FES and AAS 3.1.6 Applications, Advantages and Limitations</p> <p>3.2 Molecular Fluorescence and Phosphorescence Spectroscopy (04L) 3.2.1 Introduction and Principle 3.2.2 Relationship of Fluorescence intensity with concentration 3.2.3 Factors affecting Fluorescence and Phosphorescence 3.2.4 Instrumentation and applications 3.2.5 Comparison of Fluorimetry and Phosphorimetry 3.2.6 Comparison with Absorption methods</p> <p>3.3 Turbidimetry and Nephelometry (04 L)</p> <p>3.3.1 Introduction and Principle 3.3.2 Factors affecting scattering of Radiation: Concentration, particle size, wavelength, refractive index 3.3.3 Instrumentation and Applications</p>
October	<p>UNIT IV: METHODS OF SEPARATION – I (6 UNITS)</p>	<p>1 Solvent Extraction (06 L)</p> <p>4.1.1 Factors affecting extraction: Chelation, Ion pair formation and Solvation 4.1.2 Graph of percent extraction versus pH. Concept of $[pH]_{1/2}$ and its significance (derivation not expected) 4.1.3 Craig's counter current</p>

		<p>extraction: Principle, apparatus and applications 4.1.4 Solid phase extraction: Principle, process and applications with special reference to water and industrial effluent analysis. 4.1.5 Comparison of solid phase extraction and solvent extraction.</p> <p>4.2 High Performance Liquid chromatography (HPLC) (06 L)</p> <p>4.2.1 Introduction and Principle Instrumentation- components with their significance: Solvent Reservoir, Degassing system, Pumps-(reciprocating pumps, screw driven- syringe type pumps, pneumatic pumps, advantages and disadvantages of each pump), Precolumn, Sample injection system, HPLC Columns, Detectors(UV – Visible detector, Refractive index detector) 4.2.2 Qualitative and Quantitative Applications of HPLC</p> <p>4.3 High Performance Thin Layer Chromatography (HPTLC) (03 L)</p> <p>4.3.1 Introduction and Principle Stationary phase, Sample application and mobile phase 4.3.2 Detectors a) Scanning densitometer-Components, Types of densitometer- Single beam and Double beam b) Fluorometric Detector 4.3.3 Advantages, disadvantages and applications 4.3.4 Comparison of TLC and HPTLC</p>
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Rayat Shikshan Sanstha's
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Teaching Plan 2021-22

Semester-VI

Class- T. Y. B. Sc.

Subject: Analytical Chemistry (USCH604)

Name of the teacher- Dr. V. B. Gade

Month	Chapter Name	Content
December	UNIT I: ELECTROANALYTICAL TECHNIQUES (6 UNITS)	<p>1.1 Polarography (Numerical and word problems are expected) (11 L) 1.1.1 Difference between potentiometry and voltammetry, Polarizable and non-polarizable electrodes 1.1.2 Basic principle of polarography H shaped polarographic cell, DME (construction, working, advantages and limitations) 1.1.3 DC polarogram: Terms involved - Residual current, Diffusion current, Limiting current, Half-Wave Potential Role and selection of supporting electrolyte, Interference of oxygen and its removal, polarographic Maxima and Maxima Suppressors Qualitative aspects of Polarography: Half wave potential $E_{1/2}$, Factors affecting $E_{1/2}$ Quantitative aspects of polarography: Ilkovic equations: various terms involved in it (No derivation) 1.1.4 Quantification 1) Wave height - Concentration plots (working plots/calibration) 2) Internal standard (pilot ion) method 3) Standard addition method 1.1.5 Applications advantages and limitations</p> <p>1.2 Amperometric Titrations (04 L) 1.2.1 Principle, Rotating Platinum Electrode(Construction, advantages and limitations) 1.2.2 Titration curves with example 1.2.3 Advantages and limitations</p>
January	UNIT II: METHODS OF SEPARATION - II (6 UNITS)	<p>2.1 Gas Chromatography (Numerical and word problems are expected) (09 L) 2.1.1 Introduction, Principle, Theory and terms involved 2.1.2 Instrumentation: Block diagram and components, types of columns, stationary phases in GSC and GLC, Detectors: TCD, FID, ECD 2.1.3 Qualitative, Quantitative analysis and applications 2.1.4 Comparison between GSC and GLC</p> <p>2.2 Ion Exchange Chromatography (06</p>

		<p>L)</p> <p>2.2.1 Introduction, Principle. 2.2.2 Types of Ion Exchangers , Ideal properties of resin 2.2.3 Ion Exchange equilibria and mechanism, selectivity coefficient and separation factor Factors affecting separation of ions 2.2.4 Ion exchange capacity and its determination for cation and anion exchangers. 2.2.5 Applications of Ion Exchange Chromatography with reference to Preparation of demineralised water. Separation of amino acids</p>
February	<p>UNIT III:FOOD AND COSMETICS ANALYSIS (6 UNITS)</p>	<p>3.1 Introduction to food chemistry (10 L)</p> <p>3.1.1 Food processing and preservation: Introduction, need, chemical methods, action of chemicals(sulphur dioxide, boric acid, sodium benzoate, acetic acid, sodium chloride and sugar) and pH control Physical methods (Pasteurization and Irradiation) 3.1.2 Determination of boric acid by titrimetry and sodium benzoate by HPLC. 3.1.3 Study and analysis of food products and detection of adulterants ·1) Milk: Composition & nutrients, types of milk (fat free, organic and lactose milk) Analysis of milk for lactose by Lane Eynon’s Method 2) Honey: Composition Analysis of reducing sugars in honey by Coles Ferricyanide method 3) Tea: Composition, types (green tea and mixed tea) Analysis of Tannin by Lowenthal’s method 4) Coffee: Constituents and composition, Role of Chicory Analysis of caffeine by Bailey Andrew method.</p> <p>3.2 Cosmetics (05 L)</p> <p>3.2.1 Introduction and sensory properties 3.2.2 Study of cosmetic products – 1) Face powder: Composition Estimation of calcium and magnesium by complexometric titration 2) Lipstick: Constituents Ash analysis for water soluble salts: borates, carbonates and zinc oxide 3) Deodorants and Antiperspirants: Constituents, properties Estimation of zinc by gravimetry.</p>
March	<p>UNIT IV:THERMAL METHODS AND ANALYTICAL METHOD VALIDATION (6 UNITS)</p>	<p>4.1 Thermal Methods (12 L)</p> <p>4.1.1 Introduction to various thermal methods (TGA, DTA and Thermometric titration). 4.1.2 Thermogravimetric Analysis (TGA)</p>

		<p>Instrumentation-block diagram, thermobalance (Basic components: balance, furnace, temperature measurement and control, recorder) Thermogram (TG curve) for $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ Factors affecting thermogram-Instrumental factors and Sample characteristics Applications: Determination of drying and ignition temperature range Determination of percent composition of binary mixtures (Estimation of Calcium and Magnesium oxalate)</p> <p>4.1.3 Differential Thermal Analysis (DTA): Principle, Instrumentation, and Reference material used Differential thermogram (DTA curve) $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ Applications Comparison between TGA and DTA.</p> <p>4.1.4 Thermometric Titrations – Principle and Instrumentation Thermometric titrations of : 1) HCl v/s NaOH 2) Boric acid v/s NaOH 3) Mixture of Ca^{+2} and Mg^{+2} v/s EDTA 4) Zn^{+2} with Disodium Tartarate</p> <p>4.2 Analytical Method Validation (03L)</p> <p>4.2.1 Introduction and need for validation of a method 4.2.2 Validation Parameters: Specificity, Selectivity, Precision, Linearity, Accuracy and Robustness</p>
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Teaching Plan 2021-22

Semester-I

Class-F.Y.B.Sc.

Subject: Chemistry-I (USCH 101)

Name of the teacher- Dr. V. B. Gade

Month	Chapter Name	Content
October	1. Chemical Thermodynamics: (10L)	Thermodynamic terms: System, surrounding, boundaries, open, closed and isolated system, intensive and extensive properties, state functions and path functions, zeroth law of thermodynamics First law of thermodynamics: concept of heat (q), work (w), internal energy (U), statement of first law, enthalpy, relation between heat capacities, sign conventions, calculations of heat (q), work (w), internal energy (U), and enthalpy (H) (Numericals expected) Thermochemistry: Heats of reactions, standard states, enthalpy of formation of molecules, enthalpy of combustion and its applications, calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, Kirchhoff's equation
November	2. Chemical Calculations: (5L) 3. Periodic Table and periodicity : (5L)	Expressing concentration of solutions: Normality, molality, molarity, formality, mole fractions, weight ratio, volume ratio, weight to volume ratio, ppm, ppb, millimoles, milliequivalents (Numericals expected) Long form of Periodic Table; Classification for elements as main group, transition and inner transition elements; Periodicity in the following properties : Atomic and ionic size; electron gain enthalpy; ionization enthalpy, effective nuclear charge (Slater's rule); electronegativity ; Pauling, Mulliken and Alred Rochow electronegativities
December	4. Atomic structure: (10L)	a) Historical perspectives of the atomic structure: Rutherford's Atomic Model, Bohr's theory, its limitations and atomic spectrum of hydrogen atom. Structure of hydrogen atom. b) Hydrogenic atoms: 1. Simple principles of quantum mechanics; 2. Atomic orbitals i) Hydrogenic energy levels ii) Shells, subshells and orbitals iii) Electron spin iv) Radial shapes of orbitals v) Radial distribution function vi) Angular shapes of

		orbitals. 3. Many Electron Atoms i) Penetration and shielding ii) Effective nuclear charge 4. Aufbau principle
January	5. Basics of Organic Chemistry (15 L)	<p>3.1 Classification and Nomenclature of Organic Compounds: (5L) Review of basic rules of IUPAC nomenclature. Nomenclature of mono and bi-functional aliphatic compounds on the basis of priority order of the following classes of compounds: alkanes, alkenes, alkynes, haloalkanes, alcohols, ethers, aldehydes, ketones, carboxylic acids, carboxylic acid derivatives (acid halides, esters, anhydrides, amides), nitro compounds, nitriles and amines; including their cyclic analogues.</p> <p>3.2 Bonding and Structure of organic compounds: (4L) Hybridization: sp^3, sp^2, sp hybridization of carbon and nitrogen; sp^3 and sp^2 hybridizations of oxygen in Organic compounds (alcohol, ether, aldehyde, ketone, carboxylic acid, ester, cyanide, amine and amide) Overlap of atomic orbitals: Overlaps of atomic orbitals to form sigma and pi bonds, shapes of organic molecules. Shapes of molecules; Influence of hybridization on bond properties (as applicable to ethane, ethene, ethyne).</p> <p>3.3 Fundamentals of organic reaction mechanism: (6L) Electronic Effects: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment: Organic acids and bases; their relative strengths. Bond fission: Homolytic and Heterolytic fission with suitable examples. Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types (primary, secondary, tertiary, allyl, benzyl), shape and their relative stability of reactive intermediates: Carbocations, Carbanions and Free radicals. Introduction to types of organic reactions: Addition, Elimination and Substitution reaction.</p>

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Teaching Plan 2021-22

Semester-I

Class-F.Y.B.Sc.

Subject: Chemistry-II (USCH 102)

Name of the teacher- Dr. V. B. Gade

Month	Chapter Name	Content
October	<p>1. Chemical Kinetics: (8 L)</p> <p>2. Liquid State: (7 L)</p>	<p>Rate of reaction, rate constant, measurement of reaction rates, order and molecularity of reaction, integrated rate equation of first and second order reactions (with equal initial concentration of reactants) (Numericals expected) Determination of order of reaction by (a) Integration method (b) Graphical method (c) Ostwald's isolation method (d) Half time method.</p> <p>Surface tension: Introduction, methods of determination of surface tension by drop number method (Numericals expected) Viscosity: Introduction, coefficient of viscosity, relative viscosity, specific viscosity, reduced viscosity, determination of viscosity by Ostwald viscometer (Numericals expected) Refractive index: Introduction, molar refraction and polarizability, determination of refractive index by Abbe's refractometer (Numericals expected) Liquid crystals: Introduction, classification and structure of thermotropic phases (Nematic, smectic and cholesteric phases), applications of liquid crystals</p>
November	<p>3. Comparative chemistry of Main Group Elements: (15 L)</p>	<p>Metallic and non-metallic nature, oxidation states, electronegativity, anomalous behaviour of second period elements, allotropy, catenation, diagonal relationship. Comparative chemistry of carbides, nitrides, oxides and hydroxides of group I and group II elements.</p>
December	<p>3. Comparative chemistry of Main Group Elements: (15 L)</p> <p>4. Stereochemistry I: (15 L)</p>	<p>Some important compounds- NaHCO_3, Na_2CO_3, NaCl, NaOH, CaO, CaCO_3; oxides of carbon, oxides and oxyacids of sulphur and nitrogen with respect to environmental aspects.</p> <p>Fischer Projection, Newman and Sawhorse Projection formulae (of erythro, threo isomers of tartaric acid and 2,3 dichlorobutane) and their interconversions ; Geometrical isomerism in alkene and cycloalkanes: cis-trans and syn-anti</p>

<p>January</p>	<p>4. Stereochemistry I: (15 L)</p>	<p>isomerism E/Z notations with C.I.P rules. Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two similar and dissimilar chiral-centres, Distereoisomers, meso structures, racemic mixture and resolution (methods of resolution not expected). Relative and absolute configuration: D/L and R/S designations. Conformation analysis of alkanes (ethane, propane and n-butane): Relative stability with energy diagrams.</p>
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Teaching Plan 2021-22

Semester-II

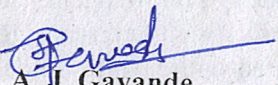
Class-F.Y.B.Sc.

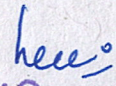
Subject: Chemistry-I (USCH 201)

Name of the teacher- Mr. A. J. Gavande

Month	Chapter Name	Content
January	<p>1. Gaseous State: (8L) 2. Chemical Equilibria and Thermodynamic Parameters: (7L)</p>	<p>Ideal gas laws, kinetic theory of gases, Maxwell-Boltzmann's distribution of velocities (qualitative discussion), ideal gases, real gases, compressibility factor, Boyle's temperature (Numericals expected) Deviation from ideal gas laws, reasons for deviation from ideal gas laws, Van der Waals equation of state, Joule-Thomson effect: qualitative discussion and experimentation, inversion temperature. Reversible and irreversible reactions, law of mass action, dynamic equilibria, equilibrium constant, (K_c and K_p), relationship between K_c and K_p. Le Chatelier's principle, factors affecting chemical equilibrium (Numericals expected) Statement of second law of thermodynamics, concepts of entropy and free energy, spontaneity and physical significance of free energy, thermodynamic derivation of equilibrium constant</p>
February	<p>3. Concept of Qualitative Analysis: (7L) 4. Acid Base Theories: (8L)</p>	<p>a) Testing of Gaseous Evolutes, Role of Papers impregnated with Reagents in qualitative analysis (with reference to papers impregnated with starch iodide, potassium dichromate, lead acetate, dimethylglyoxime and oxine reagents). b) Precipitation equilibria, effect of common ions, uncommon ions, oxidation states, buffer action, complexing agents on precipitation of ionic compounds. (Balanced chemical equations and numerical problems expected.) b) Arrhenius, Lowry- Bronsted, Lewis, Solvent – Solute concept of acids and bases, Hard and Soft acids and bases. Applications of HSAB Applications of acid base chemistry in: i) Understanding organic reactions like Friedel Craft's (acylation/alkylation) reaction ii) Volumetric analysis with special reference to calculation of</p>

		titration curve involving strong acid and strong base.
March	5. Chemistry of Aliphatic Hydrocarbons (15 L)	3.1 Carbon-Carbon sigma bonds: Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz-Fittig Reactions, Free radical substitutions: Halogenation -relative reactivity and selectivity. 3.2 Carbon-Carbon pi bonds: Formation of alkenes and alkynes by elimination reactions: Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.
April	5. Chemistry of Aliphatic Hydrocarbons (15 L)	Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/Anti Markownikoff addition), Mechanism of oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, reduction(catalytic and chemical), syn and anti-hydroxylation (oxidation). 1, 2-and 1, 4- addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic bromination using N-bromosuccinimide and mechanism, e.g. propene, 1-butene, toluene, ethylbenzene. Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.


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Teaching Plan 2021-22

Semester-II

Class-F.Y.B.Sc.

Subject: Chemistry-II (USCH 202)

Name of the teacher- Dr. V. B. Gade

Month	Chapter Name	Content
January	1. Ionic Equilibria: (7L) 2. Molecular Spectroscopy: (4L)	Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water, ionization of weak acids and bases, pH scale, common ion effect, dissociation constants of mono-, di- and triprotic acid (exact treatment for monoprotic acid) Buffers: Introduction, types of buffers, derivation of Henderson equation for acidic and basic buffers, buffer action, buffer capacity Electromagnetic radiation, electromagnetic spectrum, Planck's equation, interaction of electromagnetic radiation with matter: Absorption, emission, scattering, fluorescence, electronic, vibrational and rotational transitions, Beer-Lambert's law
February	3. Solid State Chemistry (4L) 4. Chemical Bond and Reactivity: (7L)	Types of solids, crystal lattice, lattice points, unit cell, space lattice and lattice plane, laws of crystallography: Law of constancy of interfacial angle, law of symmetry and law of rational indices. Types of chemical bond, comparison between ionic and covalent bonds, polarizability (Fajan's Rule), shapes of molecules, Lewis dot structure, Sidgwick Powell Theory, basic VSEPR theory for AB _n type molecules with and without lone pair of electrons, isoelectronic principles, applications and limitations of VSEPR theory.
March	5. Oxidation Reduction Chemistry: (8L) 6. Stereochemistry-II: Cycloalkanes and Conformational Analysis: (5L)	Reduction potentials b) Redox potentials: half reactions; balancing redox equations. c) Redox stability in water i) Latimer and Frost Diagrams ii) pH dependence of redox potentials. d) Applications of redox chemistry i) Extraction of elements: (example: isolation of copper by auto reduction) ii) Redox reagents in Volumetric analysis: a) I ₂ ; b) KMnO ₄ iii) Titration curves: i) single electron systems (example Ce(IV) against Fe(II)); and ii) Multi electron systems as in KMnO ₄ against

		Fe(II)) Types of cycloalkanes and their relative stability, Baeyer strain theory, Conformation analysis of cyclohexane: Chair, Boat and Twist boat forms; Relative stability with energy.
April	7. Aromatic Hydrocarbons: (10L)	Aromaticity: Hückel's rule anti-aromaticity, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft alkylation/acylation with their mechanism., Hammond's postulate, Directing effects of the groups.

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