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Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: Bachelor's in Science (B. Sc.)

Credits: 132

SYLLABUS

(Approved in the Academic council meeting held on-26/07/2022)

F. Y. B. Sc. Chemistry

Revised as per
Choice Based Credit System (60:40)
w. e. f. Academic Year 2022-23

BACHELOR'S IN SCIENCE (B. Sc.)

Programme Outcomes

S. N.	After completion of B.Sc. program students will acquire	Graduate Attribute
PO1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary knowledge
PO2	An ability to develop and conduct experiments, analyze, and interpret data and use scientific judgment to draw conclusions	Scientific reasoning
PO3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO5	An ability to achieve high order communication skills.	Communication skills
PO6	An ability to collect, analyze and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO11	An ability to understanding values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Preamble:

Bachelor of Science (B.Sc.) in Chemistry is an undergraduate course of Department of Chemistry, Changu Kana Thakur Arts, Commerce & Science College, New Panvel (Autonomous). The Choice Based Credit System to be implemented through this curriculum would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities.

This syllabus is prepared to give the sound knowledge and understanding of chemistry to undergraduate students at first year of the B.Sc. degree course. The goal of the syllabus is to make the study of Chemistry as stimulating, interesting and relevant as possible. The syllabus is prepared by keeping in mind the aim to make students capable of studying Chemistry in academic and industrial courses. Also to expose the students and to develop interest in them in various fields of Chemistry.

The new and updated syllabus is based on disciplinary approach with vigour and depth taking care of the syllabus is not heavy at the same time it is comparable to the syllabi of other universities at the same level. The students pursuing this course would have to develop understanding of various aspects of the chemistry. The conceptual understanding, development of experimental skills, developing the aptitude for academic and professional skills, obtaining basic ideas and understanding of hyphenated techniques, understanding the fundamental chemical processes and rationale towards application of knowledge are among such important aspects.

Semester - I
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry 1	Core	USC1CH1	3	40	60	100	2
Chemistry 2	Core	USC1CH2	3	40	60	100	2
Chemistry Practical	Core	USC1CHP	6	--	100	100	2
Environmental Science	Ability enhancement	USC1EVS	2	40	60	100	2

Semester - II
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry 1	Core	USC2CH1	3	40	60	100	2
Chemistry 2	Core	USC2CH2	3	40	60	100	2
Chemistry Practical	Core	USC2CHP	6	--	100	100	2
Communication Skill	Ability enhancement	USC2ECS	2	40	60	100	2

Examination Scheme

Choice Based Credit System (CBCS)

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component and by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below –

A) Internal Assessment: 40 % 40 Marks
B) Semester End Examination: 60 % 60 Marks

A) Internal Assessment: 40 % 40 Marks

01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Project 2. Presentation and write up on the selected topics of the subjects / Case studies. 3. Test on Practical Skills 4. Open Book Test 5. Quiz	20 arks

Question Paper Pattern for Periodical Class Test/ online examination--

- Maximum marks : 20
- Duration : 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

Question Paper Pattern for Semester End Examination

Semester End Examination: 60 % 60 Marks

- **Undergraduate Programmes of F. Y. B.Sc. (Sem. I & II)**
- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
1. There shall be four questions of 15 marks each (30 marks with internal options). 2. On each unit there will be one question and fourth question will be based on entire syllabus. 3. All questions shall be compulsory with internal options. 4. Question may be subdivided into sub-questions a, b, c… and the allocation of marks depends on the weightage of the unit.

Question Paper Pattern for Continuous Assessment
(Total Marks 20 to be converted in 10 marks)

Marks	Group Project*/ Individual Project	Presentation and write-up	Practical Skills	Open book test	Quiz
5	Hypothesis/Topic of the project	Presentation skill	Demonstration of skill	High order thinking questions (HOTS)	Quiz on application of subject in real life
5	Actual laboratory work/Field work	Knowledge	Viva		
5	Result/output	Quality of ppt	Report		
5	Dissertation/Report	Writing skill	Problem solving ability		

Note

Group Project*

1) Define number of students

2) Every student will get equal marks if the same contribution

3) if any student without any kind of involvement in the project, guide will take the decision on his share

Question Paper Pattern for Practical Examination

Semester End Practical Examination (100 Marks)

- Laboratory Work (70 Marks)
- Journal (10 Marks)
- Viva (20 Marks)

The practical examination will be held for 3.0 hrs.
The candidates will be examined practically and orally.

Course Discription	
Semester	**I**
Course Name	**Chemistry**
Course Code	**Paper-I - USC1CH1**
Eligibility for the Course	**12th Science of all recognizedBoard**
Credit	**2**
Hours	**45**

Course Objectives

- To construct and apply knowledge of chemistry, and appreciate therelationship between Chemistry and other disciplines.
- To promote understanding of basic facts and concepts in Chemistry while retaining the excitement of Chemistry.
- To enable students to understand Chemistry and its Industrial and Social Context.

Course Outcomes

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Recall thermodynamics terms, the first law of thermodynamics and terms like normality, molarity.	Remember
CO 2	Solve the Numerical problems based on the Concentration of solutions	Apply
CO 3	Classify the elements according to electronic configuration and explain details of periodic trends and atomic structure.	Understand
CO 4	Explain the name, bonding and structure of organic compounds, bond fission, types of organic reactions and various electronic effects	Understand

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	**1.1 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, calculations of heat (q), work (w), internal energy (U) and enthalpy (H) (Numericals expected) Second law of thermodynamics and its different statements. Carnot's cycle, its efficiency and Carnot's Theorem (Heat engine) Concepts of entropy and free energy, spontaneity and physical significance of free energy. **1.2 Chemical Calculations: (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)	15h	2	2	1
2	**2.1 Atomic structure: (10L)** (Qualitative treatment only; it is expected that the learner knows the mathematical statements and understands their physical significance after completing this topic. No derivations of the mathematical equations required) 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: 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	15h	3	1	4

	i) Penetration and shielding ii) Effective nuclear charge 4. Electrons filling rules in various orbitals: a) Aufbau principle b) Hund's rule of maximum multiplicity c) Pauli's exclusion principle **2.2 Periodic Table and Periodicity (5L)** 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 (Numerical problems expected, wherever applicable.)				
3	**Basics of Organic Chemistry** **3.1** Introduction, General properties and applications of organic compounds in every days life **(1L)** **3.2 Classification and Nomenclature of organic compounds: (4L)** 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 **3.3 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) Shapes of molecules; Influence of hybridization on bond properties (as applicable to ethane, ethene, ethyne) Bond dissociation energy, steric effect, Concept of tautomerism, Concept of hydrogen bonding **3.4 Fundamentals of organic reaction mechanism: (4L)** **Electronic Effects:** Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment. Bond fission: Homolytic and Heterolytic fission with suitable examples. Electrophiles and Nucleophiles; Nucleophilicity and basicity. **Types (primary, secondary, tertiary, allyl, benzyl),**	15h	2	3	7

	shape and their relative stability of reactive intermediates: Carbocations, Carbanions and Free radicals. **3.5 Introduction to polymer chemistry: (2L)** Introduction, Basic concept, Classification of polymers, Properties of polymers, applications of polymers.				

Course Description	
Semester	**I**
Course Name	**Chemistry**
Course Code	**Paper-II- USC1CH2**
Eligibility for the Course	**12th Science of all recognizedBoard**
Credit	**2**
Hours	**45**

Course Objectives

- To expose the students to various emerging new areas of Chemistry and apprise them with their prevalent in their future studies and their applications in variousspheres of chemical sciences.
- To familiar students with chemistry of main group elements.
- To do the comparative study of carbides, nitrides, oxides and hydrides of group 1 and group 2 elements and some important compounds.
- To aware the students with important class of organic compounds with applications.

Course Outcomes

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO 1	Explain the rules of integration , derivatives.	Apply
CO 2	Outline the metallic and non-metallic nature, oxidation states, electronegativity, Anomalous behaviour and allotropy of main group elements.	Understand
CO 3	Explain the reactivity of group 1 and group 2 elements and the effects of Oxides of carbon, sulfur and nitrogen on the environment.	Understand
CO 4	Define surface tension, Viscosity, Refractive index of Liquid, Order of reaction.	Remember

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	**1.1 Chemical Kinetics: (7L)** 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 (Numericals expected) **1.2 Mathematical Concept in Chemistry: (8L)** Graphical representation of equations: Rules for drawing graph co-ordinates etc., Equation of straight line, slope and intercept, plotting the graph from the data of chemical properties and problems. Derivative: Rules of differentiation (without proof), Algebraic, Logarithmic and exponential functions and numerical. Integration: rules of integration (without proof), Integration with limit, Algebraic, Logarithmic and exponential functions and numerical. Numerical related to Chemistry	15h	4	1	5,8
2	**2.1 Comparative chemistry of Main Group Elements: (15L)** 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. Some important compounds- $NaHCO_3$, Na_2CO_3, NaCl, NaOH, CaO, $CaCO_3$ **2.2 Chemistry of Noble Gases** 1 Physical properties 2 Chemical properties 3 Clathrate compounds	15h	1	2	9
3	**Stereochemistry: (15)** Classification of isomer, IUPAC nomenclature of stereoisomers. 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 isomerism E/Z notations with C.I.P. rules.	15h	2	1	8

	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.				

Course Discription	
Semester	**I**
Course Name	**Chemistry**
Course Code	**Practical- USC1CHP**
Eligibility for the Course	**12th Science of all recognizedBoard**
Credit	**2**
Hours	**45**

Course Objectives

- To develop the practical skills in the students regarding the preparation of chemical solutions.
- To build the knowledge of important reagents, practical techniques in the students.
- To develop the knowledge of handlings chemical instruments used in the laboratory.

Course Outcomes

COs. No.	**After completing the course, students will be able to:**	**Bloom Taxonomy Level (BTL)**
CO 1	Find exact concentration of the solutions and enthalpy of dissolution.	Remember
CO 2	Apply chemical kinetics law to calculate the rate constant of the reaction.	Apply
CO 3	Find the normality of acids and bases and purity of samples gravimetrically.	Remember
CO 4	Apply Thin Layer Chromatographic (TLC), Distillation, Recrystallization, Sublimation methods for separation of a mixture.	Apply

Course Description		Hrs	CO No.	PSO No.	PO No.
	Physical chemistry 1. Standardization of solutions of two different concentration of KOH by using 0.1 N oxalic acid solution. 2 To determine the rate constant for the hydrolysis of ester using HCl as catalyst 3 To determine enthalpy of dissolution of salt (like KNO3) 4 Preparation of different normal and molar solutions (at least two). **Inorganic chemistry** **1.** Commercial analysis of a) Mineral acid–Sulphuric acid b) Organic acid **2.** Titration using double indicator: analysis of solution of Na2CO3 and NaHCO3. **3.** To determine the percent purity of sample of BaSO4 containing NH4Cl by gravimetrically. 4) To determine the percentage purity of given sample of ascorbic acid . **Organic Chemistry** Purification of Organic Compound compounds by 1. Recrystallization (02) (Benzoic acid, Acetanilide) 2. Sublimation (01) Phthalic anhydride to Phthalic acid 3. Distillation. (01) (Recording of M.P. & B.P.) Learners are expected to report a) Solvent for recrystallization. b) Mass and the M.P. & B.P. of purified compound. Learners should calibrate thermometer before determining melting point 2. Chromatography-- Separation of a mixture of o-and p-nitrophenols by thin layer chromatography (TLC)	6 hr	3	2	3,7

Course Discription	
Semester	**II**
Course Name	**Chemistry**
Course Code	**Paper-I – USC2CH1**
Eligibility for the Course	**12th Science of all recognised Board**
Credit	**02**
Hours	**45**

Course Objectives

- To develop problem solving skills in students.
- To make students capable of studying Chemistry in academic and Industrialcourses.
- To develop analytical skills and critical thinking through application of theoryknowledge into practical course
- To acquaint students with the fundamental Organic, Inorganic, Physical &Analytical Chemistry.

Course Outcomes

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Explain deviations from ideal gas laws , Joule-Thomson effect and nanotechnology with the experimental setup.	Understand
CO 2	Define the equilibrium constant, Le-Chatelier Principle and the second law of thermodynamics.	Remember
CO 3	Discuss basic terms of co-ordination chemistry, qualitative analysis and acid-base theories	Understand
CO 4	Identify the products of reactions of alkanes, alkenes and alkynes	Apply

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	**1.1 Gaseous State: (8L)** 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. (Numericals expected) **1.2 Chemical Equilibria: (4L)** Reversible and irreversible reactions, law of mass action, dynamic equilibria, equilibrium constant, (Kc and Kp), relationship between Kc and Kp, Le Chatelier's principle, factors affecting chemical equilibrium (Numericals expected (4 L) **1.3 Nanochemistry: (3L)** Introduction, Definition of Nanochemistry, nanoparticles, Basic concept explanation., all types of nanoparticles.	15h	2	1	3
2	**2.1 Concept of Qualitative Analysis: (4L)** 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.) **2.2 Coordination chemistry: (3L)** 1. Introduction to coordination compound 2. Terminology in coordination compound 3. Types of ligands **2.3 Acid Base Theories: (5L)** Arrhenius, Lowry- Bronsted, Lewis, Lux-Flood acid –base concept, Usanovich acid –base concept, Solvent – Solute concept of acids and bases, Hard and Soft acids and bases, Applications of HSAB **2.4 Chemistry of 3d series elements: (3L)** Introduction Characteristics of d-block elements with special reference to i) Electronic structure ii) Oxidation states iii) Magnetic character iv) Colored ions v) Complex formation.	15h	3	2	7,9
3	**Chemistry of Aliphatic Hydrocarbons** **3.1** Physical and chemical properties of alkane, alkene and alkynes : (1L) **3.2 Carbon-Carbon sigma bonds: (3L)**	15h	2	1	10

	Chemistry of alkanes: Formation of alkanes by Corey-House reaction, Sabatier-Sanderens reaction, and Reaction of alkanes- , Chlorination, Iodination, Nitration,Sulphonation, Combustion. **3.3 Carbon-Carbon pi bonds: (11L)** Formation of alkenes and alkynes by elimination reactions: Mechanism of E1, E2, E1cb, Saytzeff and Hofmann eliminations **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. Alkylation of terminal alkynes.				

Course Discription	
Semester	**II**
Course Name	**Chemistry**
Course Code	**Paper-II-USC2CH2**
Eligibility for the Course	**12th Science of all recognised Board**
Credit	**02**
Hours	**45**

Course Objectives

- To construct the problem solving approach in the students.
- To build the skills in the students to apply their theory and practical knowledge in real life.
- to produce knowledge of various chemical reagents and their reactivity in industrial fields.

Course Outcomes

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Classify between aromatic, anti-aromatic, and non-aromatic compounds.	Understand
CO 2	Write the mechanism of the Electrophilic aromatic substitution reaction.	Apply
CO 3	Identify the shapes of molecules with and without lone pair of electrons and the oxidation number of elements to balance the redox equations.	Apply
CO 4	Explain Law of crystallography, Different types of interaction of electromagnetic radiation with matter, Degree of ionization and Henderson equation for acidic and basic buffers.	Understand

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	**1.1 Ionic Equilibria : (7L)** 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 (Numericals expected) **1.2 Liquid State: (4L)** 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 (Numerical expected) **1.3 Solid State Chemistry (4L)** 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	15h	4	3	6,9

	(Numericals expected)				
2	**2.1 Chemical Bond and Reactivity: (7L)** 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 ABn type molecules with and without lone pair of electrons, isoelectronic principles, applications and limitations of VSEPR theory. **2.2 Oxidation Reduction Chemistry: (3L)** a) Reduction potentials b) Redox potentials: half reactions; balancing redox equations. c) Applications of redox chemistry: Metallurgy **2.3 General Principles of Metallurgy: (5L)** **i)** Introduction, occurrence of metals, ores and minerals, types of ores. **ii)** operations involved in metallurgy:- crushing, methods of concentration such as hand picking, gravity separation, Froth floatation, Calcinations, Roasting etc. **iii)** Reduction:- Auto reduction, Aluminothermic process and electrolytic reduction. **iv)** Refining of metals:- poling, liquation, electrolytic and vapour phase refining. i) Extraction of elements: (example: isolation of copper by auto reduction)	15h	2	1	3,7
3	**Aromatic Hydrocarbons: (15L)** 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. Disadvantages of F&C acylation and alkylation reaction. Name reaction Involving Electrophilic aromatic substitution. Activating and deactivating groups Mono and Disubstituted compounds and their orienting effects the groups. Disadvantages of F&C acylation and alkylation reaction. Name reaction Involving Electrophilic aromatic substitution. Activating and deactivating groups Mono and Disubstituted compounds and their orienting effects.	15h	2	3	10

Course Discription	
Semester	**II**
Course Name	**Chemistry**
Course Code	**Practical - USC2CHP**
Eligibility for the Course	**12th Science of all recognised Board**
Credit	**02**
Hours	**45**

Course Objectives

- To develop practical skills of identification of organic compounds.
- To identify the compounds by performing chemical tests.
- To develop the skills of titrations in the students.

Course Outcomes

COs. No.	After completing the course, students will be able to:	Bloom Taxonomy Level (BTL)
CO 1	Apply chemical kinetics law to calculate the rate constant of reaction.	Apply
CO 2	Make use of colorimeter and pH meter.	Apply
CO 3	Identify cations and anions from the given mixture of compounds and percentage of metal present in the sample by titration.	Apply
CO 4	Identify organic compound containing C,H (O) N, S, X elements.	Apply

	Course Description	Hrs	CO No.	PSO No.	PO No.
	Physical Chemistry 1. Determination of viscosity of given liquid by viscometer. 2. To determine dissociation constant of weak acid (Ka) using Henderson's equation and the method of incomplete titration pH metrically. 3. To verify Beer-Lambert's law, using $KMnO_4$	6 h	2,4	2	3,8

	solution by colorimetric method. 4. To standardize commercial sample of HCl using borax and to write material safety data of the chemicals involved. **Inorganic Chemistry** **1. Qualitative analysis: (at least 3 mixtures to be analyzed)** Semi-micro inorganic qualitative analysis of a sample containing two cations and two anions. Cations (from amongst): Ba^{2+}, Ca^{2+}, Sr^{2+}, Cu^{2+}, Cd^{2+}, Fe^{2+}, Ni^{2+}, Mn^{2+}, Mg^{2+}, Al^{3+}, Cr^{3+}, K^{+},$NH4^{+}$ Anions (From amongst): $CO^{3\ 2-}$, S^{2-}, $SO^{3\ 2-}$, NO2 -, NO3 -, Cl^{-}, Br^{-}, I^{-}, $SO^{-4\ 2-}$, $PO^{-4\ 3-}$. (Scheme of analysis should avoid use of sulphide ion in any form for Precipitation / separation of cations.) **2. Redox Titration:** 1 . To determine the percentage of copper(II) present in a given sample by titration against a standard aqueous solution of sodium thiosulfate (iodometry titration) 2 Estimation of available chlorine in bleaching powder iodometrically. **Organic Chemistry** Characterization of monofunctional organic compound (solid, liquid) containing C, H, (O), N, S, X elements. (minimum 6 compounds) **Characteristic Reactions of following Test** 1. Test for unsaturation (KMnO4 and bromine water) 2. Test for acid 3) Test for phenol 4) Test for base 5) Test for nitrogen 6) Test for sulphur 7) Test for halogens 8. Functional groups test A) Alcohols B) Aldehyde and ketone C) Esters D) Primary aromatic amines E) Nitro/Dinitro F) Phenol G) Amide .				

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Practicals

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