SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Affiliated to the University of Mumbai

Programme: Science

S.Y.B.Sc. CHEMISTRY (Major)

Syllabus for the Academic Year 2025-2026 based on the National Education Policy 2020

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

COURSE DETAILS FOR MAJOR:

	SEMESTER 3		SEMESTER 4
TITLE	Basics of Physical and Analytical Chemistry -I		Basics of Physical and Analytical Chemistry -II
TYPE OF COURSE - DSC	Major		Major
CREDITS	4		4

	SEMESTER 3		SEMESTER 4
TITLE	Basics of Organic and Inorganic Chemistry -I		Basics of Organic and Inorganic Chemistry -II
TYPE OF COURSE - DSC	Major		Major
CREDITS	4		4

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Preamble:

Chemistry - a vibrant and ever growing science that encompasses every aspect of our lives. The fascinating study of matter and its applications is vital in areas like drug designing, material science, nanotechnology and most importantly, 'green chemistry', areas that are beneficial to both humanity and the environment. Bachelor's degree in Chemistry is the culmination of in-depth knowledge of Inorganic, Organic and Physical chemistry, Analytical chemistry and specialized courses such as Pharmaceutical Chemistry, spectroscopy, Nanoscience, Forensic Science, Cosmeticology, Food chemistry, Dairy Chemistry, Environmental chemistry and so on.

The learning objectives are designed to provide a focused outcome based syllabus with an agenda to structure the teaching learning experiences in a more student centric manner. This programme helps learners in building a solid foundation for higher studies in Chemistry. The hands-on experience the students gain in Practical enable them to apply theoretical knowledge acquired to solve problems in everyday life, think critically and innovatively. The syllabus is designed so that the student starts from the basic concepts of chemistry and will gradually move towards the advanced level. They are given opportunities to improve their creativity, scientific writing and communication skills through assignments and other co-curricular activities in all the semesters. The credit courses on "Positive Health in Women" and "Innovation in Natural dyeing and Entrepreneurship Skills" offered by the department further enhances their life skills and helps them evolve as entrepreneurs.

Students completing this programme will be equipped with knowledge of the concepts of Chemistry, interpret data and present their findings to both the scientific community and laymen. Completion of this programme will also enable the learners to join teaching professions, conducting research in Industry and Government run research labs

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PROGRAMME OBJECTIVES

PO 1	The students are expected to understand the basic concepts in chemistry and be aware of the recent development in the subject area.
PO 2	To inculcate critical thinking and scientific attitude in the students.
PO 3	The students should be able to apply the theoretical knowledge and practical skills acquired to solve the real world problems and environmental issues.

PROGRAMME SPECIFIC OUTCOMES

PSO 1	**Core competency:** The chemistry graduates are expected to gain theoretical and practical knowledge of the basic concepts in chemistry.
PSO 2	**Skill development:** They would acquire necessary skills and training to pursue higher studies in the field of chemistry and to be an entrepreneur.
PSO 3	**Responsible citizens:** The students will get trained to adopt and practice sustainable techniques for their personal growth and to address societal and environmental problems

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Programme: Sciences **CHEMISTRY MAJOR**	**Semester – 3**
Course Title: Basics of Physical and Analytical Chemistry -I	**Course Code: SCHE233MJ**

COURSE OBJECTIVES:

1. To understand and enumerate the concept of entropy, free energy functions, its variation with temperature and pressure, partial molal properties and emanate the significance of Van't Hoff Reaction Isotherm & Isochore.
2. To learn basic concepts in analytical chemistry and its importance

COURSE OUTCOMES:

The learner will be able to :

1. explain and interrelate the different thermodynamic parameters such as entropy, helmholtz free energy, gibbs free energy changes and its significance
2. identify and classify the sources of error, calculate accuracy and precision of a method from the given data, and apply significant figures rules accurately.

Theory Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**2**	
Evaluation System	**Summative Assessment**	**1 Hour**	**30 marks**
	Continuous Assessment	**--**	**20 marks**

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UNIT 1 (1 Credit)	1.1	**Chemical Thermodynamics – II** 1.1.1 Recapitulation: Second law of thermodynamics 1.1.2 Free Energy Functions: Helmholtz Free Energy, Gibbs Free Energy, Variation of Gibbs Free Energy with pressure and temperature, Gibbs -Helmholtz Equation. (Numericals expected) 1.1.3 Thermodynamics of open systems: Partial molal properties, Chemical potential and its variation with pressure and temperature, Gibbs- Duhem equation. 1.1.4 Van't Hoff Reaction Isotherm and Van't Hoff Reaction Isochore. (Numericals expected)	**15 Hours**
	1.2	**Electrochemistry – I** 1.2.1 Electrochemical Cells: Galvanic cells, Electrochemical conventions, Reversible and Irreversible cells. 1.2.2 Types of electrodes, Standard electrode potential, Electrochemical series, Nernst Equations: Derivation and its applications. (Numericals expected). 1.2.3 Calomel electrode, Glass electrode and Salt bridge – Principle, construction and working. 1.2.4pH determination using Glass electrode and Quinhydrone electrode (Numericals expected)	
UNIT 2 (1 Credit)	2.1	**Introduction to Analytical Chemistry** Language of Analytical Chemistry: (Important terms and their significance in Analytical Chemistry): Analysis, determination, measurement, techniques, methods, procedures, protocols, sensitivity, selectivity, robustness, ruggedness and scale of operation.	**15 Hours**
	2.2	Classical and non-classical methods of analysis: Their types and importance. Errors: Errors in analysis and its classification, Minimization of errors. Normal distribution curve.	
	2.3	Precision and accuracy: Methods for their expression:- Absolute error, relative error, mean, mode, median, range, deviation, relative average deviation, standard deviation, relative standard deviation, variance and coefficient of variance (Numericals expected)	

	2.4	Significant figures and computation: Significant figures, Significance of zero in the computation of analytical data, Rules of computation.	
	2.5	Calibration of glasswares: Calibration of burette, pipette and standard flask.	

Programme: Sciences CHEMISTRY PRACTICAL	**SEMESTER 3** **Course Code: SCHE233MJP**

COURSE OUTCOMES:

1. To prove various laws and equations using different instrumental methods.
2. use potentiometry for analysis of various compounds and to construct an electrochemical cell

COURSE LEARNING OUTCOMES:

1. analyze various compounds by using classical and instrumental methods of analysis
2. able to prove or verify laws/equations through simple experiments and calculate rate and order of the reaction for known chemical systems

	DSC I SCHE233MJP
1.	To interpret the order of the reaction graphically for the given experimental data and calculate the specific reaction rate.
2.	To investigate the reaction between $K_2S_2O_8$ and KI with equal concentration of reactants.
3.	To determine the rate constant for the alkaline hydrolysis of ethyl acetate conductometrically
4.	To titrate a strong acid against a strong base conductometrically
5.	To estimate copper in a given solution iodometrically.
6.	To determine the standard EMF and the standard free energy of the Daniel cell potentiometrically.
7.	To conduct a pH titration of a weak acid against a strong base and to find out its dissociation constant.

ASSESSMENT DETAILS:

- Continuous assessment (CA): Any one activity / assignment / test of 20 marks
- Summative assessment (SA): Theory exam of 30 marks – One hour duration
- Summative assessment (SA):: Practical exam of 50 marks – Three hours duration

SCHE245 Basics of Physical and Analytical Chemistry -II

References

1. Physical Chemistry by G.M. Barrow. Tata McGraw-Hill (2007)
2. Physical Chemistry by G.W. Castellan. Narosa 4th Edition (2004)
3. General Chemistry by Kotz J.C., Treichel P.M. & Townsend. Cengage Learning India Pvt. Ltd., New Delhi (2009)
4. University Chemistry by B.H. Mahan. Narosa 3rd Edition (1998)
5. General Chemistry by R.H. Petrucci. Macmillan Publishing Co., New York 5th Edition (1985)
6. A textbook of Physical Chemistry by K.L. Kapoor. Macmillan Publishing Co., New Delhi 3rd Edition (2001)
7. Analytical Chemistry by G. L. David Krupadanam, D.Vijaya Prasad and others. University Press.
8. Modern Analytical Chemistry by David Harvey. Mc Graw-Hill International Edition.
9. Fundamental of Analytical Chemistry by Skoog, West, Holler and Crouch. Indian Edition
10. Analytical Chemistry by D. Kealey and P.J. Haines.
11. Quality Assurance in Analytical Chemistry by Elizabeth Prichard and Vicki Barwick. John Wiley and Sons, Ltd.
12. Analytical Chemistry by Open Learning series (ACOL)-Wiley India Edition

SCHE245P Basics of Physical and Analytical Chemistry -II

References

1. Senior Practical Physical Chemistry by B.D. Khosla, V.C. Garg & A. Gulati. R. Chanda and Co., New Delhi (2011)
2. Experiments in Physical Chemistry by C.W. Garland, J.W. Nibler& D.P. Shoemaker. McGraw-Hill New York 8th Edition (2003)
3. Experimental Physical Chemistry by Halpern A.M. & G.C. McBane. W.H. Freeman and Co., New York (2003)
4. Experimental Physical Chemistry by V.D. Athawale and P. Mathur. New Age International, New Delhi (2001)
5. Practical Physical Chemistry by Vishwanathan B. and RaghavanP.S.. Viva Books (2017)
6. Systematic experimental physical chemistry by Rajbhoj S.W. and Chondhekar T.K. Anjali Publication (2013)
7. Physical Chemistry – A Lab Manual by Sinha S.K. Narosa Publication (2014)

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: Sciences **CHEMISTRY MAJOR**	**Semester – 4**
Course Title: Basics of Physical and Analytical Chemistry -II	**Course Code: SCHE245MJ**

COURSE OBJECTIVES:

1. To understand and extrapolate phase rule, phase diagrams and its application.
2. Understand different classes of chemical reactions with respect to kinetics. To introduce the importance of classical and instrumental methods of analysis.

COURSE OUTCOMES:

The learner will be able to :

1. To identify and classify chemical reactions with respect to kinetics identify techniques for fast reactions, the effect of temperature on rate and theories of reaction rate
2. Explain the principle, working and applications of UV-VIS spectrophotometer.

Theory Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**2**	
Evaluation System	**Summative Assessment**	**1 Hour**	**30 marks**
	Continuous Assessment	**--**	**20 marks**

UNIT 1 (1 Credit)	1.1	**Electrochemistry – II** 1.1.1 Conductivity, Equivalent and Molar Conductivity (Numericals expected) and their variation with dilution of weak and strong electrolytes, Debye- Huckel Onsager Equation (no derivation) and its verification. 1.1.2 Kohlrausch Law of Independent Migration of	15 hours

		ions and its application: Determination of Ionization constant of a weak electrolyte, Solubility of a sparingly soluble salt and ionic product of water (Numericals expected) 1.1.3 Transference Number and Its Experimental Determination using Moving Boundary Method (Numericals expected)	
	1.2	**Chemical Kinetics-II** 1.2.1 Collision theory of reaction rates application of collision theory to (1) Bimolecular reaction and (2) Unimolecular reaction (Lindermann theory, derivation expected). Merits and drawbacks of collision theory. 1.2.2 Activated Complex Theory of Bimolecular Reactions. (Qualitative treatment only). Comparison of collision theory and activated complex theory.	
	1.3	**Phase Equilibria** 1.3.1 Phases, Components and Degrees of Freedom of a System, Criteria of Phase Equilibrium, 1.3.2 Gibbs Phase Rule: Thermodynamic derivation and its application. Phase diagram of one component system: Water and Sulphur. 1.3.3 Phase diagram of two component system involving Eutectics: Lead- Silver system. Clapeyron Equation and Clausius-Clapeyron 1.3.4 Equation: Derivation and its importance in phase equilibrium. (Numericals expected)	
UNIT 2 (1 Credit)	2.1	**Quantitative Methods of Chemical Analysis: Titrimetric methods** Terms involved in titrimetric methods of analysis, conditions suitable for titrimetry. Types of titrimetry: Neutralization, Redox (iodometry, iodimetry), Precipitation, and Complexometric titrations	15 hours
	2.2	**Instrumental Methods of Analysis** Basic concepts in Instrumental methods : Relation between the analyte, stimulus and measurement of change in the observable property. Types of Analytical Instrumental methods (only principle)	

		based on: (i) Optical Interaction: UV- Visible Spectroscopy, Polarimetry (ii) Electrochemical interactions: Potentiometry, pH metry and Conductometry (iii) Thermal interactions: Thermogravimetry	
	2.3	**Spectroscopic methods of analysis** EMR, absorption and emission spectroscopy, absorbance, transmittance and wavelength of maximum absorption. Beer-Lambert law and its deviation (no derivation) Numericals expected. Instrumentation for absorption spectroscopy: Colorimeters and spectrophotometers, Block diagram of single and double beam colorimeter and spectrophotometer, Principle, construction and working. Applications of UV-Vis spectroscopy: (i) Qualitative analysis (ii) Quantitative analysis by calibration curve method. Photometric titrations: Principle, working, types and applications.	

Programme: Sciences **CHEMISTRYPRACTICAL**	**SEMESTER 4** **Course Code: SCHE245MJP**

COURSE OBJECTIVES:

1. To understand applications of various instrumental methods to various systems, to evaluate simulated data
2. To understand and perform experiments based on optical methods

COURSE LEARNING OUTCOMES:

The learner will be able to :

1. generate data to find out rate and order of reaction
2. analyze commercial samples by optical methods at very low concentration

	DSC 5 **SCHE245MJP**
1.	To statistically evaluate the given analytical data for its accuracy and precision.

2.	To determine the amount of HCl in the given sample potentiometrically using Quinhydrone electrode.
3.	To determine the amount of Fe (III) in the given solution by titrating against $K_2Cr_2O_7$
4.	To determine the concentration of Cu (II) in the given solution by colorimetry.

ASSESSMENT DETAILS:

- Continuous assessment (CA): Any one activity / assignment / test of 20 marks
- Summative assessment (SA): Theory exam of 30 marks – One hour duration
- Summative assessment (SA):: Practical exam of 50 marks – Three hours duration

SCHE245 Basics of Physical and Analytical Chemistry -II

References

1. Physical Chemistry by G.M. Barrow. Tata McGraw-Hill (2007)
2. Physical Chemistry by G.W. Castellan. Narosa 4th Edition (2004)
3. General Chemistry by Kotz J.C., Treichel P.M. & Townsend. Cengage Learning India Pvt. Ltd., New Delhi (2009)
4. University Chemistry by B.H. Mahan. Narosa 3rd Edition (1998)
5. General Chemistry by R.H. Petrucci. Macmillan Publishing Co., New York 5th Edition (1985)
6. A textbook of Physical Chemistry by K.L. Kapoor. Macmillan Publishing Co., New Delhi 3rd Edition (2001)
7. Analytical Chemistry by G. L. David Krupadanam, D.Vijaya Prasad and others. University Press.
8. Modern Analytical Chemistry by David Harvey. Mc Graw-Hill International Edition.
9. Fundamental of Analytical Chemistry by Skoog, West, Holler and Crouch. Indian Edition
10. Analytical Chemistry by D. Kealey and P.J. Haines.
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12. Analytical Chemistry by Open Learning series (ACOL)-Wiley India Edition

SCHE245P Basics of Physical and Analytical Chemistry -II

References

1. Senior Practical Physical Chemistry by B.D. Khosla, V.C. Garg & A. Gulati. R. Chanda and Co., New Delhi (2011)
2. Experiments in Physical Chemistry by C.W. Garland, J.W. Nibler& D.P. Shoemaker. McGraw-Hill New York 8th Edition (2003)

3. Experimental Physical Chemistry by Halpern A.M. & G.C. McBane. W.H. Freeman and Co., New York (2003)
4. Experimental Physical Chemistry by V.D. Athawale and P. Mathur. New Age International, New Delhi (2001)
5. Practical Physical Chemistry by Vishwanathan B. and RaghavanP.S.. Viva Books (2017)
6. Systematic experimental physical chemistry by Rajbhoj S.W. and Chondhekar T.K. Anjali Publication (2013)
7. Physical Chemistry – A Lab Manual by Sinha S.K. Narosa Publication (2014)

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme:Sciences **Chemistry Major**	**Semester – 3**
Course Title: Basics of Organic and Inorganic Chemistry-I	**Course Code: SCHE234MJ**

COURSE OUTCOMES:

The learner will be able to :

1. Write various preparative methods and predict the mechanisms of reactions of hydrocarbons, predict the stability of cycloalkanes/aromatic compounds and predict the product for given reactions and identify and arrange the given compounds as per acidity, reactivity and stability.
2. Differentiate between ionic and covalent compounds, and explain their properties using different theories, predict and understand geometries of different covalent compounds

COURSE OBJECTIVES:

1. To understand the stability, reactivity, acidity, methods of preparation of hydrocarbons and aromaticity of benzene and benzenoid compounds and reactivity of benzene.
2. To understand the bonding fundamentals for both ionic and covalent compounds, including electronegativities, bond distances and bond energies using MO diagrams and thermodynamic data. To predict geometries of simple molecules

UNIT 1 (1 Credit)	1.1	**Alkanes** 1.1.1 Introduction to Alkanes and Cycloalkanes. The Chemistry of Petroleum Refining, Shapes of Alkanes Conformational Analysis of Butane. The Relative Stabilities of Cycloalkanes: Ring Strain. Conformations of Cyclohexane: The Chair and the Boat. Physical Properties of Alkanes and Cycloalkanes, 1.1.2 Synthesis of Alkanes and Cycloalkanes- Hydrogenation of Alkenes and Alkynes. Chemical Reactivity of Alkanes.	**15 Hours**

	1.2	**Alkenes and alkynes- Introduction** 1.2.1Relative Stabilities of Alkenes, Cycloalkenes Synthesis of Alkenes via Elimination Reactions, (mechanism) - Dehydrohalogenation of Alkyl Halides, Acid-Catalyzed Dehydration of Alcohols, Carbocation Stability, and Molecular Rearrangements 1.2.2 The Acidity of Terminal Alkynes, Synthesis of Alkynes by Elimination Reactions, Replacement of the Acetylenic Hydrogen Atom of Terminal Alkynes Alkylation of Alkynide Anions and Reactivity	
	1.3	**Alkenes and Alkynes Reactions** 1.3.1 Addition Reactions of Alkenes. Electrophilic Addition of Hydrogen Halides to Alkenes: Mechanism and Markovnikov's Rule Stereochemistry of the Ionic Addition to an Alkene Addition of Sulfuric Acid to Alkenes Addition of Water to Alkenes: Acid-Catalyzed Hydration. 1.3.2 Alcohols from Alkenes through Oxymercuration–Demercuration: Markovnikov Addition Alcohols from Alkenes through Hydroboration–Oxidation: Anti-Markovnikov Syn Hydration Hydroboration: Synthesis of Alkylboranes, Oxidation and Hydrolysis of Alkyl Boranes, Oxidative Cleavage of Alkenes. 1.3.3 Addition of Hydrogen Halides to Alkynes Electrophilic Addition of Bromine and Chlorine to Alkynes.	
	1.4	**Introduction to Aromaticity** 1.4.1 Criteria for aromaticity (Hückel's rule), antiaromaticity, aromatic character of arenes, cyclic carbocations /carbanions (examples using C3-C7 atoms) 1.4.2 The nomenclature of Benzene, Naphthalene and anthracene contain different functional groups. 1.4.3 Reactions of aromatic compounds- Electrophilic substitution (mechanism expected) and Nucleophilic substitution.	

UNIT 2 (1 Credit)	2.1	**Non-Directional Bonding** 2.1.1Ionic Bond: Introduction, conditions for the formation of an ionic bond. 2.1.2 Ionic crystals: definitions-crystal lattice, lattice points, unit cell, lattice parameters, types of ionic crystals 2.1.3 Lattice Energy: Born-Lande equation, Kapustinski equation, Born-Haber Cycle and its application (Numericals expected)	**15 Hours**
	2.2	**Directional bonding** 2.2.1 Covalent Bonding: Valence Bond Theory- introduction and basic tenets 2.2.2 Formation of H_2 :Interaction between two hydrogen atoms and the potential energy diagram of the resultant system, corrections applied to the system of two hydrogen atoms 2.2.3 Hybridization and types of hybrid orbitals- *sp, sp^2,sp^3,sp^3d, sp^3d^2* 2.2.4 Equivalent and Non-Equivalent hybrid orbital 2.2.5 Limitations of VBT	
	2.3	**Molecular Orbital Theory** 2.3.1Introduction to MOT, definitions- bonding, anti-bonding and non-bonding molecular orbitals 2.3.2 LCAO- MO approach to homonuclear diatomic molecules H_2 to Ne_2 (calculation of bond order and magnetic property) 2.3.3 Bond Order and magnetic property of species of O_2 : $O2^+$,$O2^{2-}$ 2.3.4 LCAO- MO approach to heteronuclear diatomic molecules- HCl, NO, CO(calculation of bond order and magnetic property)	
	2.4	**Acid- Base Theory** 2.4.1Arrhenius, Lowry- Bronsted, Lewis, Usanovich concept, Solvent – Solute concept of acids and bases 2.4.2 Concept of Ka and pKa to understand acid strength(numericals expected) 2.4.3 Hard and Soft acids and bases. Applications of HSAB	

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Theory Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**2**	
Evaluation System	**Summative Assessment**	**1 Hour**	**30 marks**
	Continuous Assessment	**--**	**20 marks**

PRACTICAL **Course Title:** Basics of Organic and Inorganic Chemistry-I	**Course Code:** SCHE233MJP

COURSE OBJECTIVES:

1. To understand the stability, reactivity, acidity, methods of preparation of hydrocarbons and aromaticity of benzene and benzenoid compounds and reactivity of benzene.
2. To understand the bonding fundamentals for both ionic and covalent compounds, including electronegativities, bond distances and bond energies using MO diagrams and thermodynamic data. To predict geometries of simple molecules

COURSE OUTCOMES:

The learner will be able to :

1. to prepare, recrystallise and identify the organic compound synthesized with the help of physical constant
2. report the amount of ions present by iodometric and complexation reaction

Lectures per week (1 Lecture is 120 minutes)		**2**	
Total number of Hours in a Semester		**60**	
Credits		**2**	
Evaluation System	**Semester End Examination**	**3 Hours**	**50 marks**
	Internal Assessment	**--**	

	1	To estimate the amount of zinc ions in solution complexometrically.	60 hours
	2	To determine the amount of magnesium ions in the given solution complexometrically	
	3	Organic preparation (purification by recrystallisation expected) a) Bromination of phenols/amines b) Nitro Derivative of aromatic hydrocarbons c) Hydrolysis of esters	

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: Sciences **Chemistry Major**	**Semester – 4**
Course Title: Basics of Organic and Inorganic Chemistry-II	**Course Code:** SCHE246MJ

COURSE OBJECTIVES:

1. To understand the stability, reactivity, acidity, methods of preparation of alkyl and aromatic halides, alcohols,phenols,ethers and epoxides.
2. To gain understanding of transition metal ions and their properties and build knowledge on coordination complexes and their application in bioinorganic chemistry.

COURSE OUTCOMES:

The learner will be able to :

1. Write various preparative methods and predict the product and mechanisms of reactions of alkyl halides/ alcohols/phenols/ethers/epoxides, identify and arrange the given compounds as per acidity.
2. Identify and list different transition metal ions and their properties and understand bonding in coordination complexes, naming of coordination compounds and explain their magnetic properties

Theory Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**2**	
Evaluation System	**Semester End Examination**	**1 Hour**	**30 marks**
	Internal Assessment	**--**	**20 marks**

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UNIT 1 (1 Credit)	1.1	**Alkyl and Aromatic Halide** 1.1.1 Organic Halides, Nucleophilic Substitution Reactions, Nucleophiles Leaving Groups, Kinetics of a Nucleophilic Substitution Reaction. An S_N2 Reaction, S_NAr, Benzyne . S_Ni (Mechanism) 1.1.2 The Reaction of tert-Butyl Chloride with Hydroxi Ion: An S_N1 Reaction (Mechanis Carbocations,Stereochemistry of S_N1 Reactio Factors Affecting the Rates of S_N1 and S Reactions.	15 hours
	1.2	**Alcohols and Phenols** 1.2.1Preparation o alcohols:dehydration,Oxymercuration-Demercurati on and hydroboration of alkenes, reduction o aldehydes and ketones and using Grignard reagent. Properties: Hydrogen bonding- types and effect on different properties. Acidity of phenol and effect of substituents on acidity 1.2.2 Preparation of phenols: (i) Dows Process (ii) isopropyl benzene by hydroperoxide method. Reactions of alcohols: Alcohols as acids, conversion of alcohols into mesylates and tosylates and alkyl halides. Reaction of Phenols Salt formation, Etherification – direct reaction with alcohol, Williamson Synthesis, O-acylation, Halogenation, Nitration	
	1.3	**Ethers:** 1.3.1Preparation : Dehydration of alcohols (mechanism),Williamson synthesis (mechanism). Reactions : Acid catalyzed cleavage reaction with HX (mechanism). Crown Ethers 1.3.2 Epoxides: Structure,Ring opening reactions by nucleophiles (i) In acid conditions: hydrolysis, reaction with – HX, alcohol, HCN (ii) In neutral or basic conditions:Reaction with ammonia, amines, metal cyanides, and alkoxides.	

UNIT 2 (1 Credit)	2.1	**Chemistry of transition elements** 2.1.1 Position in the periodic table, natural occurrence, principal ores and minerals of elements of the first transition series. 2.1.2 Oxidation states,origin of colour of transition metals and their compounds: d-d transitions and charge transfer 2.1.3 Magnetic properties of transition metal compounds: Origin of magnetism-spin and orbital motion of electrons; equation for spin only and spin-orbital magnetism terms of Bohr magnetons (No derivation of relevant equations expected); Reasons for quenching of orbital moment of electrons 2.1.4 Uses of transition elements	15 hours
		Coordination Chemistry 2.2.1Introduction: Basic terms, types of ligands, nomenclature of co-ordination compounds, isomerism and its types 2.2.2 Werner's theory of coordination, effective atomic number rule,sixteen and eighteen electron rule 2.2.3 Nature of the Metal-Ligand Bond:Valence Bond Theory: hybridisation -sp^3, dsp^2, sp^3d^2,d^2sp^3 (Inner and outer orbital complexes of Mn(II), Fe(II),Fe(III),Co(II),Co(III),Ni(II), Cu(II), Zn(II) with ligands like aqua, ammonia,cyanide and halides) 2.2.4Limitations of V.B.T with respect to co-ordination compounds. 2.2.5 Uses of coordination compounds: medicinal, biological, industrial and as laboratory reagents	
	2.3	**Chemistry of Silicon and Germanium** 2.3.1 Silicon & Germanium: Occurrence and extraction 2.3.2 Preparation of pure Silicon and Germanium 2.3.3 Uses of Silicon and germanium	

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL COURSE **Course Title: Basics of Organic and Inorganic Chemistry - II**	**Course Code: SCHE246MJP**

COURSE OBJECTIVE:

1. Qualitatively analyze the given mono functional organic compounds using microtechniques.
2. analysis of given organic compounds based on functional group specific reactions

COURSE OUTCOMES:

The learner will be able to :

1. identify the given monofunctional organic compounds
2. estimate the amount of organic compound present in the given sample using suitable method

Lectures per week (1 Lecture is 120 minutes)	**2**
Total number of Hours in a Semester	**60**
Credits	**2**

Evaluation System	**Summative Assessment**	**3 Hours**	**50 marks**
	Continuous Assessment	**--**	

	1	To determine the percentage of optically active substance in a given solution (glucose/sucrose) by polarimetry.	60 hours
	2	To determine the amount of nickel ions (as nickel DMG) in the given solution gravimetrically.	
	3	To determine the amount of barium ions (as barium chromate) in the given solution gravimetrically	

	4	To determine the hardness of water.	
	5	To determine the dissolved oxygen in the given sample.	
	6	To determine the percentage of composition of calcium oxide/magnesium oxide in the given dolomite sample complexometrically.	
	7	Systematic Qualitative analysis of organic compounds with mono functional groups (acids, phenols, alcohols/ketone, amides, nitro, amines, esters, hydrocarbons) minimum 8 compounds	
	8	Organic Estimations: a. Estimations equivalent weight of acid b. Estimation of acetamide	

ASSESSMENT DETAILS:

- Continuous Assessment (CA): Any one activity / assignment / test of 20 marks
- Summative Assessment (SA): Theory exam of 30 marks – One hour duration
- Summative Assessment (SA): Practical exam of 50 marks – Three hours duration

REFERENCES:

SCHE246 Basics of Organic and Inorganic Chemistry

1. Organic Chemistry by Jonathan, Clayden,Greeves Warren
2. Mc Murry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013
3. Graham Solomons, T.W., FryhleC.b.&Dnyder, S.A *Organic Chemistry* John Wiley & Sons 7th Edition.
4. Mc Murry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition 2013.
5. Sykes, P. *A Guide to Mechanism in Organic Chemistry*, 6th Ed. Orient Longman, New Delhi (1988)
6. Paula Y. B., *Organic Chemistry*, 3rd Ed. Pearson Education, Inc.
7. Morrison, R.T. Boyd & R.N. Bhattacharjee, S.K., *Organic Chemistry,* 7th Ed. Pearson Education Inc.
8. Concise inorganic chemistry, J D Lee, Blackwell Science Ltd, fifth edition.
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SCHE246P Basics of Organic and Inorganic Chemistry

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