



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Affiliated to the University of Mumbai

Programme: Science

Chemistry

T.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:

DISCIPLINE SPECIFIC CORE

	SEMESTER 5		SEMESTER 6
DSC-7	PHYSICAL CHEMISTRY-I	DSC-10	PHYSICAL CHEMISTRY-II
DSC-8	ORGANIC CHEMISTRY-I	DSC-11	ORGANIC CHEMISTRY-II
DSC-9	ANALYTICAL CHEMISTRY-I	DSC-12	ANALYTICAL CHEMISTRY-II
TYPE OF COURSE	Major		Major
CREDITS	4+4+4		4+4+4



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

DISCIPLINE SPECIFIC ELECTIVE

	SEMESTER 5		SEMESTER 6
TITLE	Inorganic Chemistry -I		Inorganic Chemistry -II
TYPE OF COURSE - DSE	Major		Major
CREDITS	4		4

OR

	SEMESTER 5		SEMESTER 6
TITLE	Chemistry of Food and Cosmetics		Industrially Important Inorganic Material
TYPE OF COURSE - DSE	Major		Major
CREDITS	4		4



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

VOCATIONAL SKILL COURSE

	SEMESTER 5
TITLE	Applied Component
TYPE OF COURSE - VSC	Major
CREDITS	2



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



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

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.



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: Sciences CHEMISTRY MAJOR	Semester – 5
Course Title: PHYSICAL CHEMISTRY-I	Course Code: SCHE357MJ

COURSE OBJECTIVES:

1. To study different types of adsorption isotherms, properties of colloidal solutions and applications of surfactants
2. To study different transmutation reactions, applications of radioisotopes, fission and fusion processes and to calculate the Q-values
3. To study the influence of ionic strength, hydrostatic pressure, dielectric constant and effect of substituents on the rate of reactions.

COURSE OUTCOMES:

The learner will be able to

1. explain the electrical properties of colloids, micellization and classify surfactants and determine the surface area of an adsorbent using B.E.T. equation
2. calculate the Q-values, explain the nuclear reactor, fissile material and applications of radioisotopes as tracers
3. apply the Hammett equation and evaluate the effect of ionic strength on rate of reactions

Lectures per week (1 Lecture is 60 minutes)		3	
Total number of Hours in a Semester		45	
Credits		3	
Evaluation System	Summative Assessment	2 Hours	50 marks
	Continuous Assessment	-	50 marks



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

<p>UNIT 1 (1 Credit)</p>	<p>1.1</p>	<p>SURFACE CHEMISTRY</p> <p>1.1.1 Adsorption - Physical and Chemical Adsorption, types of adsorption isotherms. 1.1.2 Langmuir's adsorption isotherm, B.E.T equation for multilayer adsorption, (derivation not expected). Determination of surface area of an adsorbent using B.E.T. equation (Numericals expected)</p>	<p>15 Hours</p>
<p>1.2</p>	<p>COLLOIDAL STATE</p> <p>1.2.1 Introduction to Colloids - Emulsions, Gels, Sols. 1.2.2 Electrical properties of colloids - Origin of charge on colloidal particles, Concept of electrical double layer, Zeta potential, Helmholtz and Stern model, Electro-kinetic phenomena- Electrophoresis, Electro-osmosis, Streaming potential, Sedimentation potential; Donnan Membrane Equilibrium. 1.2.3 Colloidal Electrolytes - Introduction, classification; Properties of colloidal electrolytes, types of ionic micelles, micellization, Critical Micelle Concentration. 1.2.4 Surfactants: Introduction, Classification, reverse micelles, solubilization of surfactant solutions; applications of surfactants in detergents, insecticides and food industry.</p>		
<p>UNIT 2 (1 Credit)</p>		<p>NUCLEAR CHEMISTRY</p> <p>2.1 Law of disintegration(Numericals expected) 2.2 Detection of radiation - Characteristics of nuclear radiations, behavior of ion pairs in electric field, GM counter, Scintillation counter 2.3 Application of radioisotopes - Use of radioisotopes as tracers. 2.4 Nuclear reactions - Nuclear transmutation, artificial radioactivity, Q – value of nuclear reaction, threshold energy (Numericals expected) 2.5 Fission process - Fissile and fertile material, nuclear fission, chain reaction, factor controlling fission process- Multiplication factor and Critical size or mass of fissionable materials, nuclear power reactor and breeder reactor. 2.6 Fusion process - Thermonuclear reactions occurring on stellar bodies and earth.</p>	<p>15 Hours</p>



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

UNIT 3 (1 Credit)	3.1	DILUTE SOLUTIONS 3.1.1 Colligative properties - Vapour pressure and relative lowering of vapour pressure – Raoult’s Law. Measurement of lowering of vapour pressure- Static and Dynamic method. 3.1.2 Elevation of Boiling point - Thermodynamic derivation relating elevation in boiling point of the solution and molar mass of non- volatile solute (Numericals expected). 3.1.3 Depression of Freezing point - Thermodynamic derivation relating depression in the freezing point of the solution and molar mass of non-volatile solute (Numericals expected) 3.1.4 Osmotic pressure - Introduction, thermodynamic derivation of Van’t Hoff equation, Van’t Hoff factor (Numericals expected), Measurement of Osmotic Pressure- Berkeley and Hartley’s method, Reverse Osmosis-principle and method.	15 Hours
		SOLVENT EFFECTS 3.2.1 Influence of solvent dielectric constant 3.2.2 Influence of ionic strength (Numericals expected) 3.2.3 Influence of hydrostatic pressure 3.2.4 Linear Gibbs energy relationships- (Hammett's equation) -Substituent constant, reaction constant, equation, reaction mechanism, σ constant	

PRACTICAL Course Title: Physical Chemistry-I	Course Code: SCHE357MJP
<p><u>COURSE OBJECTIVES:</u></p> <ol style="list-style-type: none"> To understand adsorption phenomena and verify adsorption isotherms, including Freundlich isotherm. To apply electrochemical and conductometric techniques to determine CMC, solubility, and K_{sp} of electrolytes. To analyze chemical systems using potentiometric titration and study reaction kinetics including effects of ionic strength. To evaluate physicochemical properties such as radioactive decay parameters and the empirical formula of metal complexes using graphical and experimental methods. <p><u>COURSE OUTCOMES:</u> The learner will be able to</p> <ol style="list-style-type: none"> explain adsorption phenomena and validate Freundlich isotherm through experimental data analysis. perform conductometric and electrochemical experiments to determine CMC, solubility, and K_{sp} accurately. conduct potentiometric titrations and analyze reaction kinetics, including the effect of ionic strength on reaction rates. 	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

- | |
|---|
| 4. determine radioactive decay parameters graphically and deduce the empirical formula of metal complexes experimentally. |
|---|

Lectures per week (1 Lecture is 120 minutes)		1	
Total number of Hours in a Semester		30	
Credits		1	
Evaluation System	Summative Assessment	3 Hours	50 marks
	Continuous Assessment	--	

	<ol style="list-style-type: none"> To investigate the adsorption of acetic acid on activated charcoal and test the validity of Freundlich adsorption isotherm. To determine the Critical Micelle Concentration of sodium lauryl sulfate from the measurement of conductance at different concentrations. To determine the solubility product and solubility of AgCl potentiometrically using a chemical cell. To determine the solubility product and solubility of AgCl potentiometrically using a concentration cell. To determine the amount of iodide, bromide and chloride in the mixture by potentiometric titration. To determine the half-life, decay constant and the average life of a radioactive element graphically. To study the influence of ionic strength on reaction between potassium persulphate and potassium iodide. To determine the empirical formula of the complex between Fe(III) and salicylic acid by static method. 	30 hours
--	---	----------



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

ASSESSMENT DETAILS:

1. Continuous assessment (CA): Any one activity / assignment of 25 marks One Test 25 marks
2. Summative assessment (SA): Theory exam of 50 marks – Two hour duration
3. Summative assessment (SA: Practical exam of 50 marks – Three hours duration

REFERENCES:

SCHE357MJ Physical Chemistry -I THEORY

1. Physical Chemistry, Ira Levine, 5th Edition, 2002 Tata McGraw Hill Publishing Co. Ltd.
2. Physical Chemistry, P.C. Rakshit, 6th Edition, 2001, Sarat Book Distributors, Kolkata.
3. Physical Chemistry, G.M. Barrow, 6th Edition (2007), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. The Elements of Physical Chemistry, P.W. Atkins, 2nd Edition, Oxford University Press Oxford. Ltd., Publishers, 2005.
5. Essentials of Nuclear Chemistry, Arnikar, Hari Jeevan, New Age International (P) Ltd., Publishers, 2011.
7. Physical Chemistry, Keith J Laidler, John H. Meiser, 2nd Edition, CBS publication and distributors Pvt. Ltd.

SCHE357MJP Physical Chemistry -I PRACTICAL

1. Experiments in Physical Chemistry C.W. Garland, J.W. Nibler and D.P. Shoemaker, McGraw Hill New York 8th Edition (2003)
2. Practical Physical chemistry, Vishwanathan B. and Raghavan P.S. Viva Books (2017)
3. Experimental Physical Chemistry, V.D. Athawale and P. Mathur, New Age International Publishers, 2001



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: Sciences CHEMISTRY MAJOR	Semester – 6
Course Title: PHYSICAL CHEMISTRY-II	Course Code: SCHE3610MJ
<u>COURSE OBJECTIVES:</u>	
<ol style="list-style-type: none"> 1. To develop understanding of the fundamental principles and mathematical framework of quantum mechanics, including wavefunctions, operators, eigenvalues, and eigenfunctions, and their applications. 2. To understand fundamentals of spectroscopy - rotational, vibrational, Raman and NMR spectroscopy. 3. To understand the fundamental principles of electrochemical reactions, including electron transfer processes, electrode kinetics and thermodynamics involved in redox reactions. 	

Lectures per week (1 Lecture is 60 minutes)	3		
Total number of Hours in a Semester	45		
Credits	3		
Evaluation System	Summative Assessment	2 Hours	50 marks
	Continuous Assessment	-	50 marks

UNIT 1 (1 Credit)	<p align="center">QUANTUM CHEMISTRY</p> <p>1.1 Classical theory - Introduction, limitations of classical mechanics, Black body radiation, photoelectric effect, Compton effect.</p> <p>1.2 Quantum theory - Introduction, Plank's theory of quantization, wave particle duality, de-Broglie's equation, Heisenberg's uncertainty principle (Numericals expected)</p> <p>1.3 Progressive and Standing waves - Introduction, boundary conditions, interpretation and properties of wave function, Schrodinger's time independent wave equation (No derivation expected)</p> <p>1.4 Functions and Operators - State function and its significance, concept of operators, definition, addition, subtraction and multiplication of operators, commutative and non-commutative operators, linear operator, Hamiltonian operator, Eigen function and Eigen value (Numericals expected)</p>	15 Hours
------------------------------	--	-----------------



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

<p>UNIT 2 (1 Credit)</p>		<p>MOLECULAR SPECTROSCOPY</p> <p>2.1 Rotational Spectrum - Introduction to dipole moment, polarization of a bond, bond moment, molecular structure, Rotational spectrum of a diatomic molecule, rigid rotor, moment of inertia, energy levels, conditions for obtaining pure rotational spectrum, selection rule, nature of spectrum, determination of internuclear distance and isotopic shift (Numericals expected)</p> <p>2.2 Vibrational Spectrum - Vibrational motion, degrees of freedom, modes of vibration, vibrational spectrum of a diatomic molecule, simple harmonic oscillator, energy levels, zero point energy (Numericals expected), conditions for obtaining vibrational spectrum, selection rule and nature of spectrum.</p> <p>2.3 Vibrational-Rotational Spectrum of Diatomic Molecule -Energy levels, selection rule, nature of spectrum, P and R branch lines. Anharmonic Oscillator - energy levels, selection rule, fundamental band, overtones (Numericals expected). Application of vibrational-rotational spectrum in determination of force constant; its significance. Infrared spectra of simple molecules like H₂O and CO₂.</p> <p>2.4 Raman Spectroscopy - Scattering of electromagnetic radiation, Rayleigh scattering, Raman scattering, nature of Raman spectrum, Stoke's lines, Anti-Stoke's lines, Raman shift, quantum theory of Raman spectrum (Numericals expected), comparative study of IR and Raman spectra, rule of mutual exclusion - CO₂ molecule.</p> <p>2.5 NMR- Principle and theory, Nuclear spin, magnetic moment, nuclear 'g' factor, energy levels, Larmor precession, Relaxation processes in NMR (spin-spin relaxation and spin-lattice relaxation), chemical shift, δ scale, low resolution spectra. Instrumentation - NMR Spectrometer</p>	<p>15 Hours</p>
<p>UNIT 3 (1 Credit)</p>	<p>3.1</p>	<p>ELECTROCHEMISTRY</p> <p>3.1.1 Activity and Activity coefficient - Lewis concept, ionic strength (Numericals expected), Mean ionic activity and mean ionic activity coefficient of an electrolyte, expression for activities of electrolytes. Debye-Huckel limiting law (No derivation).</p> <p>3.1.2 Chemical and concentration cells - Chemical cells with and without transference Electrode concentration cells and Electrolyte concentration cells with and without transference (Numericals expected)</p> <p>3.1.3 Polarization - Concentration polarization and its elimination</p> <p>3.1.4 Decomposition potential and Overvoltage - Introduction, decomposition potential and its experimental determination, overvoltage, relationship between decomposition potential and overvoltage, factors affecting decomposition potential, Tafel's theory of overvoltage, Tafel's equation for hydrogen overvoltage, experimental determination of overvoltage (Numericals expected).</p>	<p>15 Hours</p>
	<p>3.2</p>	<p>PHASE EQUILIBRIA & THERMODYNAMIC RELATIONSHIPS</p> <p>3.2.1 Three component system formation of one pair of partially miscible liquids</p> <p>3.2.2 Maxwell relations—derivation and application to ideal gases</p> <p>3.2.3 Fugacity - definition, experimental method of determination</p>	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL Course Title: Physical Chemistry-II	Course Code: SCHE3610MJP
--	---------------------------------

COURSE OUTCOMES:

1. To determine molecular weight of polymer using viscosity measurements.
2. To determine activity coefficient using a concentration cell without transference
3. To study the phase behavior of a three-component system.
4. To estimate strength of mixture of weak and strong acids using conductometric titration.
5. To plot linear, exponential, and trigonometric functions.
6. To determine electrons transferred using potentiometric methods.
7. To determine the isoelectric point of an amino acid.
8. To determine strength of a dibasic acid conductometrically.

COURSE OUTCOMES: Learner will be able to

1. calculate molecular weight of polymer from viscosity data.
2. evaluate activity coefficient from electrochemical data.
3. interpret ternary phase diagrams and miscibility relations.
4. quantify strength of acids from conductance curves.
5. identify continuous and non continuous functions from graphs.
6. calculate electron transfer in redox reactions.
7. identify isoelectric point from pH metric experimental data.
8. evaluate dibasic acid strength from conductometric titration data.

Lectures per week (1 Lecture is 120 minutes)		1	
Total number of Hours in a Semester		30	
Credits		1	
Evaluation System	Summative Assessment	3 Hours	50 marks
	Continuous Assessment	--	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

		<ol style="list-style-type: none">1. To determine the molecular weight of poly vinyl alcohol from viscosity measurements.2. To determine the activity coefficient of Ag ions using a concentration cell without transference.3. To study the phase diagram of the three-component system water – chloroform / toluene – acetic acid.4. To titrate a mixture of weak acid and strong acid against a strong base and to determine the amount of each acid in the mixture conductometrically.5. To plot the graphs of mathematical functions – linear, exponential and trigonometric and identify whether they are acceptable or non-acceptable6. To determine the number of electrons in the redox reaction between ferrous ammonium sulphate and ceric sulphate potentiometrically7. To determine the isoelectric point of an amino acid.8. To determine the strength of a given dibasic acid by conductometric titration.	30 hours
--	--	--	----------

ASSESSMENT DETAILS:

1. Continuous assessment (CA): Any one activity / assignment of 25 marks One Test 25 marks
2. Summative assessment (SA): Theory exam of 50 marks – Two hour duration
3. Summative assessment (SA: Practical exam of 50 marks – Three hours duration

REFERENCES:

SCHE3610MJ Physical Chemistry -II

1. Physical Chemistry, Ira Levine, 5th Edition, 2002 Tata McGraw Hill Publishing Co. Ltd.
2. Physical Chemistry, P.C. Rakshit, 6th Edition, 2001, Sarat Book Distributors, Kolkata.
3. Fundamentals of Molecular Spectroscopy, 4th Edn. Colin N Banwell and Elaine McCash Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2008.
4. Physical Chemistry, G.M. Barrow, 6th Edition (2007), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
5. Physical Chemistry, Keith J Laidler, John H. Meiser, 2nd Edition, CBS publication and distributors Pvt. Ltd.

SCHE3610MJP Physical Chemistry -II

1. Experiments in Physical Chemistry C.W. Garland, J.W. Nibler and D.P. Shoemaker, McGraw Hill New York 8th Edition (2003)
2. Practical Physical chemistry, Vishwanathan B. and Raghavan P.S. Viva Books (2017)
3. Experimental Physical Chemistry, V.D. Athawale and P. Mathur, New Age International Publishers, 2001



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: Sciences Chemistry Major	Semester – 5
Course Title: Organic Chemistry-I	Course Code: SCHE358MJ
<p><u>COURSE OBJECTIVES:</u></p> <ol style="list-style-type: none"> To learn the method of naming bicyclo and heterocyclic compounds, and understand the various methods for determining mechanisms of reactions and mechanism of NGP reactions. To understand the basic concept of chirality (for molecules with and without stereogenic center), topicity, stereospecificity and stereoselectivity of reactions, ring strain in cycloalkanes & conformational stability cyclohexanes (with mono and di substitution). To learn preparation and reactions of organo-lithium, magnesium, copper, zinc and palladium compounds, and understand the preparation, mechanism of addition polymerisation reactions with applications of polymers. 	
<p><u>COURSE OUTCOMES:</u></p> <p>The learner will be able to:</p> <ol style="list-style-type: none"> write the structure and name of the given molecule according to IUPAC, identify the method used in predicting the mechanism of a given reaction, identify and write the mechanism of NGP reactions. predict the configuration, optical activity of molecules, topicity of ligands and faces, stereospecific and stereoselective reactions. identify and write the mechanism of reactions of organometallic compounds with different substrates, define terms in polymer chemistry, predict and write the mechanism of addition polymerisation, identify and predict the monomer/polymer and applications. 	

Theory Lectures per week (1 Lecture is 60 minutes)	3		
Total number of Hours in a Semester	45		
Credits	3		
Evaluation System	Summative Assessment	2 Hour	50 marks
	Continuous Assessment	--	50 marks



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

UNIT 1 (1 Credit)	1.1	<p>MECHANISM OF ORGANIC REACTIONS:</p> <p>1.1.1 Basics terms and concepts: Bond fission, reaction intermediates, electrophiles and nucleophiles, ligand, base, electrophilicity vs. acidity and nucleophilicity vs basicity.</p> <p>1.1.2 Investigation of reaction mechanisms: Product analysis including cross-over products, trapping of intermediates, isotopic labeling, kinetic and stereochemical evidence.</p> <p>1.1.3 Thermodynamic and kinetic control of organic reactions - concept with mechanism of the following addition of HX to butadiene; sulfonation of naphthalene</p> <p>1.1.4 Neighbouring group participation in nucleophilic substitution reactions - participation of lone pair of electrons, kinetics and stereochemical outcome. S_Ni</p>	15 Hours
	1.2	<p>IUPAC NOMENCLATURE:</p> <p>1.2.1. Bicyclic Compounds- spiro, fused and bridged (up to 1 carbon atom) - saturated and unsaturated. Cumulenes (up to 3 double bonds) Biphenyls</p> <p>1.2.2 Monocyclic (5 and 6 membered) aromatic and non-aromatic heterocyclic compounds containing a maximum of two hetero atom among N,O,S</p>	
UNIT 2 (1 Credit)		STEREOCHEMISTRY III:	15 Hours
	2.1	Recapitulation of important concepts including R/S configuration.	
	2.2	Molecular chirality and element of symmetry : Mirror plane symmetry, inversion centre, rotation-reflection (alternating) axis.	
	2.3	Chirality of compounds without stereogenic centre: cumulenes, spirans and biphenyls.	
	2.4	Cycloalkanes and Conformational analysis: Types of cycloalkanes and their relative stability, Baeyer strain theory, Conformation analysis of cyclohexane: Chair, Boat and Twist boat forms; Relative stability with energy. mono, disubstituted cyclohexanes and their relative stabilities	
	2.5	Stereoselectivity and stereospecificity - Idea of enantioselectivity (ee) and diastereoselectivity (de), Topicity - enantiotopic and diastereotopic atoms, groups and faces.	
2.6	Elimination reactions - E ₂ -Base induced dehydrohalogenation of 1-bromo-1, 2- diphenylpropane.		



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

<p>UNIT 3 (1 credit)</p>	<p>3.1</p>	<p>ORGANOMETALLIC CHEMISTRY: 3.1.1 Organolithium/ magnesium compounds - Preparation using alkyl/aryl halides. Reactions with compounds containing acidic hydrogen, alkyl halides, carbonyl compounds, cyanides and CO₂. 3.1.2 .Lithium dialkyl cuprates - Preparation and reactions with aliphatic/ aromatic/ vinylic halides. Micheal addition 3.1.3 Organozinc compounds - Preparation and application in Simmons-Smith reaction with mechanism. 3.1.4 Organopalladium compounds - Heck reaction and Suzuki coupling and basic catalytic cycle for coupling reaction.</p>	<p>15 Hours</p>
	<p>3.2</p>	<p>POLYMER CHEMISTRY: 3.2.1 Introduction - General idea of monomers, polymers and polymerization, natural and synthetic polymers, homopolymers and copolymers, classification of polymers. Copolymers – alternating, block, random and graft. 3.2.2 Mechanism of free radical, cationic and anionic addition polymerisation. Stereochemistry of polymers -Tacticity, role of Ziegler–Natta catalyst (coordination polymerization) in directing the tacticity in polypropylene (no mechanism). 3.2.3 Preparation and uses of polymers- (a) Addition polymers - (i) polyethylene (ii) polypropylene (iii) PVC (iv) polystyrene (v) polyacrylonitrile (vi) polyvinylalcohol (vii) poly (tetrafluoroethelyene); b) Condensation polymers – (i) polyesters (ii) polyamides (Nylon-6, Nylon-66) (iii) polyurethans (iv) phenol-formaldehyde resin (v) urea-formaldehyde resin (vi) epoxy resin (vii) polycarbonates (viii) saran (ix) SAN (x) ABS (xi) rubber 3.2.4 Additives to polymers - Plasticizers, stabilizers and fillers 3.2.5 Recyclable polymers - Biodegradable polymers and their uses. Biomedical uses of polymers. (*Identification of monomers in a given polymer and knowing the structure of a polymer from a given set of monomers is expected)</p>	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL Course Title: Organic Chemistry-I	Course Code: SCHE358MJP
<u>COURSE OBJECTIVES:</u> 1. To understand the method and concept of separation of a binary mixture quantitatively by physical and chemical method. 2. To train the learners to perform qualitative analysis and identify a component 3. To understand the method of purification of the components. <u>COURSE OUTCOMES: Learner will be able to</u> 1. identify the nature of a binary mixture and separate the mixture quantitatively. 2. develop skills in organic qualitative analysis. 3. purify compounds by recrystallization technique.	

			1
Total number of Hours in a Semester			30
Credits			1
Evaluation System	Summative Assessment	3 Hours	50 marks
	Continuous Assessment	--	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

	<p>Organic Separation</p> <p>Separation of Binary solid-solid mixture (2.0 g mixture to be given).</p> <ol style="list-style-type: none">1. Minimum eight mixtures to be completed by the students. Components of the mixture should include water soluble and water insoluble acids (carboxylic acid), water insoluble phenols(2-naphthol, 1-naphthol), water insoluble bases (nitroanilines) , water soluble neutral (thiourea, urea) and water insoluble neutral compounds (anilides , amides, m-DNB, hydrocarbons)2. After correct determination of chemical type, the separating reagent should be decided by the student for separation. Follow separation scheme with the bulk sample of binary mixture. After separation into component A and component B, one component (decided by the examiner) is to be analyzed and identified with melting point	30 hours
--	---	----------

ASSESSMENT DETAILS:

1. Continuous assessment (CA): Any one activity / assignment of 25 marks one test 25 marks
2. Summative assessment (SA): Theory exam of 50 marks – Two hour duration
3. Summative assessment (SA: Practical exam of 50 marks – Three hours duration

REFERENCES:

SCHE358MJ Organic Chemistry -I THEORY

1. Organic chemistry, T.W Graham, Solomons Craig, B Fryhle, 9th Edition John Wiley & sons. ISBN:978-81-265-1143-4
2. Organic Chemistry, Jonathan Clayden, Nick Greeves, Stuart Warren and Peter Wothers, Oxford University Press.
3. A Guidebook to Mechanism in Organic Chemistry, Peter Sykes, 6th Edition, Pearson Education, New Delhi.
4. Organic Chemistry, 8th Edition John McMurry, 5th edition, Asian books Pvt. Ltd
5. Stereochemistry of Organic Compounds-Principles and Applications By D. Nasipuri 2nd Edition New Age International Publishers Limited
6. Stereochemistry, P.S. Kalsi, 4th Edition, New age International Limited.



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

7. Name Reactions- Jie Jack Li, 4th Edition, Springer Pub.
8. Nomenclature of Organic Compounds by S.C.Pal, 2nd Edition Narosa Publishing House

SCHE358MJP Organic Chemistry -I PRACTICAL

1. Vogel's Textbook of Practical Organic Chemistry A.I. Vogel, 5th Edition, Revised by Furniss, hannafor, Smith and tatchell ELBS
2. Systematic Qualitative Organic Analysis- H. Middleton Edward Arnold publishers Ltd.
3. Advanced Practical Organic Chemistry- O.P. Aggarwal, Krishna Prakashan Media (P) Ltd

Programme: Sciences Chemistry Major	Semester – 6
Course Title: Organic Chemistry-II	Course Code: SCHE3611MJ
<u>COURSE OBJECTIVES:</u> <ol style="list-style-type: none">1. To understand the basic concepts of molecular spectroscopy.2. To learn the chemistry of biomolecules (carbohydrates and amino acids) and important rearrangement and name reactions.3. To understand the preparation, reactions of heterocyclic compounds and reactivity and selectivity of various catalysts and reagents	
<u>COURSE OUTCOMES:</u> The learner will be able to: <ol style="list-style-type: none">1. interpret spectral data in identification of various organic molecules.2. interconvert open chain and Haworth structures of monosaccharides, identify and classify the carbohydrates, amino acids, and identify rearrangement and name reactions and write their mechanisms.3. Compare properties of heterocyclics, write reactions, methods of preparation and predict the catalysts/reagents used in reactions.	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Theory Lectures per week (1 Lecture is 60 minutes)		3	
Total number of Hours in a Semester		45	
Credits		3	
Evaluation System	Summative assessment	2 Hour	50 marks
	Continuous Assessment	--	50 marks

UNIT 1 (1 Credit)		SPECTROSCOPY	15 hours
	1.1	Introduction - Electromagnetic spectrum, units of wavelength and frequency	
	1.2	UV-VIS spectroscopy - Basic theory, solvents, nature of UV-VIS spectrum, concept of chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic and hypochromic effects, chromophore- chromophore and chromophore – auxochrome interactions. Calculation of absorption maxima by Woodward - Fischer Rule for conjugated polyenes. Applications of UV-VIS spectroscopy	
	1.3	IR Spectroscopy- Basic theory, selection rule, nature of IR spectrum, characteristic vibrational frequencies of functional groups, fingerprint region. Applications of IR Spectroscopy.	
	1.4	¹ H NMR Spectroscopy - Basic theory of ¹ H NMR, nature of ¹ H NMR spectrum, chemical shift (δ unit), standard for ¹ H NMR, solvents used. Factors affecting chemical shift - inductive effect and anisotropic effect (with reference to C=C, C \equiv C, C=O and benzene ring). Spin- spin coupling and coupling constant. Application of deuterium exchange technique. Application of ¹ H NMR in structure determination	
1.5	Mass Spectrometry- Basic theory. Nature of mass spectrum. General rules of fragmentation. Importance of molecular ion peak, isotopic peaks, base peak, Nitrogen rule. Fragmentation of alkanes and aliphatic carbonyl compounds including McLafferty rearrangement		



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

	1.6	Spectral characteristics of following classes of organic compounds, including benzene and mono substituted benzenes with respect to UV-VIS, IR, ¹ H NMR - a) alkanes b) alkenes and polyenes c) alkynes d) haloalkanes e) alcohols f) carbonyl compounds g) ethers h) carboxylic acids i) esters j) amines k) amides (broad regions characteristic of different groups are expected).	
	1.7	Problems of structure elucidation of simple organic compounds using individual or combined use of the UV-VIS, IR, ¹ H NMR and Mass spectroscopic techniques. (Index of hydrogen deficiency expected).	
UNIT 2 (1 Credit)	2.1	NAME REACTIONS: a) Wittig Reaction b) Michael Reaction c) Oppenauer Oxidation d) Stobbe Condensation e) Wolff-Kishner Reduction f) McMurry Reaction	15 hours
	2.2	MOLECULAR REARRANGEMENTS: Mechanism of following rearrangements with examples and stereochemistry wherever applicable a) Migration to electron deficient carbon: Pinacol, Benzylic acid b) Migration to electron deficient nitrogen- Beckmann, Hofmann c) Migration involving a carbanion - Favorskii.	
	2.3	BIOMOLECULES: 2.3.1 Carbohydrates Introduction - Classification, reducing and non-reducing sugars, D and L- notations. 2.3.2 Structures of Monosaccharides - Open chain structures of aldoses and ketoses, ring structures of aldohexoses, aldopentoses and ketohexoses. Inter conversions - open chain and Haworth forms of monosaccharides with 5 and 6 carbons 2.3.3 Stereoisomers of Monosaccharides - Enantiomers and diastereoisomers of monosaccharides, epimers, anomers, mutarotation (with mechanism) in D-Glucose. 2.3.4 Chain lengthening and shortening reactions: Modified Kiliani-Fischer synthesis, Wohl's method. 2.3.5 Disaccharides – introduction and structures of sucrose and maltose. 2.3.6 Amino Acids Amino acids - Introduction, Classification, synthesis of amino acids-, Amidomalonate synthesis and Erlenmeyer Azalactone synthesis 2.3.7 Polypeptides - Introduction, peptide bond, Nomenclature, Merrifields solid phase peptide synthesis. 2.3.8 Evolution of Chemistry of Natural Products of Plant Origin. 2.3.9 Development of Contemporary Chemistry in India Polymer Chemistry Carbohydrate Chemistry	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

		Carbon nanoparticles	
UNIT 3 (1 Credit)	3.1	<p>HETEROCYCLIC CHEMISTRY</p> <p>3.1.1 Introduction - Electronic structure and aromaticity of furan, pyrrole, thiophene Synthesis - Synthesis of furans, pyrroles, and thiophenes by Paal Knorr synthesis.</p> <p>3.1.2 Reactivity - Reactivity towards electrophilic substitution reactions- of furan, pyrrole, thiophene on the basis of stability of intermediate and pyridine on the basis of electron distribution. Nucleophilic substitution of pyridine on the basis of electron distribution</p> <p>3.1.3 Reactions of heterocycles - furan, pyrrole and thiophene: Halogenation, Nitration, sulphonation, Vilsmeierformylation reaction, Friedal-crafts reaction Furan - Diels-Alder reaction, ring opening of furan</p> <p>3.1.4 Pyrrole - Acidity and basicity of pyrrole- comparison of basicity of pyridine, pyrrole and pyrrolidine, Acid catalysed polymerisation of pyrrole.</p>	15 hours
	3.2	<p>CATALYST AND REAGENTS</p> <p>3.2.1 Study of the following catalysts and reagents with respect to functional group transformations and selectivity (no mechanism) aromatic ring; Pd/C - C=C, COCl → CHO (Rosenmund); Lindlar catalyst Catalysts - Catalysts for hydrogenation - Raney Ni, Pt and PtO₂ - C=C, CN, NO₂,</p> <p>3.2.2 Reagents - (a) LiAlH₄ and Red-Al - reduction of CO, -COOR, -CN, and NO₂ (b) NaBH₄ - reduction of CO (c) SeO₂ - hydroxylation of allylic and benzylic positions, oxidation of CH₂ to CO (d) m-CPBA epoxidation of C=C (e) NBS -allylic and benzylic bromination (f) KMnO₄ OsO₄ - oxidation of C=C (g) Jones reagent , PCC and PDC oxidation of alcohols Designing synthesis via functional group interconversion with stereochemistry where ever applicable)</p> <p>3.2.3 Researchers in Organic Chemistry in India: Highlights of contributions of some selected Scientists i) Chemistry in the Medical Schools of India ii) Dyes and Paints (4th to 1st Century BCE)</p>	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL COURSE Course Title: Organic Chemistry -II	Course Code: SCHE3611MJP
---	---

COURSE OBJECTIVES:

1. To understand the method and concept of separation of a binary mixture quantitatively by physical method.
2. To train the learners to perform qualitative analysis and identify a component and to understand the method of purification of the components.
3. To be able to synthesise organic compounds quantitatively.
4. Understand to read the spectrum and draw conclusions

COURSE OUTCOMES:

Learner will be able to

1. identify the nature of a binary mixture and separate the mixture quantitatively.
2. develop skills in organic qualitative analysis and to purify compounds by distillation technique.
3. perform synthesis of organic compounds.
4. interpret and deduce the structure of the compound from the spectrum.

Lectures per week (1 Lecture is 120 minutes)	1
Total number of Hours in a Semester	30
Credits	1

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



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

	1	Organic Separation: Separation of a binary mixture: Type of mixture, separation and identification (micro scale) of one component through systematic scheme of identification. Type of mixtures: a) Volatile Liquid + Solid b) Volatile Liquid + Non-volatile liquid (Volatile ~ 6-8mL, Non-volatile ~ 4-6 mL)	60 hours
	2	Preparations: a. 2- Naphthol to Methyl-2-naphthyl ether b. Phthalic anhydride to Phthalimide c. p-Bromoacetanilide to p-bromoaniline. d. Phthalic anhydride to anthranilic acid (2 step preparation). Preparation of organic compounds as per the procedure given, measuring the mass of crude, purification of the separated product by crystallization and recording of the m.p. (Quantity of the reactant to be given: 1 g) *Demonstration of TLC for any of the above reactions to understand the progress of the reaction	
	3	Identification of compound based on the spectra provided (NMR, IR and Mass) and plan a synthesis for that compound	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

ASSESSMENT DETAILS:

1. Continuous assessment (CA): Any one activity / assignment of 25 marks One Test 25 marks
2. Summative assessment (SA): Theory exam of 50 marks – Two hour duration
3. Summative assessment (SA: Practical exam of 50 marks – Three hours duration

REFERENCES:

SCHE3611MJ Organic Chemistry-II

1. Organic chemistry, T.W Graham, Solomons Craig, B Fryhle, 9th Edition John Wiley & sons. ISBN:978-81-265-1143-4
2. Organic Chemistry, Jonathan Clayden, Nick Greeves, Stuart Warren and Peter Wothers, Oxford University Press.
3. A Guidebook to Mechanism in Organic Chemistry, Peter Sykes, 6th Edition, Pearson Education, New Delhi.
4. Organic Chemistry, 8th Edition John McMurry, 5th edition, Asian books Pvt. Ltd
5. Name Reactions in Heterocyclic Chemistry-Jie Jack Li, Wiley Interscience publications, 2005.
6. Name Reactions- Jie Jack Li, 4th Edition, Springer Pub.
7. Lehninger Principles of Biochemistry, 7th Edition, David Nelson and Michael Cox, Publisher W.H Freeman
8. History of Science in India Vol III Chemical Science

SCHE3611MJP Organic Chemistry-II

1. Vogel's Textbook of Practical Organic Chemistry A.I. Vogel, 5th Edition, Revised by Furniss, hannafor, Smith and tatchell ELBS
2. Systematic Qualitative Organic Analysis- H. Middleton Edward Arnold publishers Ltd.
3. Advanced Practical Organic Chemistry- O.P. Aggarwal, Krishna Prakashan Media (P) Ltd



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme:Sciences Chemistry Major	Semester – 5
Course Title: Analytical Chemistry-I	Course Code: SCHE359MJ
<p><u>COURSE OBJECTIVES:</u></p> <ol style="list-style-type: none"> 1. To introduce the importance of sampling and statistical treatment of data in chemical analysis. 2. To understand concentration units, preconcentration, separation and different chemical methods of analysis used in the field of analytical chemistry. 3. To learn principle, instrumentation and application of atomic spectroscopy. 	
<p><u>COURSE OUTCOMES:</u> Learner will be able to</p> <ol style="list-style-type: none"> 1. decide appropriate sampling techniques for a given sample and apply statistical tests to the given data or the data generated in the laboratory to comment on the accuracy and precision of a given method. 2. work confidently with different concentration units, inter-convert them as per the requirement and decide the most appropriate preconcentration and separation method for a given mixture. 3. compare different spectroscopic methods with regards to principle, working, limitations and advantages 	

Theory Lectures per week (1 Lecture is 60 minutes)	3		
Total number of Hours in a Semester	45		
Credits	3		
Evaluation System	Summative Assessment	2 Hour	50 marks
	Continuous Assessment	--	50 marks



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

UNIT I (1 Credit)	1.1	<p>STATISTICAL TREATMENT OF DATA – I</p> <p>1.1.1 Treatment of Analytical Data - Criteria for rejection of doubtful data - (i) 2.5 d rule (ii) 4 d rule (iii) Q test</p> <p>1.1.2 Concept of Confidence limit, confidence interval and its computation using - (i) Population standard deviation (ii) Student's t-test (ii) Range</p> <p>1.1.3 Test of significance- (i) Null hypothesis (ii) F-test (variance ratio test)</p> <p>1.1.4 Graphical representation of data and obtaining best fitting straight line i) line passing through origin ii) not passing through the origin (Derivation is not expected): i) Method of averages ii) Method of least squares.</p>	15 hours
	1.2	<p>SAMPLING</p> <p>1.2.1 Sampling - Terms involved, importance, types</p> <p>1.2.2 Sampling of gases - ambient and stack sampling, equipments used</p> <p>1.2.3 Sampling of liquids - homogeneous and heterogeneous, static and flowing</p> <p>1.2.4 Sampling of solids- free flowing and compact; importance of particle and sample size</p> <p>1.2.5 Reduction of sample size – need and methods (i) Coning and quartering (ii) Riffling</p>	
UNIT II (1 Credit)	2.1	<p>CHEMICAL CALCULATIONS</p> <p>2.1.1 Interconversion of various concentration units</p> <p>2.1.2 Percent composition of elements in chemical compounds</p> <p>2.1.3 Stoichiometry-limiting reagent (Numericals expected)</p>	15 hours
	2.2	<p>METHODS OF SEPARATION - SOLVENT AND SOLID EXTRACTION</p> <p>2.2.1 Partition coefficient, distribution ratio and separation factor</p> <p>2.2.2 Single step, multi-step extraction, percentage extraction and extraction efficiency (Numericals expected)</p> <p>2.2.3 Role of complexing agents in solvent extraction, chelation, ion pair formation</p> <p>2.2.4 Types of solvent extraction: Batch and continuous, Craig's counter current extraction</p>	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

		2.2.5 Solid phase extraction - Principle, process and applications Comparison of solid phase extraction with solvent extraction	
Unit III (1 Credit)	3.1	<p>OPTICAL METHODS – II</p> <p>3.1.1 Atomic Spectroscopy: Flame Emission Spectroscopy (FES) and 3.1.2 Atomic Absorption Spectroscopy (AAS) – Introduction, Energy level diagram, Atomic, Absorption and Emission spectra 3.1.3 Flame Photometry – Principle; Instrumentation – Flame Atomizers, Types of burners, wavelength selectors, detectors 3.1.4 Atomic Absorption Spectroscopy- Principle; Instrumentation- source, chopper, flame and electro-thermal atomizer Quantification, methods of FES and AAS- Calibration curve, Standard addition and Internal standard methods 3.1.5 Comparison between FES and AAS Applications, advantages and limitations of FES and AAS</p>	15 hours
	3.2	<p>MOLECULAR FLUORESCENCE AND PHOSPHORESCENCE SPECTROSCOPY</p> <p>3.2.1 Introduction and Principle (Jablonski Diagram) 3.2.2 Relationship between Fluorescence intensity with concentration 3.2.3 Factors affecting Fluorescence and Phosphorescence 3.2.4 Instrumentation and Applications of Molecular Fluorescence and Phosphorescence Spectroscopy 3.2.5 Comparison of Fluorimetry and Phosphorimetry, Comparison of Fluorimetry and Phosphorimetry with Absorptions methods</p>	
	3.3	<p>Turbidimetry and Nephelometry</p> <p>3.3.1 Introduction and Principle 3.3.2 Factors affecting scattering of radiation – Concentration, particle size, wavelength and refractive index 3.3.3 Instrumentation and Applications of Turbidimetry and Nephelometry</p>	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL Course Title: Analytical Chemistry-I	Course Code: SCHE359MJP
<p><u>COURSE OBJECTIVES:</u></p> <ol style="list-style-type: none"> To train learners to prepare standard solutions of known concentration. To introduce the learner to various classical and instrumental methods of analysis to commercial samples. To train learners to handle and standardize analytical instruments for its optimum use. <p><u>COURSE OUTCOMES:</u> Learner will be able to</p> <ol style="list-style-type: none"> decide suitability of an instrument for its use in analysis. to prepare and standardise solutions with the highest degree of accuracy. analyse different samples using various methods of chemical analysis 	

Lectures per week (1 Lecture is 120 minutes)	2		
Total number of Hours in a Semester	30		
Credits	1		
Evaluation System	Summative Assessment	3 Hours	50 marks
	Continuous Assessment	--	

	1	Determination of sodium carbonate in washing soda by pH metry titration.	60 hours
	2	Estimation of the amount of Cr (VI) in the given solution as dichromate by the method of least squares spectrophotometrically	
	3	Estimation of the amount of vitamin C in the given solution by redox titration with Ce (IV)	
	4	Determination of saponification value of given oil	
	5	Determination of the amount of acetic acid in a sample of vinegar by the potentiometric titration with a standard base using quinhydrone electrode	
	6	Determination of the amount of Fe(III) using bioreagent in the given solution spectrophotometrically	
	7	Determination of the amount of potassium in commercial sample by flame photometry using calibration curve method.	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

ASSESSMENT DETAILS:

1. Continuous Assessment (CA): Any two activities / assignment / test of 25 marks
2. Summative Assessment (SA): Theory exam of 50 marks – Two hours duration
3. Summative Assessment (SA): Practical exam of 50 marks – Three hours duration

REFERENCES:

SCHE359MJ ANALYTICAL CHEMISTRY-I THEORY

1. Fundamentals of analytical Chemistry, 8th Edition :Skoog , West, Holler and Crouch, India Edition
2. Analytical Chemistry –G.D. Christian, 6th Edition, John Wiley and Sons.
3. Instrumental Analysis - Skoog, Holler and Crouch (2007), Cenage Learning India Private Limited (2007)
4. Modern analytical Chemistry- David Harvey, 2000
5. Analytical Chemistry -G L David Krupadanam, D Vijaya Prasad, K Varaprasad Rao, K L N Reddy, C Sudhakar, Universities Press
6. Preparation and Uses of Metallic Bhasma in Indian System of Medicine (DOI: 10.5958/2321-5836.2015.00027.0)
7. Therapeutic potentials of metals in ancient India: A review through Charaka Samhita - PMC

SCHE359MJP ANALYTICAL CHEMISTRY-I PRACTICAL

1. Vogel's Quantitative Chemical Analysis, 3rd edition
2. Analytical Chemistry-Krupadanam David, University Press; 2012
3. Instrumental Methods of Chemical Analysis –Chatwal Anand, 5th Edition, 2005. Himalaya Publishing House.



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme:Sciences Chemistry Major	Semester – 6
Course Title: Analytical Chemistry-II	Course Code: SCHE3612MJ
<p><u>COURSE OBJECTIVES:</u></p> <ol style="list-style-type: none"> 1. To study different types of classical methods of titrations and to determine their end point graphically and theoretically. 2. To introduce the concept of Ayurveda, an Indian knowledge system and various techniques for the quality check of Ayurvedic formulations. 3. To understand the principle, instrumentation and application of polarography and amperometry 	
<p><u>COURSE OUTCOMES:</u> Learner will be able to</p> <ol style="list-style-type: none"> 1. calculate the end point of titrations graphically and theoretically.. 2. comprehend theory, working and applications of TLC, PC HPLC in the field of Ayurveda. 3. explain principle and working of polarography and amperometry and calculate polarographic parameters using Ilkovic equation for given data 	

Theory Lectures per week (1 Lecture is 60 minutes)	3		
Total number of Hours in a Semester	45		
Credits	3		
Evaluation System	Summative Assessment	2 Hour	50 marks
	Continuous Assessment	--	50 marks



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

UNIT I (1 Credit)	IA	INDIAN KNOWLEDGE SYSTEM	15 hours
		Brief overview of Indian Systems of Medicine, Basic Principles involved in Ayurveda, Terms involved in Ayurvedic formulations.	
	IB	CLASSICAL METHODS OF ANALYSIS (TITRIMETRY)	
	1.1	REDOX TITRATION 1.1.1 Introduction to Redox titrations 1.1.2 Construction of the titration curves and calculation of E system in aqueous medium in case of i) One electron system (Fe^{+2} Vs Ce^{+4}) (*Numericals expected) 1.1.3 Theory of redox indicators, use of diphenyl amine and ferroin as indicators	
	1.2	COMPLEXOMETRIC TITRATIONS 1.2.1 Introduction, construction of titration curves 1.2.2 Use of EDTA as a titrant, absolute and conditional formation constant of metal EDTA complexes, effect of pH on EDTA equilibria. 1.2.3 Types of EDTA titrations 1.2.4 Factors enhancing selectivity of EDTA as a titrant 1.2.5 Metallochromic indicators: Theory, examples and applications	
	1.3	PRECIPITATION TITRATIONS 1.3.1 Argentimetric titrations, construction of the titration curves (Numericals expected) 1.3.2 Volhard's method and Mohr's method 1.3.3 Adsorption indicators (Fajan's method), theory and applications	
UNIT II (1 Credit)	2.1	EXTRACTION AND SEPARATION OF PHYTOCONSTITUENTS Extraction of compounds from herbs using -Solvent extraction, Percolation, Maceration, Soxhlet extraction, steam distillation and Super critical fluid extraction.	15 HOURS
	2.2	CHROMATOGRAPHY-I Chromatography - Introduction to chromatographic techniques, Classification of chromatographic techniques. Separation based on partition, adsorption, ion-exchange and size exclusion.	
	2.3	THIN LAYER CHROMATOGRAPHY 2.3.1 Introduction and Principle; Stationary and mobile phase, Sample application 2.3.2 Methods of detection of developed spots, qualitative and quantitative	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

		2.3.3 analysis Applications - i) Determining purity of a given solute (ii) Following progress of a given reaction	
	2.4	PAPER CHROMATOGRAPHY	
		2.4.1 Principle, Techniques and different modes of development - Ascending, descending and circular paper chromatography 2.4.2 Applications - Separation of amino acids	
UNIT III (1 Credit)	III	USE OF METALS IN AYURVEDA AND ITS DETECTION BY ANALYTICAL TECHNIQUES	
	3.1	THERAPEUTIC USE OF METALS IN ANCIENT INDIA 3.1.1 Use of noble metals, heavy metals and alloys in Ayurveda. 3.1.2 Use of Bhasmas in the Indian system of medicine.	15 hours
	3.2	ELECTROANALYTICAL TECHNIQUES FOR METAL IONS	
	3.2.1	POLAROGRAPHY 3.2.1.1 Difference between potentiometry and voltammetry, polarizable and non-polarizable electrodes 3.2.1.2 Basic principle of polarography, H shaped polarographic cell, DME-construction, working, advantages and limitations. 3.2.1.3 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 aspect of polarography - Ilkovic's Equation -terms involved (No derivation) 3.2.1.4 Quantification of Polarogram by - i) Wave height ii) Internal standard method (iii) Standard addition method 3.2.1.5 Applications, Advantages and Limitations of Polarography	
	3.2.2	AMPEROMETRIC TITRATIONS 3.2.2.1 Principle of Amperometric titrations; Rotating Platinum Electrode - Construction, advantages and limitations 3.2.2.2 Titration curves with examples of Amperometric titrations 3.2.2.3 Advantages and limitations of Amperometric titrations	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL Course Title: Analytical Chemistry-II	Course Code: SCHE3612MJP
--	---------------------------------

COURSE OBJECTIVES:

1. To train learners to prepare standard solutions of known concentration.
2. To train learners to handle and standardize analytical instruments for its optimum use
3. To introduce the learner to various classical and instrumental methods of analysis to real life and commercial samples.

COURSE OUTCOMES: Learner will be able to

1. decide suitability of an instrument for its use in analysis.
2. learn to prepare and standardise solutions with the highest degree of accuracy.
3. analyse different samples using various methods of chemical analysis.

Lectures per week (1 Lecture is 120 minutes)	2		
Total number of Hours in a Semester	30		
Credits	1		
Evaluation System	Summative Assessment	3 Hours	50 marks
	Continuous Assessment	--	

	1	Estimation of Magnesium from talcum powder	60 hours
	2	Determination of Vitamin C content of a given tablet by titration against NaOH by pH metry	
	3	Determination of percentage purity of a common salt using a cation exchanger (Amberlite IR120)	
	4	Determination of the amount of fluoride in herbal toothpaste by colorimetrically	
	5	Determination of phosphoric acid in cola sample using pH metry	
	6	Estimation of glucose in honey by Wilstatter's method	
	7	Statistical Evaluation of data: Rejection of data and Test of significance.	
	8	Visit to a herbal garden/ herbal Industry/ public testing lab-students will write and submit a visit report.	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

ASSESSMENT DETAILS:

1. Continuous Assessment (CA): Any two activities / assignment / test of 25 marks
2. Summative Assessment (SA): Theory exam of 50 marks – Two hours duration
3. Summative Assessment (SA): Practical exam of 50 marks – Three hours duration

REFERENCES

SCHE3612MJ ANALYTICAL CHEMISTRY-II THEORY

1. Instrumental Methods of Analysis-Willard, Merritt, Dean and Settle, 7th Edition.
2. Fundamentals of analytical Chemistry, 8th Edition :Skoog , West, Holler and Crouch, India Edition
3. Analytical Chemistry –G.D. Christian, 6th Edition, John Wiley and Sons
4. Modern analytical Chemistry- David Harvey, 2000

SCHE3612MJP ANALYTICAL CHEMISTRY-II PRACTICAL

1. Vogel's Quantitative Chemical Analysis, 3rd edition
2. Analytical Chemistry-Krupadanam David, University Press; 2012



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

DISCIPLINE SPECIFIC ELECTIVE

	SEMESTER 5		SEMESTER 6
TITLE	Inorganic Chemistry -I		Inorganic Chemistry -II
TYPE OF COURSE - DSE	Major		Major
CREDITS	4		4

OR

	SEMESTER 5		SEMESTER 6
TITLE	Chemistry of Food and Cosmetics		Industrially Important Inorganic Material
TYPE OF COURSE - DSE	Major		Major
CREDITS	4		4



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme: Sciences CHEMISTRY MAJOR	Semester – 5
Course Title: Inorganic Chemistry-I	Course Code: SCHE351E
<p><u>COURSE OBJECTIVES:</u></p> <ol style="list-style-type: none"> To expose students to the concept of symmetry and symmetry elements, molecular orbital theory of heteroatoms and chemistry of inner transition elements. To learn the preparation and properties of superconductors, nanomaterials, thin films and uses of non aqueous solvents. 	
<p><u>COURSE OUTCOMES:</u></p> <p>The learner will be able to :</p> <ol style="list-style-type: none"> interpret the symmetry of simple inorganic molecules and assign appropriate point groups, draw molecular orbital diagrams and compare properties of inner transition elements. write synthesis, properties and application of superconductors, nanomaterials and non aqueous solvents. 	

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



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

UNIT 1 (1 Credit)	1.1	<p>Molecular Symmetry 1.1.1 Introduction, importance, symmetry elements and operations.</p> <p>1.1.2 Concept of point groups with illustrations using the following point groups: C_{av} (HCl), D_{ah} (H_2), C_{2v} (H_2O), C_{3v} (NH_3), C_{2h} (trans – trichloroethylene), D_{3h} (BCl_3)</p>	15 Hours
	1.2	<p>Chemical Bonding 1.2.1 MOT of heteronuclear diatomic and polyatomic species (BeH_2, H_2O, H_3^+).</p> <p>1.2.2 Molecular shapes of simple triatomic species H_3^+ and H_3 (correlation between bond angle and Molecular orbitals)</p> <p>1.2.3 Walsh correlation diagram, Symmetry Adapted Linear Combinations (SALCs), Ligand Group orbitals (LGOs)</p>	
	1.3	<p>Chemistry of Inner transition elements 1.3.1 Chemistry of lanthanides: Properties, occurrence, extraction and separation of Lanthanide 1.3.2 Chemistry of actinides: Occurrence, extraction of Uranium</p>	
UNIT 2 (1 Credit)	2.1	<p>Solid state synthesis Film deposition using dip coating, spin coating, chemical vapor deposition.</p>	15 Hours
	2.2	<p>Nanomaterials Introduction, properties (optical and electrical), methods of synthesis and applications</p>	
	2.3	<p>Superconductivity Discovery, types, explanation of terms and applications</p>	
	2.4	<p>Nonaqueous Solvents 2.4.1 Classification and importance of non-aqueous solvents. Leveling effect of solvents. 2.4.2 Supercritical carbon dioxide and ionic liquids as solvents</p>	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL Course Title: Inorganic Chemistry Practical-I	Course Code: SCHE351EP
<p><u>COURSE OBJECTIVES:</u></p> <ol style="list-style-type: none"> 1. To train students to prepare simple inorganic complexes, silver nanoparticles and to analyze given inorganic complexes. 2. To analyze metal ions from a variety of samples by complexometry. 3. To train students to perform titrimetric analysis under non-aqueous conditions <p><u>COURSE OUTCOMES:</u></p> <p>The learner will be able to</p> <ol style="list-style-type: none"> 1. prepare and analyze simple inorganic complexes. 2. prepare and characterize silver nanoparticles using UV spectrophotometer. 3. estimate metal ions from an unknown sample with high degree of accuracy complexometrically. 4. carry assay of given drug samples by non-aqueous titrations. 	

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	--	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

1	Preparation of tris (ethylenediammine) nickel(II) thiosulphate complex.	60 hours
2	Determination of metal content in Tris(ethylenediamine)nickel(II)thiosulphate.	
3	Preparation of tetra amine copper complex.	
4	Estimation of copper (complexometrically/iodometrically) in tetra amine copper complex.	
5	Estimation of lead complexometrically (Standardization of EDTA expected)	
6	Estimation of calcium from milk sample by EDTA back titration.	
7	Preparation of silver nanoparticles and their spectroscopic characterization.	
8	Estimation of two commercial drug samples using non aqueous titration.	

ASSESSMENT DETAILS:

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

REFERENCES:

SCHE351E Inorganic Chemistry -I

Theory

1. Concise Inorganic Chemistry, J.D. Lee, 4th Edn , ELBS
2. Inorganic Chemistry: Principles of Structure and Reactivity, James E. Huheey
3. Mechanisms of Inorganic Chemistry, Basolo F and Pearson R.C., John Wiley & Sons, NY,
4. Organometallic Chemistry: A Unified Approach, Ram Charan Mehrotra, New Age International.
5. Inorganic Chemistry, D. F. Shriver and P. W. Atkins, 3rd edition, Oxford University Press (1999)
6. Advanced Inorganic Chemistry, Cotton and Wilkinson, 3rd Edition.



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

**SCHE351EP Inorganic Chemistry -I
Practical**

1. Practical Inorganic Chemistry, Shikha Gulati, JL Sharma, Shagun Manocha, CBS Publishers and distributors.
2. Vogel Textbook of Quantitative Chemical Analysis G.H. Jeffery, J. Basset.
3. Advanced Experiments in Inorganic Chemistry, G. N. Mukherjee, 1st Edn, 2010, U.N. Dhur & Sons Pvt Ltd

Programme: Sciences CHEMISTRY MAJOR	Semester – 6
Course Title: Inorganic Chemistry-II	Course Code: SCHE363E
<u>COURSE OBJECTIVES:</u> 1. To build basic concepts of coordination chemistry using crystal field and molecular orbital theory. 2. To understand stability and reactivity of coordination compounds and electronic spectra.	
<u>COURSE OUTCOMES:</u> The learner will be able to : 1. calculate crystal field energies of given molecules and construct molecular orbital diagrams for coordination complexes 2. write mechanisms of reactions of octahedral complexes, predict stability of octahedral complexes and calculate ground terms for transition metals.	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

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 Co-ordination Chemistry-I (1 Credit)	1.1	Crystal field theory 1.1.1 Introduction to Crystal field theory, splitting of d orbitals in octahedral, tetrahedral and square planar complexes. 1.1.2 Distortions from octahedral geometry. 1.1.3 Crystal field splitting parameter: calculation and factors affecting it. 1.1.4 Spectrochemical series. 1.1.5 Consequences of crystal field splitting. 1.1.6 Limitations of CFT. Evidence for covalent bonding in complexes.	15 hours
	1.2	Molecular Orbital Theory 1.2 Molecular orbital theory for coordination compounds, molecular orbital diagrams depicting sigma bonding only for $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$, $[\text{FeF}_6]^{4-}$, $[\text{Fe}(\text{CN})_6]^{4-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{CoF}_6]^{3-}$	
UNIT 2 Co-ordination Chemistry-II (1 Credit)	2.1	Reactivity and Stability of coordination complexes 2.1.1 Stability of complexes: Types of stability-thermodynamic and kinetic, factors affecting thermodynamic stability. Stability constants and inter-relationship. 2.1.2 Reactivity of complexes: Types of reactions, inert and labile complexes. Ligand substitution reactions (associative and dissociative mechanism), acid and base hydrolysis and anation reactions.	15 hours
	2.2	Electronic Spectra Origin, types of electronic transition in coordination compounds. Selection rules. Term and term symbols for ground state determination	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL COURSE Course Title: Inorganic Chemistry Practical-2	Course Code:SCHE363EP
---	------------------------------

COURSE OBJECTIVES:

1. To prepare ,characterize and estimate crystal field stabilization energy inorganic complexes.
2. To learn to perform complexometric titrations for given metal ions.
3. To estimate chlorine from a commercial bleaching powder sample

COURSE OUTCOMES: The learner will be able to

1. synthesis ,analyze and calculate crystal field stabilization energy of inorganic complexes
2. estimate metal ions from a given sample complexometrically
3. analyze commercial sample for chlorine content by redox titration

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	--	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

	1	Preparation of potassium trioxalato ferrate(III) complex.	60 hours
	2	Determination of metal content and oxalate ions in Potassium trioxalato ferrate (III)	
	3	Preparation of copper chloride dimethyl sulphoxide complex	
	4	Estimation of metal content in copper chloride dimethyl sulphoxide complex .	
	5	Estimation of aluminium complexometrically. (Standardization of EDTA expected)	
	6	Estimation of chlorine (iodometrically) in a commercial sample of bleaching powder.	
	7	Controlled synthesis of copper oxalate hydrate complexes.	
	8	To determine the wavelength of maximum absorption and calculate the value of $10Dq$ for any two complexes spectrophotometrically.	

ASSESSMENT DETAILS:

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

REFERENCES:

SCHE363E Inorganic Chemistry II Theory

1. Concise Inorganic Chemistry, J.D. Lee, 4th Edn , ELBS
2. Inorganic Chemistry: Principles of Structure and Reactivity, James E. Huheey
3. Mechanisms of Inorganic Chemistry, Basolo F and Pearson R.C., John Wiley & Sons, NY,
4. Organometallic Chemistry: A Unified Approach, Ram Charan Mehrotra, New Age International.
5. Inorganic Chemistry, D. F. Shriver and P. W. Atkins, 3rd edition, Oxford University Press (1999)
6. Advanced Inorganic Chemistry, Cotton and Wilkinson, 3rd Edition.



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

SCHE363EP Inorganic Chemistry- II Practical

1. Practical Inorganic Chemistry, Shikha Gulati, JL Sharma, Shagun Manocha, CBS Publishers and distributors.
2. Vogel Textbook of Quantitative Chemical Analysis G.H. Jeffery, J. Basset.
3. Advanced Experiments in Inorganic Chemistry, G. N. Mukherjee, 1st Edn, 2010, U.N. Dhur & Sons Pvt Ltd.

Programme: Sciences CHEMISTRY MAJOR	Semester – 5
Course Title: Chemistry of Food and Cosmetics	Course Code: SCHE352E
<u>COURSE OBJECTIVES:</u> 1. To have knowledge, understanding and skills about food groups, food additives and food adulterants. and to spread awareness about consumer rights and regulations for food safety. 3. To learn the basic principles of cosmetic chemistry, composition, formulation and function of various cosmetic components and to prepare various formulations and their qualitative analysis	
<u>COURSE OUTCOMES:</u> The learner will be able to : 1. Identify food groups and their nutritive value, perform qualitative and quantitative analysis of food for presence of additives and adulterants and apply the knowledge of food safety regulations and consumer rights in case she is faced with any such challenge in the future 2. Identify and classify cosmetic products and predict the components of the product and their function. Prepare various cosmetic formulations and carry out qualitative analysis of cosmetic products	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

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



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

UNIT 1 (1 Credit)	1.1	Food groups Introduction to food groups - Composition and nutritive value.	15 Hours
	1.2	Food Additives 1.2.1 Definition, direct and indirect additives, class of food additives 1.2.2 Role and function of food additives, interaction of food additives and effect on food characteristics 1.2.3 Coding of food additives 1.2.4 Detection of additives	
	1.3	Food Adulteration 1.3.1 Definition and types of adulteration 1.3.2 Means of adulteration, reasons for adulteration. 1.3.3 Methods of detection of adulterants in the following foods: milk, oil, sugar, spices and condiments, processed food, fruits and vegetables. (Qualitative and quantitative) 1.3.4 Difference between food additives and adulterants.	
	1.4	Present law and regulations (wrt food adulteration and additives) [2L] 1.4.1 Highlights of Food safety and standards authority of India (FSSAI) 1.4.2 Role of Voluntary agencies AGMARK, ISI	
	1.5	Consumer Protection Consumer's problem rights and responsibilities and Consumer Protection Act 2019	
UNIT 2 (1 Credit)	2.1	Basics of cosmetics Definition of cosmetics, historical background, classification, functions and properties.	15 Hours
	2.2	Skin Products Structure of skin, composition and functions of face powders, talcum powders, compact powders: Face cream, cold cream, sunscreen	
	2.3	Hair Products Structure of hair, hair dyes and its types: temporary, semi-permanent and permanent, hair sprays and shampoo	
	2.4	Coloured products Structure of nail, nail polish, nail polish remover and lipsticks	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

	2.5	Hygiene Products Antiperspirants and deodorants, toothpaste, tooth powders and mouthwash	
--	-----	--	--

PRACTICAL Course Title: Chemistry of Food and Cosmetics	Course Code: SCHE352EP
<p><u>COURSE OBJECTIVES:</u></p> <ol style="list-style-type: none"> 1. To train students to prepare simple inorganic complexes, silver nanoparticles and to analyze given inorganic complexes. 2. To analyze metal ions from a variety of samples by complexometry. 3. To train students to perform titrimetric analysis under non-aqueous conditions <p><u>COURSE OUTCOMES:</u></p> <p>The learner will be able to</p> <ol style="list-style-type: none"> 1. prepare and analyze simple inorganic complexes. 2. prepare and characterize silver nanoparticles using UV spectrophotometer. 3. estimate metal ions from an unknown sample with high degree of accuracy complexometrically. 4. carry assay of given drug samples by non-aqueous titrations. 	

Lectures per week (1 Lecture is 120 minutes)	4 Practical		
Total number of Hours in a Semester	60		
Credits	2 Practical		
Evaluation System	Summative Assessment	3 Hours	50 marks
	Continuous Assessment	--	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

	<p>Detection of food groups</p> <p>1 Test to identify carbohydrates :Molisch’s test, Fehling’s test, Benedict’s test, Tollen’s test and Iodine test 2 Test to identify proteins: Biuret test, Xanthoproteic test, Millions test, Ninhydrin test 3 Test to identify fats and oils: Translucent spot test, solubility test to distinguish between fats and oils, acrolein test, Hubble’s test</p> <hr/> <p>Qualitative Detection of food additives</p> <p>Detection of food additives: Aspartame(ninhydrin test),nitrite,magnesium silicate,salicylic acid,borates,saccharin(Nesseler’s reagent test), food colors (curcumin,caramel,annatto, chlorophyll), pyrogallate,alginate and pectin</p> <hr/> <p>Qualitative Detection of adulterants in food</p> <p>1 Milk: sugar, starch, hydrogen peroxide, formalin , nitrate, benzoic and salicylic acid, borax and boric acid. Acidity test 2 Honey : Water, sugar/jaggery, glucose/high fructose corn syrup. Acidity test 3 Tea: Spent leaves, added colouring material, iron fillings 4 Coffee: Cereal/starch, scorched persimmon stones, chicory, iron fillings, colouring matter 5 Ghee/Butter: Mashed potatoes/ sweet potatoes. Acid value 6 Edible oil: Other oils in edible oil 7 Vegetables & Fruits: Malachite green on chillies or green vegetables, Rhodamine B on sweet potatoes, wax polish on apples 8 Cereals : Rhodamine B in ragi, turmeric in sella rice, bran in wheat flour. 9 Spices and condiments: saw dust in spices, lead chromate in turmeric, papaya seeds in pepper, grass seeds in cummin, artificial colour in chilli powder/saffron</p> <hr/> <p>Preparation of cosmetic formulation</p> <p>1 Preparation of toothpaste/tooth powder 2 Preparation of nail polish remover 3. Preparation of shampoo 4. Preparation of Hand Wash/sanitizer. 5.Preparation of Lip Balm /lipsticks</p>	<p align="center">60 hours</p>
--	--	--------------------------------



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

		Qualitative Analysis of cosmetic products 1. Estimation of Mg in talcum powder 2. Estimation of acetone in nail polish remover (demonstration) 3. Estimation of Zn in deodorants complexometrically	
		Assay of shampoo	

ASSESSMENT DETAILS:

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

REFERENCES:

SCHE352E Chemistry of Food and Cosmetics Theory and Practical

1. A first course in food analysis- A.Y.Sathe, New Age International Ltd,1999
2. Food safety, case studies- R V Bhat, NIN,1992
3. <https://www.fssai.gov.in>
4. [https://indianlegalsolution.com/law on food adulteration](https://indianlegalsolution.com/law%20on%20food%20adulteration)
5. <https://vikaspedia.in>
6. Cosmetic Formulation: Principles and Practice - Heather A.E. Benson, Michael S. Roberts, Vania Rodrigues Leite-Silva, Kenneth Walters
7. Perfumes, Cosmetics and soaps, ninth edition, – W. A. Poucher.
8. Naturals and Cosmetics – by Dr. Satish Sakharwade
9. Manufacture of Perfumes, Cosmetics & Detergents – Giriraj Prasad
10. Cosmetics: Science & Technology – Sagarin.



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

SCHE352EP Chemistry of Food and Cosmetics Practical

1. Vogel's textbook of Qualitative Chemical Analysis (Longman ELBS Edition)
2. Vogel's textbook of Quantitative Analysis (Longman ELBS Edition)
3. Practical Organic Chemistry by A.I. Vogel
4. Practical Organic Chemistry by O.P. Agrawal.
5. Practical Organic Chemistry by F. G. Mann & B. C. Sounders
6. Comprehensive Practical Organic Chemistry Qualitative Analysis by V. K. Ahluwalia
7. Cosmetics-Formulation, manufacture and Quality Control by P.P Sharma Vandana Publications Pvt. Ltd

Programme: Sciences CHEMISTRY MAJOR	Semester – 6
Course Title: Industrially Important Inorganic Material	Course Code: SCHE364E
<p><u>COURSE OBJECTIVES:</u></p> <ol style="list-style-type: none"> 1. To introduce to the learner diverse roles of inorganic material in the industry. 2. To learn about silicates, fertilisers and nano dimensional materials. 	
<p><u>COURSE OUTCOMES:</u> The learner will be able to :</p> <ol style="list-style-type: none"> 1. explain the different kinds of glasses and application of ceramics 2. explain composition and application of fertilisers 3. explain the synthesis of nano-dimensional material and its use in electronics. 	

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



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

UNIT 1 SILICATES	1.1	<p>Glass</p> <p>1.1.1 Glassy state and its properties.</p> <p>1.1.2 Classification (non silicate and silicate)</p> <p>1.1.3 Manufacture and processing of glass</p> <p>1.1.4 Composition , properties and applications of following types of glasses: Soda lime glass, lead glass, photo sensitive and photo chromatic glass, glass wool and optical fibre</p>	10 hours
	1.2	<p>Ceramics</p> <p>1.2.1 Brief introduction to types of ceramics</p> <p>1.2.2 Glazing of ceramics</p>	
	1.3	<p>Cement</p> <p>1.3.1 Manufacture of Portland cement and the setting process</p> <p>1.3.2 Different types of cement and its applications : Quick setting , eco-friendly (slag cement) , pozzolana cement</p>	
UNIT 2 FERTILIZERS	2.1	<p>2.1.1 Different types of fertilizers (N,P,K)</p> <p>2.1.2 Importance of fertilizers</p>	10 hours
	2.2	Chemistry involved in the manufacture of the following fertilizers: urea, ammonium nitrate, calcium ammonium nitrate, ammonium phosphate, superphosphate , potassium chloride and potassium nitrate.	
UNIT 3 NANOMATERIAL	3.1	Introduction to dimensions of nano materials [0D, 1D,2D,3D]	10 HOURS
	3.2	Synthesis , properties and applications of fullerenes, carbon nanotubes, carbon fibres and their applications.	
	3.3	Synthesis of nano dimensional superconductors and semiconductors. Application in electronics	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

PRACTICAL COURSE Course Title: Industrially Important Inorganic Material Practical	Course Code:SCHE364EP
---	------------------------------

COURSE OBJECTIVES:

1. To develop practical skills in qualitative and quantitative analysis of fertilizers, including detection and estimation of ions such as ammonium, sulphate, calcium, and phosphate using titrimetric, turbidimetric, and pH-metric methods.
2. To introduce students to the synthesis and characterization of nanomaterials, including ZnO and silver nanoparticles, using both chemical and green synthesis approaches along with UV–Visible spectrophotometric analysis.
3. To provide exposure to industrial and applied aspects of chemistry through field visits and hands-on experience, enhancing understanding of real-world laboratory techniques and instrumentation.

COURSE OUTCOMES: The learner will be able to

1. analyze fertilizer samples by identifying and estimating their chemical constituents using standard laboratory techniques
2. synthesize and characterize nanoparticles (ZnO and silver) and interpret UV–Visible spectroscopic data to evaluate their properties.
3. to correlate theoretical knowledge with practical and industrial applications, including reporting observations from field visits and laboratory experiments effectively.

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	--	



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

1	Detection of constituents of ammonium sulphate fertilizer i.e ammonium and sulphate ions qualitatively and sulphate turbidimetrically	60 hours
2	Determine the free acidity of ammonium sulphate fertilizer titrimetrically.	
3	Detection of constituents of superphosphate fertilizer i.e calcium ions and phosphate ions titrimetrically	
4	Detection of phosphoric acid content in superphosphate fertilizer pH metrically.	
5	Preparation of pure ZnO nanoparticles.	
6	Preparation of copper doped ZnO nanoparticles	
7	Synthesis of silver nano particles by green method and its characterisation using UV- visible spectrophotometry.	
8	Synthesis of silver nano particles by chemical approach and its characterisation using UV- visible spectrophotometry	

ASSESSMENT DETAILS:

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

REFERENCES:

SCHE364E Industrially Important Inorganic Material Theory

1. West AR (2014), Solid State Chemistry and its applications, Wiley
2. Kent J A, Riggels Handbook of Industrial Chemistry, CBS Publishers, New Delhi
3. Poole Jr, Charles P, et al, Introduction to nanotechnology, John Wiley and sons

SCHE363EP Industrially Important Inorganic Material Practical

1. Vogels Qualitative Analysis, Prentice hall.
2. Orbeak, Mc Hale et al. Synthesis and characterisation of silver nanoparticles for undergraduate laboratory, J.Chem.Educ.2015



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Programme:Sciences Chemistry Major	Semester – 5
Course Title: Applied Chemistry	Course Code: SVSC501
<p><u>COURSE OBJECTIVES:</u></p> <ol style="list-style-type: none"> 1. Understand the basics of pharmaceutical chemistry, formulation principles and synthesis techniques of pharmaceutical compounds. 2. Acquire hands-on skills in the synthesis and estimation of selected drugs and drug intermediates. 3. Understand the basics of dyestuff chemistry including the synthesis, classification, and application of dyes. 4. Gain practical exposure in extraction, dyeing, and fastness evaluation of both natural and synthetic dyes. 	
<p><u>COURSE OUTCOMES:</u></p> <ol style="list-style-type: none"> 1. Explain the process and importance of sustained release formulation using drugs like amoxicillin. 2. Synthesis and estimate drug and drug intermediates 3. Synthesise and classify a dye based on the mode of application to fabric and predict the affinity and fastness property. 4. Perform the separation of food colours/inks. 	

Lectures per week (1 Lecture is 120 minutes)	2	
Total number of Hours in a Semester	60	
Credits	2	
Evaluation System	Summative Assessment	—
	Continuous Assessment	-- 50 marks



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

1	Formulations of dosage forms : Amoxicillin (emphasis on sustained release formulations.)	60 Hours
2	Synthesis of Drugs and Drug Intermediates (any two) a) p-nitroaniline from p-nitroacetanilide b) Benzocaine from 4-aminobenzoic acid c) Hydantoin with monograph d) Benzimidazole with monograph	
3	Estimation of Drugs (any two) a) Estimation of Ibuprofen (Back titration) b) Estimation of acid neutralizing capacity of a drug. c) Estimation of Iodine in Tincture Iodine. d) Assay of a given drug by fluorimetry.	
4	Case Studies explaining the concepts of : Introduction to drugs, basic terminology, pharmacodynamic agents and chemotherapeutic agents.	
5	Enquiry based learning on basic terminology, introduction to the dyes including nomenclature.	
6	Synthesis of methyl orange/indigo	
7	Extraction and dyeing of fabric (cotton, silk, nylon) using natural colours and study of its fastness properties (Sources: turmeric, marigold, beetroot)	
8	Dyeing of fabric (cotton, silk, nylon) using different classes of synthetic dyes (vat, mordant, acidic, azoic) and studying the fastness properties.	
9	Separation of food colours, inks by TLC	

ASSESSMENT DETAILS:

1. No Summative Assessment
2. Continuous Assessment (CA): One activity 20 Marks+ Test 20 Marks
3. Attendance: 10 Marks

REFERENCES:

SVSC501 Applied Chemistry

1. Arthur, Vogel. Textbook of practical organic chemistry, 5th edition, publishers
2. Longman group Ltd, 1989 2 J. Leonard, Trevor P. Toubé, B. Lygo, G Advanced Practical Organic Chemistry. Proctor, 2nd edition Stanley Thornes. 1990



SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

3. Keese, R, Martin P. B, and Trevor P. Toubé. Practical organic synthesis: a student's guide. John Wiley & Sons, 2006. British Pharmacopoeia
4. Indian Pharmacopoeia
5. Chemistry of Synthetic Dyes, Vol I – VIII, Venkatraman K., Academic Press 1972
6. Colour Chemistry, Heinrich Zollinger
7. Colour Chemistry, Allen
8. Colour Chemistry, Robert M Christie, 2nd Edition, Royal Society of Chemistry, 2015
9. Practical Organic Chemistry, A.I. Vogel
10. Textbook of Medicinal Chemistry, Volume I Alagarsamy, 2010
11. FOYE'S Principles of Medicinal Chemistry 7th Edition