

DEPARTMENT OF CHEMISTRY
B.Sc., CHEMISTRY PROGRAMME
SCHEME OF EXAMINATION
CHOICE BASED CREDIT SYSTEM – FOR 2016 – 2019

FIRST SEMESTER

Course Code	PART	Course	Hrs / Week	Hours Exam	Max. Marks		Total	Credits
					Intl.	S.E		
16UTL101	I	Tamil / Hindi paper – I	6	3	25	75	100	03
16UEN101	II	Applied English - I	5	3	25	75	100	03
16UCY101	III	Core Paper – I Inorganic and Organic chemistry	7	3	25	75	100	04
16UCY203		Core Practical- I Inorganic Qualitative Analysis	2	--	--	--	--	--
16UCY1A1		Allied Mathematics Paper- I	8	3	25	75	100	04
16UHRI01	IV	Skill Based Elective Human Rights in India	1	2	--	50	50	02
16HEC101		HE – (Personal values & SKY Yoga practice -I)	1	2	25	25	50	01
	V	Extension Activities (NSS, NCC, Sports & Games						
			500					17

SECOND SEMESTER

Course Code	PART	Course	Hrs / Week	Hours Exam	Max.Marks		Total	Credits
					Intl.	S.E		
16UTL202	I	Tamil paper – II/ Hindi Paper II	6	3	25	75	100	03
16UEN202	II	Applied English - II	5	3	25	75	100	03
16UCY202	III	Core Paper –II Organic and Physical chemistry	6	3	25	75	100	04
16UCY203		Core Practical- I Inorganic Qualitative Analysis	2	3	40	60	100	03
16UCY2A2		Allied Mathematics Paper-II	8	3	25	75	100	04
16EVS201	IV	Environmental studies	2	2	--	50	50	02
16HEC202		HE – (Family values & SKY Yoga practice -II)	1	2	25	25	50	01
	V	Extension Activities (NSS, NCC, Sports & Games)						
			600					
			20					

THIRD SEMESTER

Course Code	PART	Course	Hrs / Week	Hours Exam	Max. Marks		Total	Credits
					Intl.	S.E		
16UTL303	I	Tamil paper/ Hindi Paper – III	5	3	25	75	100	03
16UEN303	II	English for Excellence-Paper - I	6	3	25	75	100	03
16UCY304	III	Core Paper – III Inorganic and Organic Chemistry	6	3	25	75	100	04
16UCY406		Core Practical II Volumetric and Organic Qualitative Analysis	3	--	--	--	--	--
16UCY3A1		Allied Physics Paper -I	5	3	25	75	100	04
16UCY4A3		Allied Physics Practical for Mathematics and Chemistry	3	--	--	--	--	--
16HEC303	IV	HE – (Professional values & SKY Yoga practice –III)	1	2	25	25	50	01
16UCY3N1 / 16UCY3N2		Skill Based Non Major Elective I Food Science and Technology/ Skill Based Non Major Elective I Chemistry of Consumer Products	1	2	--	50	50	02
	V	Extension Activities (NSS, NCC, Sports & Games)						
			500					
								17

FOURTH SEMESTER

Course Code	PART	Course	Hrs / Week	Hours Exam	Max. Marks		Total	Credits
					Intl.	S.E		
16UTL404	I	Tamil Paper/ Hindi Paper IV	5	3	25	75	100	03
16UEN404	II	English for Excellence Paper -II	6	3	25	75	100	03
16UCY405	III	Core Paper – IV Inorganic, Organic and Physical Chemistry	6	3	25	75	100	04
16UCY406	III	Core Practical II Volumetric and Organic Qualitative Analysis	3	6	80	120	200	05
16UCY4A2	III	Allied Physics Paper - II	5	3	25	75	100	04
16UCY4A3	III	Allied Physics Practical for Mathematics and Chemistry	3	3	40	60	100	04
16HEC404	IV	HE – (Social Values & SKY Yoga practice -IV)	1	2	25	25	50	01
16UCY4N3/ 16UCY4N4	IV	Skill Based Non Major Elective II Water and Water Treatment Processes/ Skill Based Non Major Elective II Diagnostic Chemistry	1	2	--	50	50	02
16UNC 401/ 16UNS 402/ 16USG 403	V	Extension Activities- NCC/NSS/ Sports and Games				50	50	01
			850					27

FIFTH SEMESTER

Course Code	PART	Course	Hrs / Week	Hours Exam	Max. Marks		Total	Credits
					Intl.	S.E		
16UCY507	III	Core Paper – V Nuclear and Co-ordination Chemistry	4	3	25	75	100	04
16UCY508		Core Paper – VI Organic Chemistry- I	4	3	25	75	100	04
16UCY509		Core Paper – VII Electro Chemistry	4	3	25	75	100	04
16UCY510		Core Paper- VIII Dye Chemistry	4	3	25	75	100	05
16UCY511		Core Elective I- Analytical Chemistry	4	3	25	75	100	05
16UCY617		Core Practical III Gravimetric Analysis and Physical Chemistry	6	--	--	--	--	--
16UCY5S1/ 16UCY5S2	IV	Skill Based Elective -I Food Chemistry/ Skill Based Elective -I Nano chemistry	1	2	--	50	50	02
16GKL501		General Knowledge& General Awareness	SS	2	--	50	50	02
16HEC505		HE – (National Values & SKY Yoga practice -V)	1	2	25	25	50	01
							650	27

SIXTH SEMESTER

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		GRAND TOTAL	390 0	140
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**Question paper pattern for major and ancillaries for the academic year
2016-2017**

Duration of Examination – 3 Hours

Section-A— 10 x 1 = 10 marks

Q.No 1-5- Multiple choice question with four choices, one question from each unit

Q.No-6-10-Short answer- one question from each unit

Section-B=5 x 5 = 25 marks Answer in one sentence

Q.No 11-15 Either/(or)type(like 1.a(or)b)

Section-C– 5 x 8 = 40 marks

Q.No 16-20 Either/(or)type(like 1.a(or)b)

Section-C one of the questions shall be application oriented question (or) a problem (or) a case study.

Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016- 2019
		Batch
Subject code	16UCY101	Semester: I
Title	CORE PAPER - I INORGANIC AND ORGANIC CHEMISTRY	
Hrs/Week	7	Credit:4
Objectives	1. To understand basic theoretical concept on bonding 2. To familiarize with the concept of hybridization and molecular orbital theory. 3. To understand the mechanisms of Nucleophilic and Electrophilic substitutions in organic reactions	
Unit	Content	Hrs
Unit I	Long form of Periodic Table: Main features advantages and defects. Periodic properties of elements. Chemical bonding: Variable electrovalency - pseudo inert gas configuration-inert pair effect. Ionic Bonding-Conditions for the formation of an ionic compound. Characteristics of ionic compounds. Crystal lattice energy and its determination by Born-Haber Cycle. Covalent Bonding: Lewis – Langmuir concept. Octet rule. Characteristics of covalent compounds. Partial ionic character in covalent bond. - Fajan’s rules & its application in explaining properties like melting points and solubility. Co-ordinate covalent bonding: Characteristics. Hydrogen bonding-types-application of concept of hydrogen bonding - melting and boiling points of hydrides of Nitrogen, Oxygen and	19

	Fluoride, Lesser density of ice.	
Unit II	Concept of Hybridization: sp, sp^2 and sp^3 with reference to C_2H_2, $BeCl_2$, C_2H_4, BCl_3, and CH_4. Application of VSEPR Theory to H_2O, NH_3, CH_4, PCl_5 and SF_6 molecules. Molecular Orbital Theory: Symmetry of molecular orbitals Application to simple Homonuclear and Heteronuclear molecules - H_2, He_2, O_2, F_2, N_2, CO and NO. Ozone : Preparation, properties, structure and uses. Ozone depletion: Causes and effects. Sulphur: Peracids of sulphur and Sodium thiosulphate - Preparation, properties, structure and uses.	18
Unit III	ORGANIC CHEMISTRY: Polar Effects : Inductive, mesomeric, electromeric and hyperconjugative effects. Homolytic and Heterolytic fission :Free radicals, carbocation, carbanion, electrophilic and nucleophilic reagents (definition only). Alkenes: Preparations involving dehydrohalogenation, dehydration, dehalogenation, reduction of alkynes and Wittig reaction. Mechanism of β-Elimination: E1 and E2 and Saytzeff rule. Reactions of Alkenes: Addition of hydrogen halide, hypohalous acid, sulphuric acid, water, hydroboration, oxidation by $KMnO_4$ and HIO_4 and Ozonolysis.	18
Unit IV	Dienes: Classification. 1,2 and 1,4 addition of Butadiene. Diels-Alder reaction. Alkynes: Preparation of alkynes by dehydrohalogenation,	18

	dehalogenation and electrolysis. Reaction: Hydroboration, addition of hydrogen halides, water, formation of acetylides and Ozonolysis. Alkyl halides: Grignard reagent - Preparation and properties of Ethyl magnesium iodide. Aliphatic Nucleophilic Substitution: S_N1 and S_N2 mechanism. Effect of solvent, nucleophile and structure of substrate.	
Unit V	Benzene: Resonance, Resonance energy and structure. Huckel's rule. Aromaticity: Non-benzenoid aromatic compounds. Cyclopentadienyl anion and Tropylium cation. Mechanism of Nitration, sulphonation, halogenation, Friedel-Crafts alkylation and acylation in benzene Orientation in aromatic substitution: ortho, para and meta directing. Role of inductive and mesomeric effects in electrophilic aromatic substitution in phenol, and nitrobenzene.	18
	Total hours/Semester	91
Text Books	1. Soni. P.L., (2012) Text book of Inorganic Chemistry, 20th edition, Sultan Chand & Sons, New Delhi, 2. Bahl.B.S.and Arun Bhal, (2007)Advanced Organic Chemistry, 1st edition, S.Chand & Company Ltd., New Delhi. 3. Soni. P.L., (2012).Text book of Organic Chemistry, 29th revised edition, Sultan Chand & Sons, New Delhi. 4. Madan. R.D.(2011) Advanced Inorganic Chemistry, Third revised edition S Chand & company, New Delhi.	

Reference Books	1. Finar I.L, (2006.)Organic Chemistry., Volume I, 4th.edition Longmans .. 2. Morrison. R.T. and Boyd. R.N. ,(1976)Organic Chemistry, , 6 th Edition, Allyn and Bacon Ltd., NewYork. 3. Wahid U.Malik, G.D, Tuli, and Madan. R.D.,(2006) Selected Topics in Inorganic Chemistry, Sixth Edition, S.Chand & Company, New Delhi,	
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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY 202	Semester: II
Title	CORE PAPER- II ORGANIC AND PHYSICAL CHEMISTRY	
Hrs/Week	6	Credit: 4
Objectives	1. To understand the mechanisms of name-reactions of carbonyl compounds. 2. To study the synthetic importance of active methylene compounds . 3. To learn basic concepts /origin of quantum mechanics. 4. To understand the important laws of thermodynamics and their significance	
Unit	Content	Hrs
Unit I	Alcohols: Distinction between primary, secondary and tertiary alcohols. Manufacture of ethanol from molasses. Absolute alcohol, methylated spirit and power alcohol. Dicboxylic acids : Preparation and properties of malonic , succinic and phthalic acid. Acetoacetic ester : Preparation and application in the synthesis of acetone, adipic acid, crotonic acid and 4-methyl uracil. Keto-enol tautomerism. Malonic ester: Preparation and application in the synthesis of , crotonic acid, barbutric acid, succinic acid and dimethyl acetic acid. Acid derivatives: Aecetyl chloride and acetic anhydride: Preparation, properties and uses.	16

Unit II	Carbonyl compounds: Preparation by Resenmund reaction, Stephen reaction and from calcium salt of fatty acids and using Grignard reagent., Mechanism of Nucleophilic addition reaction in aldehydes and ketones: Addition of Grignard reagent, HCN, NaHSO₃ and ammonia. Addition of NH₂-NH₂, C₆H₅NHNH₂, NH₂OH and Semicarbazide. Mechanism of Aldol, Perkin, Benzoin condensation, Cannizzaro reactions and Reformatsky reaction. Reduction: Wolff-Kishner, Clemmensen, MPV and Lithium Aluminium Hydride (without mechanism). Oxidation of aldehydes and ketones using Tollen's reagent, Fehiling's solution, SeO₂ and CrO₃.	16
Unit III	Quantum Theory: Failure of classical theory in explaining the black body radiation. Planck's radiation theory, Quantisation of energy. Einstein's theory of Photoelectric effect. Wave mechanics: Characteristics of wave motion. De-Broglies equation. Davison and Germer experiment. Heisenbergs uncertainty principle. Schrodinger wave equation and significance of Ψ and Ψ^2 (Derivation not required)	16
Unit IV	Thermodynamics: Importance, Limitations and Thermodynamic Terms. Types of Thermodynamic equilibrium and processes. First law of Thermodynamics: Law of conservation of energy, internal energy and First law. Enthalpy. Heat capacity: Relation between Cp and Cv. Work done in an isothermal reversible expansion of ideal gas. Reversible adiabatic expansion of an ideal gas: Relation between	15

	temperature and volume/ pressure. Joule- Thomson Experiment: J-T -Effect, Joule –Thomson coefficient for an ideal gas, Inversion Temperature. Zeroth law of thermodynamics. Absolute zero temperature.	
Unit V	Second law of thermodynamics: Limitations of First law. Need for Second law of thermodynamics. Various statements of Second law of thermodynamics. Thermo chemistry: Definition – Standard Enthalpy of formation and Enthalpy of neutralization. Bond energy and its applications Measurement of enthalpy of reactions by Bomb Calorimeter. Entropy: Definition, Entropy changes in reversible and irreversible spontaneous processes. Entropy change accompanying change of phase, isothermal expansion of an ideal gas with change in pressure, volume and temperature. Entropy of mixing of ideal gases. Physical significance of entropy. Helmholtz and Gibbs free energy functions: Variation of free energy with temperature or pressure- Gibbs Helmholtz equation. Third law of Thermodynamics (only statement).	15
	Total hours/Semester	78
Text Books	1 Bahl, B.S and Arun Bahl, (2007). A textbook of Organic Chemistry, 18th Edition. S.Chand & Co. 2. Soni P.L, (2012.) Text book of Organic Chemistry, 29th Revised Edition, Sultan Chand & Sons, New Delhi, 3. Puri B.R., Sharma. L.R and Madan S. Pathania, (2013), Principles of Physical Chemistry, 46th Edition Vishal Publishing House. 4. Negi. A.S., and Anand S.C., (2009.) A text book of physical chemistry, Fourth Reprint, New Age International PVT Ltd.	

Reference Books	1. Finar, I.L., (2003). Organic Chemistry, Vol. I & Vol. II, Pearson Education, Singapore. 2. Soni. P.L. and Dharmarha O.P., (2005)Text book of Physical Chemistry, 7 th Edition,. Sultan Chand & Sons, New Delhi,	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY203	Semester: I&II
Title	Core Practical-I Inorganic Qualitative Analysis (Examination at the end of Second Semester)	
Hrs/Week	2	Credit:3
Objectives	To enable the students to develop analytical skill in inorganic qualitative analysis.	
Unit	Content	Hrs
	a) Reactions of the following ions: Lead, Copper, Nickel, Bismuth, Cadmium, Iron, Manganese, Zinc, Calcium, Strontium, Barium, Magnesium and Ammonium. Carbonate, Nitrate, Fluoride, Sulphate, Chloride, Oxalate, Phosphate and Borate. b) Analysis of a mixture containing two cations and two anions of which one will be an interfering ion.	
	Total hours/Semester	26
Text Books	Venkateswaran, V., R. Veeraswamy and A.R. Kulandaivelu, (2004) Basic Principles of Practical Chemistry, 2nd Edition, S.Chand Publications, New Delhi .	
Reference Books	Thomas, A.O., (2003) Practical Chemistry, Scientific Book Center, Cannanore.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY304	Semester: III
Title	CORE PAPER – III- INORGANIC AND PHYSICAL CHEMISTRY	
Hrs/Week	6	Credit:4
Objectives	1. To learn the industrial aspects of inorganic materials 2. To understand the concept of the thermodynamics of solution 3. To acquire knowledge in colligative properties	
Unit	Content	Hrs
Unit I	Basic Metallurgical operations: Concentration, calcination, roasting, reduction and refining. Alloys: Preparation and properties. Composition and uses of some important alloys of Al, Ni, Sn and Pb. Fertilizers: Important nutrients and their functions. Primary and secondary nutrients. Manufacture of urea, ammonium sulphate, super phosphate of lime, triple super phosphate and potassium nitrate.	15
Unit II	Cement : Types of cement, composition, manufacture and setting of cement. Glass : Manufacture, types and coloured glass. Inorganic Polymers: Silicones-Preparation, properties and applications. Fuels: Classification of fuels, calorific value and characteristics of good fuel.	16

	Gaseous Fuels: Advantages, Composition and uses of natural gas, water gas, producer gas, oil gas, LPG, CNG and Gobar gas. Liquid fuels –Petroleum-composition and classification. Refining of crude petroleum and uses of various fractions. Petroleum industries in India. Knocking agents, Octane and Cetane numbers. Synthetic Petrol – Catalytic Cracking of petroleum.	
Unit III	Chemical potential, Gibbs – Duhem equation, variation of chemical potential with temperature and pressure. Chemical potential of ideal gases. Clapeyron-Clausius equation-application to various equilibria. Chemical equilibrium: Law of mass action - relation ship between K_p and K_c. Van't Hoff's reaction isotherm and isochore. Dedonders concept of chemical equilibria. Hydrogen – Iodine equilibrium, dissociation of PCl_5 and N_2O_4. Lechatelier's principle : Application to synthesis of ammonia .	15
Unit IV	Thermodynamics of solution: Kinds of solution: Solution of liquids in liquids. Ideal solution. Raoult's law, Henry's law (Statement only). Non-ideal solution-deviation from Raoult's law. Duhem – Margules equation. Fractional distillation and azeotropes. Phase equilibria between condensed phases : Partially miscible liquid system-phenol-water , triethylamine –water and nicotine –water system. Completely immiscible liquids: steam distillation. Nernst distribution law-thermodynamic derivation, application to association of benzoic acid and study of $\text{I}_2 + \text{I}^- \rightleftharpoons \text{I}_3^-$.	16

Unit V	Colligative properties of solutions : Lowering of vapour pressure: Determination of lowering of vapour pressure by Static method and molecular weight. Boiling point elevation: Thermodynamic derivation .Cottrell's method of determination of molecular weight. Depression of freezing point: Thermodynamic derivation .Beckmann's method of determination of molecular weight. Osmotic pressure: Berkley and Hartley's method of determination. Laws of Osmotic pressure. Van't Hoff's equation for osmotic pressure of dilute solution. Abnormal molecular weight and Van't Hoff's factor.	16
	Total hours/Semester	78
Text Books	1. Soni P.L, (2002.) Text book of Inorganic Chemistry, 20th edition, Sultan Chand & Sons Publishers. 2. Puri Sharma and.Kallia. K.C., (2013) Principles of Inorganic Chemistry, 31st Edition, Milestone Publishers and Distributors. 3. Puri, Sharma and Pathania., (2013) Principles of Physical Chemistry, 46th Edition, Vishal Publishing Co., Jalandar.	
Reference Books	1.Jain. P.C. and Monaka Jain., Compiled by Trishla Jain and Jyothika Jain, (2005.) Engineering Chemistry, 15th Edition, Dhanpat Rai Publishing Company (P) Ltd., 2. Soni. P.L. and Dharmarha. O.P., (2005)Text book of Physical Chemistry, 7th Edition, Sultan Chand & Sons,. New Delhi.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY3N1	Semester: III
Title	NON MAJOR ELECTIVE FOOD SCIENCE AND TECHNOLOGY	
Hrs/Week	1	Credit: 2
Objectives	To have an exposure to food preservation techniques, To Have an awareness regarding food adulteration and ISI standards.	
Unit	Contents	Hrs
Unit I	Food and Nutrition : Functions of food , food sources, energy value of foods, elementary idea about digestion and metabolism of Carbohydrates, Fats and Proteins.	3
Unit II	Food preservation : Importance of food preservation , causes of food spoilage, principles of food preservation . Methods of food preservation- Bacterostatic Methods: Dehydration, pickling and salting Bacterocidal Methods: Canning and cooking.	3
Unit III	Milk Processing – Pasteurisation and milk products Food Additives : Antioxidants , Food Colours, Food enzymes, Spices and flavouring agents. Merits and demerits of additives and preservatives.	3
Unit IV	Food adulteration: Common adulterants and their effects. Intentional and incidental adulterants. Metallic contamination, contamination by pests and pesticide residues. Simple physical and chemical tests for	2

	detection of food adulterants.	
Unit V	Packaging hazards. Food poisoning and food borne diseases. Food Laws: FSSAI Food Standard: ISI standards and the Agmark standards. Functions of Food Corporation of India.	2
	Total hours/Semester	13
Text Books	1. Swaminathan M., (2002).Essentials of Food and Nutrition, Volume I and II, 2 nd Edition, Ganesh Publishers, Madras, 2. Sumati R. Mudambi and Rajagopal M.V., (1990)Fundamentals of Foods and Nutrition, 3 rd Edition, Wiley Eastern Ltd., New Delhi,	
Reference Books	1. Jayashree Ghosh., (2006) Applied Chemistry, 1st Edition, S.Chand and company Ltd., New Delhi, 2. Srilakshmi B, (2006) Food Science, Third Edition, New Age International Publishers, New Delhi.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY3N2	Semester: III
Title	NON MAJOR ELECTIVE CHEMISTRY OF CONSUMER PRODUCTS	
Hrs/Week	1	Credit: 2
Objectives	To acquire the basic knowledge in consumer product chemistry To update the knowledge relevant to modern trends in the industry.	
Unit	Content	Hrs
Unit I	SOAPS : Saponification of oils and fats. Manufacture of soaps. Formulation of toilet soaps. Different ingredients used. Their functions. Medicated soaps. Herbal soaps. Mechanism of action of soap. Soft soaps. Shaving soaps and creams.	3
Unit II	DETERGENTS: Different ingredients in the formulation of detergent powders and soaps. Liquid detergents. AOS (alpha olefin sulphonates. cationic detergents: examples. Manufacture and applications. Non- ionic detergents: examples. Mechanism of action of detergents. Comparison of soaps and detergents.	3
Unit III	COSMETICS: Introduction and classification Face creams: cold cream, vanishing cream, cleansing and bleaching cream-ingredients, formulation and uses. Face powder: Requirements and ingredients.	3

	Hand cream: Formulations, Ingredients and uses. Nail preparations: Nail bleach, nail lacquers, nail lacquers and nail removers – requirements ingredients and formulations.	
Unit IV	MAKE UP PREPARATIONS : Lipstick, Rouge, Mascara – characteristics and ingredients Dentifrices: Tooth paste and tooth powder -Essential and special ingredients and their functions.	2
Unit V	Hair preparations: Hair oils and hair tonics. Ingredients and their functions. Hair cream : Formulations. Shampoos : constituents and functions. Hair Dyes: Primary requirements of a dye. Vegetable colorings, metal salts and dye used in hair dyes. Hair removers: Temporary and permanent removal of hair. Quality control of cosmetics in India. Hazards of cosmetics.	2
	Total hours/Semester	13
Text Books	1. Thangamma Jacob. (1987) Text book of Applied Chemistry, 1 st Edition, Macmillan.	
Reference Books	1. Gobala Rao, . S., (1998.)Outlines of chemical technology, Affiliated East West press.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY406	Semester: IV
Title	CORE PRACTICAL -II VOLUMETRIC AND ORGANIC QUALITATIVE ANALYSIS	
Hrs/Week	3	Credit: 5
Objectives	1. To enable the students to develop the analytical skills in volumetric and organic qualitative analysis. 2. To develop preparative skills in the organic preparations	
Unit	Content	Hrs
	I) Volumetric Analysis a) Permanganometry: 1. Estimation of Ferrous ion. 2. Estimation of Oxalic acid. 3. Estimation of Sodium nitrite. 4. Estimation of calcium (Demonstration only). b) Dichrometry: 1) Estimation of Ferrous ion using internal indicator. 2) Estimation of Ferric ion using internal indicator c) Iodimetry and Iodometry: 1) Estimation of Arsenious oxide. 2) Estimation of Copper.(Demonstration only) 3) Estimation of Potassium dichromate. d) EDTA-Titrations: 1) Estimation of Calcium. 2) Estimation of Zinc.	

	3) Estimation of Magnesium. 4) Estimation of hardness of water-temporary and permanent. (Demonstration only)	
	Organic Qualitative Analysis a) Systematic qualitative analysis of organic compounds containing one functional group: Aldehydes, Ketones, Primary amines, Nitrocompounds, Amides, Anilides, Carbohydrates, Carboxylic acids and Phenols. b) Organic Preparations: 1) Acetylation of aniline to acetanilide. 2) Acetylation of Salicylic acid to acetyl salicylic acid. 3) Hydrolysis of benzamide to benzoic acid. 4) Nitration of nitrobenzene to m-dinitrobenzene. 5) Hydrolysis of ester.	
	Total hours/Semester	39
Reference Books	1. Venkateswaran,V., R.Veerawamy and A.R.Kulandaivelu, (2004)Basic Principles of Practical Chemistry, 2nd Edition, S.Chand Publications, New Delhi . 2. Alkondan .M. (1966)Quantitative analysis First edition, N.G.M College, Pollachi, Students Co.Operative stores Ltd., 3. Thomas, A.O., (2003) Practical Chemistry, Scientific Book Center, Cannanore..	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY4N3	Semester: IV
Title	NON MAJOR ELECTIVE II Water and Water Treatment Processes	
Hrs/Week	1	Credit: 2
Objectives	To create awareness on softening methods of hard water and industrial wastewater treatment. To have a knowledge on purification methods of water.	
Unit	Content	Hrs
Unit I	Hardness of water – Hard water and Soft water. Types of hardness, Units of hardness, Equivalents of Calcium carbonate. Estimation of hardness of water by EDTA method. Total hardness, temporary hardness and permanent hardness.	3
Unit II	Disadvantages of hard water in domestic and industrial use: Scales and Sludge formation, prevention of scales. Internal conditioning and external conditioning. Caustic embrittlement – boiler corrosion – priming and foaming.	3
Unit III	Softening of hard water: Lime soda process, Cold and Hot process. Zeolite process : Natural and synthetic zeolites. Ion exchange process : Cation exchange and anion exchange resins. Regeneration of cation and anion exchangers.	2
Unit IV	Purification of water for municipal purposes: Filtration, Sedimentation and Coagulation, Sterilization, Physical and Chemical methods. Sea water as a source of drinking water: Desalting, electrodialysis and	3

	reverse osmosis.	
Unit V	Industrial wastewater treatment: Removal of Iron and Silica . Water for boiler use. Industrial wastes and treatment processes: Types of industrial wastes, The nature, effect and treatment of paper, pulp and food processing industrial wastewater.	2
	Total hours/Semester	13
Text Books	1.Jain. P.C. and Monika Jain., Compiled by Trishla Jain and Jyothika Jain, (2005.) Engineering Chemistry, 15th Edition, Dhanpat Rai Publishing Company (P) Ltd., 2 .Sharma, B.K., (2000)Environmental chemistry, 2nd Edition Goel Publishing Company(P) Ltd.	
Reference Books	1. Ravishanker., N.. (2002).Applied chemistry, 3 rd Edition National Pathippaham.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16 UCY4N4	Semester: IV
Title	NON MAJOR ELECTIVE- II DIAGNOSTIC CHEMISTRY	
Hrs/Week	1	Credit: 2
Objectives	1. To know the basic concepts of metabolism of carbohydrates 2. To familiarise with mechanism of regulations of blood sugar and the clinical tests. 3. To have a basic idea about haemoglobin, renal and liver function tests. 4. To develop their skill in clinical laboratory techniques.	
Unit	Content	Hrs
Unit I	Enzymes: classification and properties of enzymes. Co-enzymes and examples Digestion and absorption of carbohydrates, fats and proteins.	3
Unit II	Metabolism of carbohydrates. Glycolysis, Glycogenesis. Regulation of blood sugar : Mechanism of maintaining blood sugar level. Glycosuria, Glucose tolerance test, Normal GTT curves. GTT curves in Diabetes mellitus Diabetes Mellitus –symptoms and control measures.	3
Unit III	Blood lipids, Ketogenesis, ketolysis and ketosis Urine : composition of urine . General characteristics. Normal and abnormal constituents of urine.	2
Unit IV	Formation of urine : Glomerular filtration and tubular reabsorption. Renal function tests : Inulin clearance test, urea concentration test and dye test. Haemoglobin : Functions and properties of Haemoglobin. Conversion	3

	of Haemoglobin to Bilepigments. Jaundice –Types and diagnosis.	
Unit V	Liver : Functions of liver. Liver function tests: Tests based on excretory functions, metabolic functions and the capacity for detoxication.	2
	Total hours/Semester	13
Text Books	1. Ambika Shanmugam, (2012)Fundamentals of Biochemistry for Medical Students, Seventh, Indian Edition, Lippincott Williams & Wilkins.	
Reference Books	1. Soni. P.L., (2012).Text book of Organic Chemistry, 29 th revised edition, Sultan Chand & Sons, New Delhi.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY405	Semester:IV
Title	CORE PAPER - IV INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY	
Hrs/Week	6	Credit: 4
Objectives	1. To study the trends in periodic properties of transition and inner transition elements. 2. To have an exposure to reactions of Phenols, amines and nitro compounds.	
Unit	Content	Hrs
Unit I	Transition Elements: Characteristics of transition elements. Trends in periodic properties- electronic configuration, Atomic and ionic sizes, oxidation states, ionization potentials, magnetic behaviour, colour, magnetic properties, catalytic properties and ability to form complexes. Extraction and uses of Ti,V,Mo,W and Co. Platinum Metals: Metallurgy of platinum. Platinum black, Platinised asbestos, colloidal platinum -preparation and uses . Group Discussions: (i) Cr ,Mo and W (iii) Fe,Co and Ni . Alloy steels. Heat treatment of steel . Iron and steel industry in India . Preparation and uses of the following compounds. TiO_2 , TiCl_4, CrO_2Cl_2 , ZrOCl_2 , V_2O_5 , FeSO_4, ammonium molybdate and Platinic chloride.	16
Unit II	Inner Transition Elements: Lanthanides and Actinides: Occurrence, electronic structure,	15

	oxidation states, colour and absorption spectra, magnetic properties. Lanthanide contraction and its consequences. Separation of Lanthanide elements by ion exchange method. Comparison of Lanthanides and Actinides. Extraction of Uranium from Pitch blende.	
Unit III	Preparation of phenols- from aryl halide and grignard reagent. Reactions of Phenols: Nitration. sulphonation , halogenation, Kolbes reaction, Friedel Crafts reaction, Reimer Tiemann reaction, Duff's reaction, Lederer –Manasse reaction and Gattermann aldehyde synthesis. Nitro Compounds: Aliphatic nitro compounds: Nitromethane and Nitroethane- preparation and properties. Nitro-Acinitro tautomerism. Aromatic nitro compounds : Reduction of Nitrobenzene in neutral, acidic and alkaline media. Preparation of ortho,meta and para dinitrobenzene,T.N.T.	16
Unit IV	Amines: Aliphatic amines: separation of mixture of amines, Basicity of amines. Aromatic amines: Preparation and properties of ortho, meta and para phenylene diamines. Conformational analysis: Conformations of Ethane, n- Butane and Cyclohexane. Stereoisomerism.: Types, R,S,-configuration, E-Z notation, optical isomerism in lactic acid and tartaric acid, racemisation, resolution, asymmetric synthesis. Geometrical isomerism in maleic and fumaric acid.	15
Unit V	Phase rule and phase equilibria: Concept of phase, components and degrees of freedom with examples. Thermodynamic derivation of Gibbs-Phase Rule.	16

	One component system : Phase diagram and discussion of water and sulphur system. Two component system : Construction of phase diagram by thermal analysis. Simple eutectic- Pb-Ag System. Formation of compounds with congruent melting point: Zn-Mg system. Formation of compounds with incongruent melting point: Na-K system. Salt- Water system: Potassium Iodide-Water system.	
	Total hours/Semester	78
Text Books	1. Soni. P.L.,(2002). Text book of Inorganic Chemistry, Sultan Chand & Sons, 20th edition, Reprint 2. Bahl, B.S and Arun Bahl, (2007). A textbook of Organic Chemistry, 18th Edition. S.Chand & Co. 3. Soni P.L, (2012). Text book of Organic Chemistry, 29th Revised Edition, Sultan Chand & Sons, New Delhi. 4. Puri B.R.,Sharma. L.R and Madan S. Pathania, (2013) Principles of Physical Chemistry, 46th Edition Vishal Publishing House, Jalandar.	
Reference Books	1. Finar, I.L., (2003) "Organic Chemistry",Vol. I, Pearson Education, Singapore . 2. Morrison, R.T. and Boyd, (2003) Organic Chemistry, 6th Edition ,Pearson Education, Singapore.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY507	Semester: V
Title	CORE PAPER – V NUCLEAR CHEMISTRY AND CO-ORDINATION CHEMISTRY	
Hrs/Week	4	Credit: 4
Objectives	(i) To understand the theory of radioactivity. (ii) To have knowledge on uses of radio active-elements in various fields (iii) To understand various theories of bonding in coordination compounds and their importance. (iv) To know the chemistry of carbonyls, basic knowledge on Metallic bonding and semiconductors.	
Unit	Content	Hrs
Unit I	Radio activity. Mass defect, packing fraction. Nuclear binding energy, n/p ratio and stability of the nucleus. Differences between nuclear and chemical reactions. Half- life period. Applications of artificial radioactivity : Age of the earth and C¹⁴ dating, medical field applications Isotopes: Detection of isotope by Aston Mass Spectrograph. Separation of isotopes by Electromagnetic, Thermal diffusion and Electrolytic techniques. Nuclear fission and fusion. Types of nuclear wastes and different methods of disposal of High and low radioactive wastes.	10

Unit II	Co-ordination chemistry: Basic concepts of Co-ordination Chemistry. Definitions of the terms: Ligands and Co-ordination number. Classification of ligands. Nomenclature of Co-ordination compounds. Theories of Co-ordination compounds: Werner's Theory: Designation of Cobalt (III)-ammine complexes. Sidgwick's Theory: Electronic interpretation of Co-ordination bond - Effective atomic number rule. Pauling's valence bond theory: Postulates and its applications in the determination of geometry and magnetic property of the complexes	11
Unit III	. Crystal field theory: Postulates. C.F.T- splitting of d-orbital in tetrahedral and Octahedral complexes. C.F.T.stabilization energy. Spectrochemical series. Chelates: Definition, classification, stability factors ,sequestration and sequestering agents. Detection and structure determination of Complexes: Solubility method, change in colour, pH measurements and conductance measurements.Molecular orbital theory –concepts and Molecular orbital energy level diagram for $[\text{Co}(\text{NH}_3)_6]\text{Cl}_2$ complex.	11
Unit IV	Isomerism in Co-ordination compounds: Structural isomerism: Ionisation, Hydrate and Linkage isomerism. Stereo isomerism: Geometrical isomerism in 4 and 6 - Co-ordination complexes. Optical isomerism in 4 -and 6- Co-ordination compounds. Applications of complexes in quantitative analysis: Estimation of Ni using D.M.G. and Mg using Oxine. Ligands substitution in octahedral complexes: Inert and Labile complexes – Nucleophilic ligands substitution reactions, S_{N}^1 and S_{N}^2 mechanisms. Substitution reactions with out breaking Metal-Ligand	10

	bond. Tran's effect in square planar complexes: Definition , trans effect series and uses of trans effect .	
Unit V	Carbonyls Compounds: Mono and Binuclear carbonyls of $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Fe}_2(\text{CO})_9$, $\text{Co}_2(\text{CO})_8$, and $\text{Cr}(\text{CO})_6$ - synthesis, properties and structure. Metallic bond: Electron Sea model, Valence bond theory and Band theory. Semiconductors: Intrinsic and Extrinsic Semi Conductors - n-type and p-type - Properties and uses. Structures of alloys-Interstitial- substitution –intermetallic alloys	10
	Total contact Hrs/Semester	52
Text Books	1. Puri and Sharma and.Kalia. K.C., (2013) Principles of Inorganic Chemistry, 31st Edition, Milestone Publishers and Distributors. 2. Soni. P.L., (2012)Text book of Inorganic Chemistry, 20th edition Sultan Chand & Sons. 3. Madan, Malik and Tuli., (2006).Selected Topics in Inorganic Chemistry, Sultan Chand & Sons.	
Reference Books	1. Lee. J.D., (2006).Concise Inorganic Chemistry., 5 th Edition ,Black Well Science Ltd., London.	

	2. Jain. P.C. and Monika Jain, Compiled by Trishla Jain and Jyothika Jain, (2005).Engineering Chemistry, 15th Edition, Dhanpat Rai Publishing Company (P) Ltd. 3. Gopalan. R. and Ramalingam V., (2006)Concise Coordination Chemistry, 3rd Edition,. Vikas Publishing house.	
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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019
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Subject code	16 UCY508	Semester: V
Title	CORE PAPER – VI ORGANIC CHEMISTRY - I	
Hrs/Week	4	Credit: 4
Objectives	(i) To understand the mechanism in molecular rearrangement (ii) To learn about the importance of the heterocyclic compounds (iii) To gain more knowledge about carbohydrates and natural products	
Unit	Content	Hrs
Unit I	Molecular Rearrangements: Pinacol - Pinacone. Beckmann, Hoffmann, Curtius, Benzidine, Benzilic acid, Schmidt and Fries rearrangements. Pericyclic reactions with reference to Cope and Claisen rearrangement.	10
Unit II	Heterocyclic Compounds: Chemistry of Furan, Pyrrole, Thiophene, Pyridine, Quinoline, Isoquinoline and Indole. Pyrazole - Preparation and properties. Antipyrine - preparation and use.	10
Unit III	Carbohydrates: Classification, chemistry and structural elucidation of Glucose and Fructose, configuration of Monosaccharides and interconversion in sugar series. [Glucose to Fructose and vice versa, Glucose to Arabinose and vice versa] Mutarotation and epimerization. Sucrose, Maltose and Lactose, Saccharin – Preparation, Properties and uses [Structural elucidation is not needed].	11

Unit IV	Alkaloids: Definition, occurrence and extraction of alkaloids from plants. General methods of determining structure. Determination of structure of Conine, Piperine, Papaverine and Nicotine .	11
Unit V	Terpenes: Classification, isoprene rule and Gemdialkyl rule, Extraction from plants, structural elucidation of Citral, Camphor, α - terpineol and Menthol. Stereochemistry of Menthol.	10
	Total hours/Semester	52
Text Books	Bahl, B.S. □ Arun bahl, (2010). Advanced Organic Chemistry, S.Chand & Co., New Delhi. 2. Soni. P.L., (2012).Text book of Organic Chemistry, 29 th revised edition, Sultan Chand & Sons, New Delhi.	
Reference Books	1.Gurtu. J.N. and Kapoor. R (1998) Organic Reactions and Reagents, 1 st Edition, S.Chand & Company, Newdelhi. 2. Gurdeep. R. Chatwal., (2004) Organic Chemistry of Natural Products, Volume I and II, 30 th Edition, Goel Publishing House, 3. Finar. I.L., (2006.) Organic Chemistry, ELBS Edition, Volume I and II,	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY509	Semester: V
Title	CORE PAPER – VII ELECTROCHEMISTRY	
Hrs/Week	4	Credit: 4
Objectives	(i) To understand the principles and applications of conductance measurements (ii) To understand the concepts between electrochemistry and thermodynamics. (iii) To apply electro chemical principles to fuel cells, batteries and mechanism of corrosion	
Unit	Content	Hrs
Unit I	Electrolytic Conduction and Electrolysis: Faradays Laws of electrolysis. Measurement of conductivity in electrolytic solution. Variation of conductance with concentration. Transport Number: Determination of transport number by the Hittorf's method and the Moving Boundary Method. Kohlrausch's law of independent migration of ions. Calculation of equivalent conductance at infinite dilution for weak electrolytes and calculation of molar ionic conductances. Arrhenius theory of electrolytic dissociation and the Ostwalds dilution law. Debye -Huckel theory of strong electrolytes. Explanation and Debye Huckel Onsager equation for the equivalent conductivity of strong electrolytes.(Derivation not required).Wein and Debye Falkenhagen effect.	10

Unit II	Applications of conductance measurements: Determination of degree of dissociation of weak electrolytes, determination of ionic product of water, determination of solubility of sparingly soluble salts and conductometric titrations. Electrochemical cells: Nernst Equation, EMF of a cell and it's measurement. Thermodynamic quantities of cell reactions: ΔH, ΔS and ΔG from EMF data. Reversible electrodes and their types: Metal - Metal ion, Metal - insoluble salt, Gas - ion and redox electrodes. Single electrode potentials, standard electrode potentials, electrochemical series, computation of standard EMF and writing cell reactions.	11
Unit III	Electrodes for the measurement of pH: Hydrogen gas electrode, Quinhydrone electrode and glass electrode Buffer solution: Buffer action, Henderson's equation and the evaluation of the dissociation constant. Acid-Base Indicators: Theory of Acid-Base Indicators. Acid-Base Titrations and use of Indicators. Hydrolysis of Salts: Degree of hydrolysis, Relationship between K_h, K_w and the dissociation constant for salts such as sodium acetate, ammonium chloride and ammonium acetate.	10
Unit IV	Electrochemical cells: Concentration cells with and without transference. Liquid junction potential - Formation and elimination. Applications of EMF measurements: Calculation of valency of ions in doubtful cases (Hg^+/Hg^{2+}), equilibrium constant of an electrochemical reaction, determination of transport number, determination of solubility	11

	of sparingly soluble salts.	
Unit V	Batteries: Dry Cell, Lead-Acid storage cell and Nickel- Cadmium accumulator. Fuel Cell: Hydrogen - Oxygen fuel cell. Hydrogen over voltage: Measurement and its application to metal deposition. Electrochemical corrosion: Mechanism, Galvanic and differential aeration corrosion. Prevention of corrosion: Proper designing, using pure metal, using metal alloys, cathodic protection, modifying the environment and uses of inhibitors. (Brief account only) Metallic coatings: Anodic and cathodic coatings. Method of application of metallic coatings: Hot dipping and electro plating. (Nickel and chromium plating).	10
	Total hours/semester	52
Text Books	1. . Puri, Sharma and Pathania., (2007). Principles of Physical Chemistry, Millennium Edition, Vishal Publishing House, 2. Soni. P.L. and Dharmarha. O.P., (2005.) Text book of Physical Chemistry 7th Edition, Sultan Chand & Sons. 3. Jain. P.C. and Monica Jain., (2005) Engineering Chemistry, 17th Edition,. Dhanpat Rai Publishing Company(P) Ltd..	
Reference Books	1. Samuel H. Maron. and Carl F. Prutton., (1972). Principle of Physical Chemistry, 4th Edition, Amerind publishing Co. Pvt. Ltd., 2. Negi. A.S. and Anand. S.C., (1995), A Text book of Physical Chemistry, 4th Edition, New Age International (P) Ltd. 3. Atkins. P.W., (1987). Physical Chemistry, ELBS/ Oxford University Press,	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY510	Semester: V
Title	CORE PAPER- VIII DYE CHEMISTRY	
Hrs/Week	4	Credit: 4
Objectives	i) To understand the theoretical concepts in dyes. ii) To know the classification and application of different dyes. iii) To help the students to opt their career as dye chemists in dyeing and textile industry.	
Unit	Content	Hrs
Unit I	Electromagnetic spectrum: Various regions. Relationship of colour observed to wavelength of light absorbed. Complementary colours. Terms used in dye chemistry - Chromophores, Auxochrome, Bathochromic shift, Hypsochromic shift, Hypochromic shift and Hyperchromic shift. Requisites of a true dye: Classification of dyes according to their chemical constitution and mode of applications. Theories of colour and constitution: Witt's theory, Quinonoid theory and Molecular orbital theory of various transitions.	10
Unit II	Nitro dyes: Picric acid, Martius yellow, Naphthol Yellow S – synthesis and applications. Nitroso dyes: Fast Green O, Naphthol Green Y - synthesis and applications	10

	Azo dyes: Diazotisation, Mechanism of diazotization, Effects of substituents on diazotization. Diazo coupling and coupling with phenols and Amines. Classification of azo dyes as monoazo and bisazo dyes. Synthesis and applications of important azo dyes: Methyl orange, Orange I, Orange II, Metanil yellow, Eriochrome Black – T, Bismark brown and Congo red.	
Unit III	Diphenyl methane dyes: Auramine O and Auramine G - synthesis and uses. Triphenyl methane dyes: Malachite green, Rosaniline, and Crystal violet - Synthesis and uses. Phthalein and Xanthene dyes: Phenolphthalein, , and Rhodamine B - Synthesis and uses. Indigoid dyes: Indigotin – Synthesis and application to fibre. Indigosol O -Synthesis.	11
Unit IV	Anthraquinone dyes: Anthraquinone acid dyes – Alizarin cyanine green and Solway ultra blue B, Mordant dyes – Alizarin and Alizarin Blue, Vat dyes- CI Vat Blue 43 and Carbazole and Disperse dyes - Disperse Red 15. Organic Pigments: Characteristics of pigments, uses of pigments. Types of Pigments - Lakes, Toners. Ionic and non-ionic Pigments. Phthalocyanines. Fluorescent brightening agents. Classification and properties. Fluorescent brighteners for a. cellulosic fibers b. acrylic fibers	10

Unit V	Types of textile fibres: Natural, Semisynthetic and Synthetic fibres – Cotton, Wool, Silk, Cellulose acetate, Viscose rayon, polyamides, polyacrylonitrile and polyester. Binding of dyed with fibre- Ionic forces, Hydrogen bonds, Vander Waals forces, Covalent bonds. Selection of dyes for different fibre, Fastness properties of dyes. Process of dyeing: A simple treatment, various methods of dyeing - Direct dyeing, Mordant dyeing, Vat dyeing, Disperse dyeing. Formation of dye on the fibre. Pollution problems in dyeing industry. Non-textile uses of dyes: Uses of dyes in leather, paper, foods and drugs, colour photography and indicators.	11
	Total contact Hrs/Semester	52
Text Books	1. Tyagi. O.D., Yadav,. M.A., (2001).Text Book of Synthetic Dyes, 1st Edition, Anmol publications Pvt. Ltd., 2. Bahl and Arun Bhal. B.S., (2007).Advanced Organic Chemistry, 1st Edition,S.Chand & Company Ltd.	
Reference Books	1. Rao. R.S., Dr.Vidya Chawathe and. Shah. S.J., (1997).An Introduction to Synthetic Drugs and Dyes, 3rd Edition, Himalaya publishing House. 2. Lubs. H.A., (1977) The Chemistry of Synthetic Dyes and Pigments, 1st Edition, Robert E.Krieger Publishing Company. 3. Arora. M.G., (1996).A Text Book of Synthetic Dyes, 1st Edition, Anmol publications Pvt.Ltd.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY511	Semester: V
Title	CORE ELECTIVE PAPER -1 ANALYTICAL CHEMISTRY	
Hrs/Week	4	Credit: 4
Objectives	To learn instrumentation, basic principles and applications of modern analytical tools such as thermo gravimetry, polarimetry, nephelometry, flame photometry, polarography, eletrogravimetry and chromatography.	
Unit	Content	Hrs
Unit I	Data Analysis: Definition and terms – absolute and relative error. Precision and accuracy. Classification of errors. Sources and minimisation of errors. Significant figures. Gravimetric Analysis: Precipitation methods. Conditions of precipitation, coprecipitation and post precipitation. Precipitation from homogeneous solution. Washing of the precipitate. Organic precipitants – DMG, Cupron, Cupferron, oxine and salicylaldoxime.	10
Unit II	Thermogravimetric Analysis (TGA): Principle, factors affecting thermogravimetric curves. Applications: Evaluation of gravimetric precipitation, curie point determination and study of organic compounds. Electrogravimetry- principle only Differential thermal analysis (DTA): Principle, factors affecting the	10

	DTA curve. Applications: heat of reaction, specific heat and quality control. Thermometric titrations (TTA): Principle and applications of thermometric titrations.	
Unit III	Polarimetry: Theory and instrumentation. Comparison of acid strength using polarimeter. Nephelometry and Turbidimetry: Theory and principles. Applications: Inorganic analysis, turbidimetric titrations and phase titrations. Flame photometry: Theory and Principle. Applications: Qualitative and Quantitative analysis.	10
Unit IV	Polarography: Principle, dropping mercury electrode – advantages and disadvantages Experimental assembly, current – voltage curves. Significance of Ilkovic equation. (derivation not required) Half wave potential. Application of this technique in qualitative and quantitative analysis. Amperometric Titrations: Principle, apparatus and technique. Dead stop end point method. Advantages and disadvantages of amperometric titrations.	11
Unit V	Chromatographic techniques: Paper Chromatography: Principle, RF value and experimental details. Applications in qualitative and quantitative analysis. Thin Layer Chromatography: Principle, brief account of experimental details and its advantages. Applications in the separation of amino acids Column Chromatography : Principle, experimental details, factors affecting the column efficiency and applications. Ion Exchange Chromatography: Principle, resins, action of resins and applications in softening of hard water.	11
	Total hours/Semester	52

Text Books	1. Chatwal and Anand (Main Reference), (2005).Instrumental Methods of Chemical Analysis, 5 th Edition, Himalaya publishing House, 2. Arthur. I.Vogel., (1964).Inorganic Quantitative Analysis, 3 rd Edition, 3. Khopkar., (1992).Basic concepts of Analytical Chemistry, 3 rd Edition,Wiley Eastern Ltd.,	
Reference Books	1. Usharani. S., (2000).Analytical Chemistry, 1 st Edition, Macmillan India Ltd .	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY5S1	Semester: V
Title	SKILL BASED ELECTIVE- I FOOD CHEMISTRY	
Hrs/Week	1	Credit: 2
Objectives	1. To learn about the importance and the basic principles of food processing. 2. To create awareness on safety of food supply. 3. To know the practical methods of home preservation of foods.	
Unit	Content	Hrs
Unit I	Food: Definition for food and nutrition. Functions of food and nutrients. Energy values of foods. Recommended dietary intake, functions and deficiency of the following: Carbohydrate, fat, proteins, vitamins, minerals.	2
Unit II	Food Preservation: Principles and importance of food preservation. Methods of food preservation: Bacterostatic Methods: Dehydration, pickling and salting Bacterocidal Methods: Canning and cooking.	3
Unit III	Milk Processing - Pasteurisation. Brief account of dairy products- Butter, cream, cheese, condensed milk and milk powder. Food Additives: Food preservatives, food colours, food enzymes and antioxidants.	3

Unit IV	Food adulteration: Adulterants and their effects. Incidental and intentional adulterants, metallic contamination. Simple physical and chemical tests for detection of food adulterants. Packaging hazards. Food poisoning and food borne diseases.	2
Unit V	Packaging hazards. Food Laws: FSSAI Food Standard: ISI standards and the Agmark standards. Functions of Food Corporation of India. Outlines of Preparation and bottling of Fruit squashes, fruit juices, pickles, jams and jellies.	3
	Total hours/Semester	13
Text Books	1. Swaminathan M., (1977) Essentials of Food and Nutrition, 2 nd Edition, Ganesh Publishers, Madras, Volume I and II, 2. Sumati R. Mudambi and Rajagopal M.V., Fundamentals of Foods and Nutrition, Wiley Eastern Ltd., New Delhi.	
Reference Books	1. Subbulakshmi. G. and Shobha A. Udipi, Food Processing and Preservation, New Age International Publishers, New Delhi. 2 Jayashree Ghosh., (2006)Applied Chemistry, 1 st Edition,S.Chand and company Ltd., New Delhi, 3. Mahindru S.N., (2000) Food Additives, Tata Mc Graw- 1 st Edition,Hill Publishing Company Ltd.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY5S2	Semester: V
Title	SKILL BASED ELECTIVE – I FOR MAJOR STUDENTS Nanochemistry	
Hrs/Week	1	Credit: 2
Objectives	1. To make the students more competent in Nanochemistry and acquire skills to become employable by learning this cutting edge technology.	
Unit	Content	Hrs
Unit I	Nano and nature -Diversity in Nanosystems. Significance of Nanomaterials.Fullerenes-introduction – Preparation by Pyrolysis and purification of fullerenes Chemistry of fullerenes in the condensed phase.	3
Unit II	Carbon Nanotubes- Introduction – Preparation by Chemical Vapour deposition and purification– Tungsten Sulphide and Titanium dioxide.	2
Unit III	Fabrication techniques, imaging and manipulation tools at the nanoscale- nanoscale Devices and circuits. (e.g.) FETs, Quantum dots.	2
Unit IV	Nano medicine and its importance in medical diagnostics , molecular therapeutics - Nano electronic – Nano optical and Nano chemical.	3
Unit V	Molecular manufacturing – Nano / molecular communication – Nano navigation – Nano scale manipulation and control Nano robots for medical application.	3
	Total hours/Semester	13
Text Books	1. Sulabha. K.K., (2007) Elements of Nanotechnology, M/S IBD	

	.Publications New Delhi,	
Reference Books	1. Pradeep.T., Nano : (2007)The essentials, Tata McGraw Hill Publishing Co. Ltd. New Delhi.,	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY612	Semester: VI
Title	CORE PAPER -XI PHYSICAL METHODS AND CHEMICAL STRUCTURE	
Hrs/Week	4	Credit: 4
Objectives	(i) To acquire knowledge regarding the methods based on relationships between structural features and physical properties (ii) To gain knowledge regarding the structural elucidation (iii) To acquire basic knowledge on analytical tools like rotational spectroscopy, UV-Visible, PMR, Mass and ESR.	
Unit	Content	Hrs

Unit I	Absorption Spectroscopy: Types of changes induced by the interaction of electromagnetic radiation with matter. Theoretical principles of spectroscopy: Microwave Spectroscopy: Theory, Rigid and non-rigid rotar models, patterns of spectral lines, Determination of bond length and accurate mass of atom. IR spectroscopy: Theory, Molecular vibrations, vibrational degrees of freedom, Harmonic and anharmonic oscillator model. Force constant, Vibrational frequency, Pattern of spectral lines of harmonic oscillator, Overtones and combination bands, Basic concepts of fingerprint region.	10
Unit II	Raman spectroscopy: Origin of Raman lines - stokes and anti-stokes line. Characteristics of Raman lines, Mechanism of Raman effect, Differences between Raman and Infrared spectra. UV and Visible Spectroscopy: Theory, types of electronic transition, chromophore, auxochrome, intensity shifts, absorption bands and intensity. Applications of UV and Visible Spectroscopy : Franck – Condon principle, pre-dissociation spectra, Birge-Sponer method of evaluation of dissociation energy from electronic spectra. Woodward Fischer rule of calculation of absorption maxima in dienes.	11
Unit III	NMR: Theory, chemical shift, Anisotropy and inductive effect, splitting of signals, spin-spin coupling, coupling constant (elementary ideas). Application of NMR in the study of simple molecules (Ethanol, Ethyl bromide , Benzene, Toluene, Xylene and Mesitylene). ESR: Theory, Difference between ESR and NMR, ‘g’ factor, derivative curves. Hyperfine splitting, line width. Application to species $\text{CH}_3^\bullet$ and Mn^{2+} ion.	10
Unit IV	Solid State Chemistry: Geometrical requirement in close packed structures. Packing in ionic crystals. Simple cubic, body centered cubic and hexagonal close packed structure – crystal structures of NaCl and ZnS. Defects in crystals - Point defects, Schottky defects, Frenkel defects, metal excess defects, metal deficiency defects.	11

	The radius-ratio rules, Crystal structures covalent compounds: Diamond and graphite. Space lattice, crystal system, Law of rational indices, Miller indices. X-Ray examination of crystals by Debye-Scherrer method.	
Unit V	Electrical properties of Molecules: Polar and non-polar molecules, Dipolemoment, Meaning of the terms – total molar polarisation, orientation polarisation and distortion polarisation. Effect of temperature on Molar polarization. Determination of dipolemoment of polar gas, Application of dipolemoment in the study of simple molecules. Magnetic properties of molecules: Meaning of the terms – magnetic susceptibility, magnetic permeability, magnetic moment. Diamagnetism, Paramagnetism and Ferromagnetism. Curie-Weiss Law. Determination of magnetic susceptibility of paramagnetic substance using Guoy balance. Application of magnetic properties in solving structural problems involving in simple and complex molecules.	10
	Total hours/Semester	52
Text Books	1. Puri, Sharma and Pathania., (2007). Principles of Physical Chemistry, Millennium Edition, Vishal Publishing House, 2. Sharma. Y.R., (2007), Elementary Organic Absorption Spectroscopy, 3rd Edition, Sultan Chand & Sons. 3. Gurdeep Chatwal & Sham K. Anand., (2005), Instrumental Methods of Analysis, 5th Edition, Himalaya Publishing House.	
Reference Books	1. Soni. P.L, (2002), Text book of Organic Chemistry, 28th Revised Edition, Sultan Chand & Sons. 2. William Kemp., (1985), Organic Spectroscopy, ELBS edition,. 3. Manas Chanda., (1988) Atomic Structure and Chemical bonding 2nd Edition,, T ata Mc Graw Hill Company.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY613	Semester:VI
Title	CORE PAPER X ORGANIC CHEMISTRY - II	
Hrs/Week	4	Credit:4
Objectives	As a basis to molecular genetics and to help students to opt their career as biotechnologists, pharamacologists or medical representative, topics on Nucleic acid, Proteins, lipids, vitamins, chemotherapy and common drugs used are included.	
Unit	Content	Hrs
Unit I	i) Solving problems of structures of organic compounds based on reactions of the following: Aldehydes, Ketones, Amines, Nitrocompounds, Phenols and Acids. ii) Polynuclear hydrocarbons: Condensed system – Naphthalene , Anthracene and phenanthrene-Preparation, properties and uses. Structural elucidation of Naphthalene and Anthracene	11
Unit II	i) Amino acids: Classification, Glycine and Alanine: Properties and synthesis by the following methods: Amination of α - halogen acids, Gabriel's phthalimide synthesis and Strecker synthesis. Synthesis of polypeptides by carbobenzoxy method. ii) Proteins: Classification, primary and secondary structure of proteins, denaturation and biological functions of proteins. Terminal residual Analysis: N-Terminal end by Sanger's method. C-Terminal end by reduction method.	10
Unit III	i) Nucleic Acids: Carbohydrates present in nucleic acids. Nitrogen bases present in nucleic acids. Nucleosides-Examples. Nucleotides-Examples .Functions of nucleotides. Nucleotide as energy carriers.	11

	Structure of DNA. Replication of DNA. Functions of DNA. ii) Lipids: Classification according to Bloor. Sources, extraction. Properties and analysis of oils and fats.	
Unit IV	Vitamins: Introduction, fat and water soluble vitamins, occurrence, deficiency diseases. Synthesis of the following: Vitamin A1(retinol), Vitamin B1, Pyridoxine and Ascorbic acid.	10
Unit V	Chemotherapy: Introduction, classification of drugs. i) Sulphadugs: Mode of action. Structure and uses of sulphanamide , sulphapyridine, sulphadiazine, sulphaacetamide, sulphathiazole and sulpha guanidine. ii) Antimalarials: Classification, structure and uses of chloroquine and pamaquine. iii) Antiseptics: Definition, structure and uses of chloramine-T and Iodoform iv) Anaesthetics: characteristics, structure and uses of Procaine and Pentothal sodium. v) Antibiotics: Introduction, structure and uses of Penicillin and Tetracycline. (Note: Structural elucidation of drugs not required)	10
	Total hours/Semester	52
Text Books	1.Soni. P.L. and Chawla. H.M., (1992) Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi, 2. Gurdeep R. Chatwal., (2006) Organic Chemistry of Natural Products, Volume II, Edition Himalaya Publishing House. 3. Bahl. B.S and Arun Bhal., (2007). Advanced Organic Chemistry, 1 st Edition, S.Chand & Company Ltd .	
Reference Books	1. Finar I.L, (2006.)Organic Chemistry., Volume I, 4th.edition Longmans	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY614	Semester: VI
Title	CORE PAPER XI CHEMICAL KINETICS AND PHOTOCHEMISTRY	
Hrs/Week	4	Credit: 4
Objectives	i) To understand the concept of rate of reaction ii) To derive rate equations of various orders iii) To understand the effect and consequence of radiation on molecular level iv) To get basic knowledge in adsorption theories.	
Unit	Content	Hrs
Unit I	The concept of Reaction Rate, Rate law and Rate equation. Factors influencing rates of chemical reactions. Order and Molecularity of a reaction. Setting and solving simple differential equations for first order, Second order and Zero order reactions. Pseudounimolecular reactions. Half-life time of a reaction – Expressions for $t_{1/2}$ - for first, second and n^{th} order reactions. Experimental techniques for measuring reaction Kinetics – Volumetry and Polarimetry.	11
Unit II	Methods of determining order of a reaction – Differential rate expressions, Integral rate expressions and Half-life method. Equilibrium approximation and Steady state approximation. Effect of Temperature on reaction rates – Temperature co-efficient, The Arrhenius equation – Derivation, activation energy and its determination. Theories of reaction rates: Lindemann theory of Unimolecular reactions and Absolute reaction rate theory. Comparison of ARRT and Lindeman's theory.	11

Unit III	Catalysis: General characteristics of Catalytic reactions. Types of catalysis – Theories of Homogeneous and Heterogeneous catalysis- Kinetics of acid – base catalysed reactions. Enzyme catalysis: Kinetics of enzyme-catalysed reactions – Michaelis- Menten equation. Effect of Temperature and pH on enzyme catalysis. Adsorption: Chemisorption and physisorption, Adsorption of gases by solids. Factors affecting adsorption – Types of adsorption isotherms – Freundlich adsorption isotherm – Langmuir adsorption isotherms.	10
Unit IV	Photochemistry: Consequence of light absorption – The Jablonski diagram, Laws of Photochemistry - Lambert and Lambert-Beer's laws, Grothus-Draper law, The Stark-Einstein law of photochemical equivalence, Quantum efficiency and its experimental determination. The photochemical rate law: Kinetics of $H_2 - Cl_2$ reaction, Kinetics of H_2-Br_2 reaction, Comparison of thermal and photochemical reaction. Photosensitization, Chemiluminescence. Lasers and their uses (Elementary idea only).	10
Unit V	Colloids: Classification, preparation and application of colloids, Properties of colloids: Optical properties: Tyndall effect and Brownian movement. Electrical properties: Charge on colloidal particle, Electrical double layer and Zetapotential. Electrokinetic properties: Electro osmosis and Electrophoresis. Emulsions: Preparation, Properties and Application. Gels: Properties and Application.	10
	Total hours/Semester	52
Text Books	1. Puri. B.R., Sharma. L.R. and Madan S.Pathania., (2007). Principles of Physical Chemistry, Millennium Edition,Vishal Publishing House. 2. Gurdeep Raj., (1997). Chemical Kinetics, 6th Revised Edition, Goel publishing house unit of Krishna Prakashan Media (P) Ltd. 3. Jain and Jain., (2005). Engineering Chemistry, 5th Edition, Dhanpat	

	Rai Publishing Company (P) Ltd .	
Reference Books	1. Samuel H.Maron and Carl F.Prutton., (1972) Principle of Physical Chemistry, 4th Edition ,Amerind publishing Co. Pvt.Ltd. 2. Negi. A.S. and Anand.S.C., (1995) A Text book of Physical chemistry, 4th Edition,.New Age International (P) Ltd . 3. Chakrabarty. D.K., (1996) An introduction to Physical Chemistry, Narosa Publishing House, ISBN – 81-7319-393-2.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019
		Batch
Subject code	16UCY615	Semester: VI
Title	CORE ELECTIVE PAPER - II POLYMER CHEMISTRY	
Hrs/Week	4	Credit: 4
Objectives	1. To highlight the commercially important polymers and their various forms. 2. To understand various industrial polymerization processes. 3. To highlight on average molecular weights. 4. To know preparation and properties of commercially important polymers.	
Unit	Content	Hrs
Unit I	Basic Concepts: Monomers, Polymers, Polymerization, Degree of polymerization. Classification of polymers: Plastics: Definition – Thermoplastic, Thermosetting plastics, Reinforced Plastic. Elastomers: Definition – Natural & synthetic rubber – smoked rubber Reclaimed rubber – Foam rubbers – Spongy rubber – Laminate rubber. Adhesives: Definition – thermosetting – thermo resins. Fibres: Definition – Natural and synthetic. Classification: comfort – safety – Industrial fibres. Thermal stabilisers- Antioxidants-photostabilisers. Polymerization Techniques: Bulk, Solution, Suspension and Emulsion Polymerization.	11
Unit II	Different types of polymerisation: Addition Polymerization & Condensation polymerization. Types of Initiators. Inhibitors. Chain transfer agents. Addition Polymerization – Free radical Mechanism Ionic Polymerisation: Anionic and Cationic Polymerizations.	10

	Step growth of polymerisation (Condensation polymerisation) Co-Polymerisation: Random - Alternating – Block and Graft co polymers.	
Unit III	Stereo Regular Polymers: Isotactic, syndiotactic & Atactic. Geometrical isomers. Factors influencing Structural regularity. Ziegler – Natta Catalysts – Bi metallic and Mono metallic mechanisms. Glass transition temperature (T_g) and T_m. Determination of T_g by differential scanning calorimeter. Factors affecting T_g T_g of copolymers. Degradation - Types of degradation - Thermal., Photo, High energy radiation and Oxidative	11
Unit IV	Molecular weights of polymers: Number-Average, Weight-Average, Sedimentation-Average & Viscosity-Average molecular weights. Molecular weight distribution – GPC method .Determination of Average molecular weight: Ebulliometry method, Cryoscopy method, osmometry method, Light Scattering method and Viscosity method	10
Unit V	Polymer processing techniques: Calendaring, film casting, compression moulding, injection moulding, blow moulding, extrusion moulding foaming and filament winding technique Preparation and uses of the following polymers: Polyethylene (LDPE & HDPE), P.V.C, Teflon, polystyrene, Nylon-6, Nylon-6, 6, Polyester, Phenol formaldehyde resins and Polycarbonates.	10
	Total hours/Semester	52
Text Books	1. Gowariker.V.R.,. Viswanathan. N.V, Jeyadev Sreedhar, (1999). Polymer Science, 13th reprint, New Age International (P) Limited, Publishers. 2. Fred.W.Billmeyer, Jr., (2011).Text Book of Polymer Science, 2nd edition, Wiley –Interscience and Sons.Inc 3. Jain. P.C.and Monika Jain., Compiled by Trishla Jain and Jyothika	

	Jain, (2005)Engineering Chemistry15th Edition, Dhanpat Rai Publishing Company (P) Ltd . 4.Madan.R.L., and Tuli.G.D.(1999),Physical chemistry, I edition , S.Chand and Company Ltd .	
Reference Books	1. Misra. G.S. (1989).Polymer Chemistry, 2nd Reprint,New age International(P) Ltd . 2. Charles G.Geberlein, Brown. Wm.C., (1997) ,Chemistry and Our World, Publishers(Singapore), ISBN 069716574-4, 3. M.Gopala Rao and Marshall Sitig, (1997).Drydens Outlines of Chemical Technology for the 21st Centuary, 3rd Edition, East-West Press.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019
		Batch
Subject code	16UCY616	Semester: VI
Title	CORE ELECTIVE PAPER- III PROGRAMMING IN - C	
Hrs/Week	4	Credit: 4
Objectives	1. To understand C concept in detail 2. To apply C concept to solve the problems in chemistry.	
Unit	Content	Hrs
Unit I	History of C - Importance of C - Character set - Keywords - C - Program structure - Data types, variables and constants. Operators - Arithmetic, Relational, Logical, Assignment, Increment and decrement, conditional and Special Operators. Arithmetic expressions - evaluation of expressions - precedence of Arithmetic operators - type conversions in expressions - operator precedence and associativity in mathematical functions.	10
Unit II	Managing input and output operations: Reading and Writing a character - Formatted input and output. Decision making and branching: Decision making with IF Statement - Simple IF Statement, the IF ELSE statement, Nesting of IF... ELSE Statements, the Else if Ladder – the switch statement - the conditional operator – the GO TO Statement. Decision making and looping :	11

	The WHILE Statement - the DO Statement – the FOR Statement.	
Unit III	Arrays and string functions: One dimensional arrays - Two dimensional arrays - initializing two dimensional arrays–Multidimensional arrays Strings and string functions: Declaring and initializing string variables – Reading strings from Terminal - Writing strings to screen - string handling function.	10
Unit IV	User - defined functions: Introduction - Multifunction program - Return values and their types - Calling a function - Category of functions - No arguments and no return values - Arguments but no return values - Arguments with return values, No Arguments but return values - Recursion. Structures: Structure definition - giving values to members - structure initialization - comparison of structure variables - arrays of structure - arrays within structures.	11
Unit V	Pointers: Introduction - Accessing the address of a variable - Declaring and initializing pointers - Accessing a variable through its pointer - Pointer expressions - Pointers and arrays. File management in C : Introduction - Defining and opening a file – closing a file - input/output operations on files – Error handling during I/O operations - Random access to files.	10
	Total hours/Semester	52

Text Books	1. Balagurusamy, E., (2004), Programming in C, Tata McGraw-Hill Education,	
Reference Books	1. Yashavant P.Kanetkar, (2008).Let us C, 5 th Edition, Infinity Science Press. 2.Kernighan, B. W. and D. M. Ritchie, (1978) ,The C Programming Language. Prentice-Hall,	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY6S3	Semester: VI
Title	SKILL BASED ELECTIVE – II GREEN CHEMISTRY	
Hrs/Week	1 Hour / 6 days	Credit: 2
Objectives	To learn the principles of green chemistry. To make awareness on environment friendly technologies and working conditions. To teach clean, eco-friendly and less wasteful manufacturig process for the sustainable development of our country To stimulate research in the field of green chemistry.	
Unit	Content	Hrs
Unit I	The need for green chemistry: Sustainability and cleaner production. Green chemistry and Eco- efficiency. Environmental Protection Laws. Challenges ahead for a chemist. Green chemistry education.	3
Unit II	Twelve Principles of Green Chemistry- Explanation with examples. Awards for Green Chemistry.	2
Unit III	An alternative approach to solvent chemistry: Solvent free reactions. Solvent free microwave assisted organic synthesis. Ionic Liquids: Prospects and retrospects	3
Unit IV	Super critical fluid extraction: Supercritical fluids. Advantages and applications of super fluid extraction technology. Carbon dioxide as a super critical fluid: Advantages and industrial	2

	applications.	
Unit V	Green Techniques: Use of Bio- catalysis, Transition metal catalysts, Supported metal catalysts for green synthesis. Solventless synthesis. Oxidation technology for waste water treatment. Agrochemicals from nature. Chitin – Green polymer.	3
	Total hours/Semester	13
Text Books	1. Rashmi Sanghi and M.M. Srivastava, (2007), Green Chemistry, (Environment Friendly Alternatives), First Edition, Narosa Publishing House, New Delhi.	
Reference Books	1. V.K. Ahluwalia, , (2006), Green Chemistry, (Environmentally Benign Reaction), First Edition, Ane Books Pvt.Ltd., New Delhi. 2. Samuel Delvin, (2006), Green Chemistry, First Edition, .IVY Publishing House. New Delhi. 3. Asim K. Das, (2010), Environmental Chemistry with Green Chemistry, First edition , Books and Allied (P) Ltd., Kolkata.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY6S4	Semester: VI
Title	SKILL BASED ELECTIVE – II CLEAN ENERGY	
Hrs/Week	1	Credit: 2
Objectives	1. Knowledge about renewable sources of energy patterns 2. Harvesting technologies for its utilization	
Unit	Content	Hrs
Unit I	Consumption of energy - Indian and global energy status- commercial and non –commercial energy sources. Renewable and non-renewable energy resources- Conservation of energy.	3
Unit II	SOLAR ENERGY Solar Radiation – Solar Thermal Collectors – Flat Plate and Concentrating Collectors– Solar Applications – fundamentals of photo Voltaic Conversion – Solar Cells – PV Systems – PV applications.	3
Unit III	WIND ENERGY Wind power – mean wind velocity- factors affecting velocity- Wind Energy generators-types.- Important Factors for building windmill.	2

Unit IV	BIO - ENERGY Biomass, Biogas, Source, Composition, Technology for utilization – Biomass direct combustion – Biomass gasifier – Biogas plant – Digesters – Ethanol production., Bio-Diesel production.	3
Unit V	TIDAL, OCEAN AND GEOTHERMAL ENERGY Wave energy - converting system. Ocean thermal energy -Open and closed cycles. Geothermal energy sources-utilizations-environmental aspects.	2
	Total hours/Semester	13
Text Books	1. Rai, G.D., (1999), Non Conventional Energy Sources, Khanna publishers New Delhi .	
Reference Books	1. Sukhatme, S.P. (1997), Solar Energy., Tata McGraw-Hill Publishing Company Ltd. , New Delhi. 2. Asim K Das, (2010), Environmental chemistry with Green chemistry, Books and Allied (P) Ltd , Kolkata .	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY617	Semester: VI
Title	CORE PRACTICAL III GRAVIMETRIC ANALYSIS AND PHYSICAL CHEMISTRY	
Hrs/Week	6	Credit: 5
Objectives	1. To apply the theoretical knowledge acquired in analytical chemistry and physical chemistry to laboratory work. 2. To enable the students to acquire analytical skills (qualitative and quantitative skills).	
Unit	Content	Hrs
	I: Gravimetric Estimations: 1. Lead as Chromate 2. Barium as Chromate 3. Barium as Sulphate 4. Nickel as dimethyl glyoxime complex (for class purpose only) 5. Calcium as Calcium oxalate. II: Physical Chemistry: 1. Heterogeneous Equilibria:	

	i) Determination of transition temperature (thermometric method) a) Sodium acetate b) Sodium thiosulphate c) Strontium chloride ii) Eutectic systems : a) Naphthalene and diphenyl b) Naphthalene and diphenylamine c) Naphthalene and benzophenone iii) Critical solution temperature: a) Phenol – Water system. b) Effect of NaCl on C.S.T. (between 1 to 2.0%) c) Effect of Succinic acid on C.S.T. (between 1 to 2.0%) iv) Molecular weight: Rast's method Solvents – Naphthalene and diphenyl. 2. Kinetics: a) Acid catalysed hydrolysis of methyl acetate b) Potassium persulphate oxidation. 3. Conductivity Experiments: a) Cell constant b) Verification of Debye – Huckel Onsager Equation. c) Conductometric Acid – Base titrations (HCl X NaOH). 4. Potentiometric Titrations(Demonstration only) a) Acid – Base titration (HCl X NaOH). b) Redox titrations (FeSO₄X K₂Cr₂O₇)	
	Total hours/Semester	78

Text Books	1. Venkateswaran. V., Veeraswamy. R.and Kulandaivelu. A.R. (1997), Basic principles of Practical chemistry, Sultan Chand & Sons.	
Reference Books	1.. Thomas. A.O., (1985) Practical Chemistry for B.Sc., Main Students, Scientific Book Centre.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	2016-2019 Batch
Subject code	16UCY618	Semester: VI
Title	COMPUTING LABORATORY COMPUTER APPLICATIONS IN CHEMISTRY	
Hrs/Week	2	Credit: 3
Objectives	To gain hand on experience on the application of C concept in solving problems in chemistry.	
Unit	Content	Hrs
	C - Program 1. Program to calculate the critical constant of Vanderwaals gas. (use of define directive) 2. Program to find the thermodynamic parameter of isothermal expansion of ideal gases (use of while loop). 3. Program to calculate $t_{1/2}$ for First and nth order reactions (use of break Statement) 4. Program to calculate Arrhenius parameters (use of global variables) 5. Program to calculate Equivalent conductivity of an electrolyte (use of DO while loop) 6. Program to calculate rate constant from “ x/a ” and “ t ” values (2 nd - Order reactions : $2A \rightarrow$ products) (use of one dimensional array) 7. Program to calculate the number of resonance structure for	26

	conjugated system (use of recursion) 8. Program to calculate the reduced mass for homodiatomic or heterodiatomic molecules. (Use of conditional operator). 9. Program to calculate wave numbers of Lyman, Balmer and Paschan series of lines in Hydrogen atomic spectrum (Use of nested for loop). 10. Obtain the mass number from atomic number and neutron number (use of function). 11. Program to calculate mass number from atomic number, Temperature, in celcius from Kelvin Temperature frequency from wave length data (use of SWITCH Statement) 12. Program to calculate the Molecular weight of a compound using recursion . 13. Program to calculate ionic strength of an electrolyte	
	Total hours/Semester	26
Text Books	1. Raman, K.V., (1990) Computers in Chemistry, Tata Mcgrow Hill Publications,	
Reference Books	1. . Yashavant P.Kanetkar, (2008) Let us C, 5 th Edition, Infinity Science Press.	

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Department	CHEMISTRY	
Course :	B.Sc. Zoology/Botany	2016-2019 BATCH
Subject code	16UBY3A1/16UZY3A1	Semester: III
Title	ALLIED CHEMISTRY PAPER -I INORGANIC,ORGANIC AND PHYSICAL CHEMISTRY	
Hrs/Week	6	Credit: 4
Objectives	1. To understand the principles of coordination chemistry and application to biologically important molecules. 2. To gain knowledge on industrially important materials and water treatment 3. To understand the principles of volumetric analysis. 4. To know the basic principles of electro chemistry.	
Unit	Content	Hrs
Unit I	Chemical bonding: Molecular orbital theory - bonding, anti-bonding and non-bonding orbitals, Application of Molecular orbital theory – MO configuration of H ₂ , N ₂ , O ₂ , F ₂ , bond order. Coordination Chemistry: Ligands–Mono and bidentate ligands; Coordination number. Nomenclature – Mononuclear complexes. Werner & Sidgwick Theories; Chelation and its industrial importance with reference to EDTA. Biological role of Haemoglobin and Chlorophyll. Applications in qualitative and quantitative analysis .	16
Unit II	Volumetric Analysis: Primary and Secondary standard substances. Principles of volumetric analysis. Preparation of normal, molal and molar solutions. Principle of acid - base titration	16

	Water treatment: Hardness of water. Temporary and permanent hardness. Units of hardness. Disadvantages of hard water. Softening of hard water – Zeolite process and De-mineralization process – Purification of water for domestic use – Disinfection by Chlorine, Ozone and UV light.	
Unit III	Covalent bond: Orbital overlap, hybridization, geometry of organic molecules – CH₄, C₂H₄, C₂H₂, C₆H₆. Inductive, Electrometric, Mesomeric, Hyperconjugative and Steric effects. Effect in properties of compounds. Aromatic compounds: Electrophilic substitution in benzene. Mechanism of nitration, halogenation, alkylation, acylation, sulphonation.	15
Unit IV	Chemotherapy : Introduction, Sulphadrugs : Mode of action. Antimalarials : Classification and use of chloroquine and Pamaquine. Antiseptics : Definition and uses of chloramines – T, Iodoform and Dettol. Anaesthetics : Classification, characteristics and uses of procaine and pentothal sodium. Antibiotics : Introduction, use of Penicillin, Chloromycetin, Streptomycin and Tetracyclin. Vitamins : Classifications, occurrence and deficiency diseases caused by Vitamin A, B complex, C, D, E and K.	16

	(Note : In Unit – IV structure of the compounds are not required.)	
Unit V	Electrochemistry: Electronic and electrolytic conductors – Faraday’s laws of electrolysis – Arrhenius theory of electrolytic dissociation – Ostwald’s dilution law. Conductance: Specific and molar conductance, Variation of conductance with dilution . Determination of molar conductance of an electrolyte, Kohlrausch law and its applications. pH: Definition, Buffer solutions, Importance of buffer in the living	15
	Total hours/Semester	78
Text Books	1. Yadav, M.S.,(2001),Electrochemistry2nd Edition,, Anmol Publications. 2. Veeraiyan., V. and Vasudevan, A.N.S., (2001).Ancillary chemistry,1st Edition, Einstein publishing house. 3. Vaidyanathan, K., Venkateswaran, A. and Ramasamy, R., (2005). Allied chemistry, 1st Edition, Priya publications.	
Reference Books	1. Puri, Sharma and Pathania,(2007), Principles of Physical Chemistry, Millennium Edition, Vishal Publishing House. 2. Jain, P.C. and Monica Jain, (2005), Engineering Chemistry, 17th Edition, Dhanpat Rai Publishing Company(P) Ltd .	

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Department	CHEMISTRY	
Course :	B.Sc., BOTANY & B.Sc. ZOOLOGY	2016-2019 Batch
Subject code	16UBY4A2/16UZY4A2	Semester: IV
Title	ALLIED CHEMISTRY PAPER – II INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY	
Hrs/Week	6	Credit: 4
Objectives	1. To have a basic ideas on synthetic dyes. 2. To understand the chemistry of biologically important molecules. 3. To know the common drugs and their use	
Unit	Content	Hrs
Unit I	Fuels: Types of fuels. Characteristics of a good fuel. Calorific value of a fuel. Advantages of gaseous fuels. Natural gas, water gas, producer gas, oil gas, LPG and Gobar gas – Composition and uses (manufacturing details not needed) Fertilizers: Manufacture of urea, ammonium sulphate, super phosphate of lime, Triple super phosphate and potassium nitrate. Silicones: Preparation, properties and uses. Glass: Manufacture, types of glass – soft glass, hard glass, flint glass, Pyrex glass and Coloured glass.	16
Unit II	Synthetic Dyes : Definition, classification based on structure and application. Colour and constitution – Chromophore – Auxochrome Theory. Synthesis and uses of the following dyes : Azo dyes – methyl orange Vat dyes – Indigo (from anthranillic acid) Anthraquinone dyes (Alizarin) Pthalein	16

	dyes – Phenolphthalein Synthetic Polymers : Classification – Homo and copolymers – Natural, Synthetic, organic, Inorganic polymers. Thermo plastics and thermosetting plastics. Types of polymerization, PVC, polystyrene, Bakelite, Teflon, Nylon – 6.6, Buna – S rubber – Preparation and uses.	
Unit III	Amino acids and Proteins : Classification of amino acids. Preparation and properties of Glycine. Action of heat on and amino acids. Peptides. Synthesis of glycylalanine by carbobenzoxy method. Proteins: Classification, simple and conjugated proteins. Denaturation and colour reactions of proteins. Primary and secondary structure. Biological functions.	16
Unit IV	Carbohydrates: Classification – preparation and properties of Glucose and Fructose. Elucidation of structure of Glucose. Comparison of properties of glucose and fructose. Conversion of Glucose to Fructose and Fructose to Glucose. Sucrose : Preparation, properties and structure (Elucidation of structure not necessary) Starch and Cellulose : Properties and uses (Elucidation of structure not necessary)	15
Unit V	Colloidal state: Types of colloids. Preparation and properties of colloids and applications. Emulsions and gels: Preparation, properties and applications. Catalysis: Characteristics, types, mechanism of catalytic action and Industrial application.	15
	Total hours/Semester	78

Text Books	1. Vaidyanathan, K., Venkateswaran, A. and Ramasamy, R., (2005) Allied chemistry, 1st Edition,.Priya publications, Karur. 2. Bahl, B.S. and Arun Bhal, (2007).Advanced Organic Chemistry1st Edition,, S.Chand & Company Ltd.	
Reference Books	1. Tyagi, O.D., Yadav, M., (2001.).A Text Book of Synthetic Dyes, 1st Edition ,Anmol publications Pvt. Ltd . 2. Soni, P.L., (2002). Text book of Organic Chemistry, 28th Revised Edition, Sultan Chand & Sons. 3. Lubs, H.A., (1955),The Chemistry of Synthetic Dyes and Pigments, 1st Edition, Robert E. Krieger publishing company.	

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Department	CHEMISTRY	
Course :	B.Sc., PHYSICS, B.Sc., BOTANY & B.Sc., ZOOLOGY	2016-2019 Batch
Subject code	16UPS4A3/16UBY4A3/16UZY4A3	Semester: III & IV
Title	ANCILLARY CHEMISTRY PRACTICAL	
Hrs/Week	2	Credit: 2
Objectives	To develop analytical skills in volumetric analysis and organic analysis.	
Unit	Content	Hrs
	Volumetric Analysis: 1. Estimation of sodium carbonate. 2. Estimation of oxalic acid (Acidimetry) 3. Estimation of ferrous ion. 4. Estimation of oxalic acid.(Permanganometry) 5. Estimation of potassium dichromate using sodium thiosulphate 6. Estimation of copper using Sodium thiosulphate.(Demonstration only) 7. Estimation of temporary, permanent and total hardness of water 8. Estimation of Zinc using EDTA. 9. Estimation of Mg using EDTA. Organic analysis: Detection of elements. Nitrogen, Sulphur and Halogens. 1. To distinguish between aliphatic and aromatic, saturated and unsaturated compounds. 2. Functional group tests for : i) Mono and dicarboxylic acids; ii) Phenols iii) Carbohydrates(Reducing and non reducing) iv) Amines and v) Amides.	

	Total hours/Semester	26
Text Books	1. Venkateswaran. V., Veeraswamy. R and Kulandaivelu. A.R., (1997), Basic principles of Practical chemistry, 1 st Edition,. Sultan Chand & Sons.	
Reference Books	1. Thomas. A.O., (1985), .Practical Chemistry for B.Sc., Main Students,. 3 rd Edition, Scientific Book Centre.	

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