

Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY01	Semester: I
Title	CORE PAPER - I INORGANIC AND ORGANIC CHEMISTRY	
Hrs/Week	7	Credit:5
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: 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. Co-ordinate covalent bonding: Characteristics. Hydrogen bonding-types-application of concept of hydrogen bonding - melting and boiling points of hydrides of Nitrogen, Oxygen and Fluoride, Lesser density of ice.	18
Unit II	Concept of Hybridization: sp, sp^2 and sp^3 with reference to $BeCl_2$, BCl_3, CH_4 Application of VSEPR Theory to H_2O, NH_3, CH_4, PCl_5 SF_6 molecules. Molecular Orbital Theory: 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). Conformational analysis: Conformations of Ethane, n- Butane and Cyclohexane. 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, dehalogenation and electrolysis. Reaction: Hydroboration, addition of hydrogen halides, water, formation of acetylides and Ozonolysis. Alkyl halides: Preparation and properties of Ethyl magnesium iodide. Aliphatic Nucleophilic Substitution: $\text{S}_\text{N}1$ and $\text{S}_\text{N}2$ mechanism. Effect of solvent, nucleophile and structure of substrate.	18
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 directors. Role of inductive and mesomeric effects in electrophilic aromatic substitution of phenol, aniline and nitrobenzene.	18
	Total hours/Semester	90
Text Books	1. Text book of Inorganic Chemistry, P.L.Soni, 20 th edition, Sultan Chand & Sons, Reprint 2002, New Delhi.	

	2. Advanced Organic Chemistry, B.S.Bahl and Arun Bhal, 1 st edition, S.Chand & Company Ltd., Reprint 2007, New Delhi. 3. Text book of Organic Chemistry, P.L.Soni, 28 th revised edition, Sultan Chand & Sons, Reprint 2002, New Delhi. 4. Selected Topics in Inorganic Chemistry –Wahid U.Malik, G.D. Tuli, and R.D.Madan, Sixth Edition, S.Chand & Company, New Delhi	
Reference Books	1. Organic Chemistry I.L.Finar, Volume I, ELBS Edition, 2006. 2. Organic Chemistry, R.T. Morrison and R.N. Boyd, 6 th Edition, NewYork, Allyn and Bacon Ltd., (1976).	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY03	Semester: II
Title	CORE PAPER- II ORGANIC AND PHYSICAL CHEMISTRY	
Hrs/Week	6	Credit: 5
Objectives	To understand the mechanisms of name-reactions of carbonyl compounds. To study the synthetic importance of active methylene compounds . To learn basic concepts /origin of quantum mechanics. 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. Dicaboxylic acids : Preparation and properties of malonic , succinic and phthalic acid. Acetoacetic ester and Malonic ester: Preparation and synthetic uses. Keto-enol tautomerism. Acid derivatives: Aecetyl chloride and acetic anhydride: Preparation, properties and uses.	15
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.	15
Unit III	Quantum Theory: Failure of classical theory in explaining the black body radiation. Plancks radiation formula, 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)	15
Unit IV	Thermochemisty-Enthalpy of a reaction. Relation between ΔE and ΔH, Measurement of enthalpy of reactions by Bomb Calorimeter. Enthalpy of hydrogenation and enthalpy of neutralization. Calculation of bond energies of H-H and C-H from the dissociation energies.	15

	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 C_p and C_v. Work done in an isothermal reversible expansion of ideal gas. Reversible adiabatic expansion of an ideal gas: Relation between 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. Entropy: Definition, Entropy changes in reversible and irreversible spontaneous processes. Entropy change accompanying change of phase. Entropy change: The 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	75
Text Books	1. Bahl B.S. and Arun Bhal, Advanced Organic Chemistry, S.Chand & Company Ltd ., New Delhi, 1st Edition, Reprint 2007. 2. Soni P.L, Text book of Organic Chemistry, 28th Revised Edition, Sultan Chand & Sons, New Delhi, Reprint 2002. 3. Puri B.R., Sharma. L.R and Madan S. Pathania, Principles of Physical Chemistry, Vishal Publishing House, Millennium Edition, 2007. 4. Negi. A.S., and Anand S.C., A text book of physical chemistry, New Age International PVT Ltd., Fourth Reprint 1995.	

Reference Books	1. Finar I.L., Organic Chemistry, ELBS Edition, Volume I, 2006. 2. Soni. P.L. and Dharmarha O.P., Text book of Physical Chemistry, Sultan Chand & Sons, New Delhi, 7 th Edition, 2005.	
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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY04	Semester: I&II
Title	Core Practical-I Inorganic Qualitative Analysis (Semi micro Techniques) (Examination at the end of Second Semester)	
Hrs/Week	2	Credit: 2
Objectives	To enable the students to develop analytical skill in inorganic qualitative analysis.	
Unit	Content	Hrs
	a) Reactions of the following ions: Lead, Copper, Bismuth, Cadmium, Iron, Manganese, Zinc, Nickel, 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. Semi micro methods using the conventional scheme with hydrogen sulphide will be adopted	13
	Total hours/Semester	25
Text Books	1. Venkateswaran, V., Veeraswamy, R. and Kulandaivelu A.R., Basic principles of Practical chemistry, Sultan Chand & Sons, 1997 Edition.	
Reference Books	1. Thomas, A.O., Practical Chemistry for B.Sc., Main Students, Scientific Book Centre, 1985 Edition.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY06	Semester: III
Title	INORGANIC AND PHYSICAL CHEMISTRY CORE PAPER - III	
Hrs/Week	6	Credit: 5
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, Characteristics of good fuel and calorific value.	15

	Gaseous Fuels: Advantages, Composition and uses of natural gas, water gas, producer gas, oil gas, LPG and Gobar gas. Liquid fuels –Petroleum-composition and classification. Refining of crude petroleum and uses of various fractions. Petroleum industries in India. Knocking and Octane numbers. Cracking–catalytic cracking.	
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 and sulphur trioxide	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 and Henry'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 $\text{I}_2 + \text{I}^- = \text{I}_3^-$.	15
Unit V	Colligative properties of solutions : Lowering of vapour pressure: Determination of lowering of vapour pressure and molecular weight. Boiling point elevation: Thermodynamic derivation .Cottrell's method of determination of molecular weight. Depression of freezing point: Thermodynamic derivation .Beckmann's	15

	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.	
	Total hours/Semester	75
Text Books	1. Soni P.L, Text book of Inorganic Chemistry, Sultan Chand & Sons, Education Publishers,.20th edition, Reprint 2002. 2. Puri Sharma and.Kallia. K.C., Principles of Inorganic Chemistry, Milestone Publishers and Distributors, 30 th Edition, 2007. 3. Puri, Sharma and Pathania., Principles of Physical Chemistry, Vishal Publishing House, Millennium edition, 2007.	
Reference Books	1. Jain. P.C. and Monaka Jain., Compiled by Trishla Jain and Jyothika Jain, Engineering Chemistry, Dhanpar Rai Publishing Company (P) Ltd., 15th Edition, 2005. 2. Soni. P.L. and Dharmarha. O.P., Text book of Physical Chemistry, Sultan Chand & Sons, 7th Edition, 2005.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCYS 01	Semester: III
Title	SKILL BASED ELECTIVE- I VALUE ADDED FOOD PRODUCTS	
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, amino acids, vitamins, minerals, fibre and water.	
Unit II	Food Preservation: Principles and importance of food preservation. Methods of food preservation: Bacterostatic Methods: Dehydration, pickling, salting, smoking and freezing Bacterocidal Methods: Canning, cooking and irradiation	
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.	
Unit IV	Food adulteration: Adulterants and their effects. Incidental and intentional adulterants, metallic contamination, contamination by pests and pesticide residues. Simple physical and chemical tests for detection of food adulterants. Packaging hazards. Food poisoning and food borne diseases.	
Unit V	Food Laws: Preservation of Food Adulteration Act and Fruit Products Order. Food Standard: ISI standards and the Agmark standards. Functions of Food Corporation of India. Preparation and bottling of the following value added products: Fruit squashes, fruit juices, pickles, jams, jellies, murabbas and marmalade	
	Total hours/Semester	12
Text Books	1. Swaminathan M., Essentials of Food and Nutrition, Ganesh Publishers, Madras, Volume I and II, 2 nd Edition, 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., Applied Chemistry, S.Chand and company Ltd., New Delhi, 1st Edition, 2006. 3. Mahindru S.N., Food Additives, Tata Mc Graw- Hill Publishing Company Ltd. 1st, 2000 Edition.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCYS 02	Semester: III
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. Fullerenes-introduction – synthesis and purification of fullerenes .Chemistry of fullerenes in the condensed phase.	
Unit II	Carbon Nanotubes- Introduction –Synthesis and purification – Filling of Nanotubes. Mechanism of growth – Nanotubes of other materials.	
Unit III	Fabrication techniques, imaging and manipulation tools at the	

	nanoscale- nanoscale Devices and circuits. (e.g.) carbon nano tubes, FETS, Quantum dots.	
Unit IV	Nano medicine and its importance in medical diagnostics , molecular therapeutics - Nano electronic – nano optical nano chemical.	
Unit V	Molecular manufacturing – nano / molecular communication –nano navigation –nano scale manipulation and control nano robots for medical application.	
	Total hours/Semester	12
Text Books	1. Sulabha. K.K., Elements of Nanotechnology, M/S IBD .Publications New Delhi, 2007 Edition.	
Reference Books	1. Pradeep.T., Nano : The essentials, Tata McGraw Hill Publishing Co. Ltd. New Delhi., 2007 Edition.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY 08	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. Extraction and uses of Ti,V,Mo,W and Co. Platinum Metals: Metallurgy of platinum. Platinum black, platinised asbestos, colloidal platinum, platinic chloride-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 and ammonium molybdate.	15
Unit II	Inner Transition Elements: Lanthanides and Actinides: Occurrence, electronic structure, 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.	15
Unit III	Reactions of Phenols: Nitration. sulphonation , halogenation, Kolbes reaction, Friedel Crafts reaction, Reimer Tiemann reaction, Duff's reaction, Lederer –Manasse reaction and Gattermann aldehyde synthesis. Derivatives of sulphanilic acid: Sulphanilamide, Chloramines-T and Saccharin- Preparation and uses. 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.	15
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. Stereoisomerism.: Types, R,S,-configuration,optical isomerism in lactic acid and tartaric acid, racemisation,resolution,asymmetric	15

	synthesis. Geometrical isomerism in maleic and fumaric acid.	
Unit V	Phase rule and phase equilibria: Concept of phase, Number of components and degrees of freedom with examples. Thermodynamic derivation of Gibbs-Phase Rule. One component system : Phase diagram and discussion of water and sulphur system. Two component system : Construction of phase diagram by thermal analysis. Solid-Liquid equilibria. Simple eutectic-Pb-Ag System. Formation of compounds with congruent melting point. Zn-Mg system. Formation of compounds with incongruent melting point Na and K system. Salt- Water system: Potassium Iodide-Water system.	15
	Total hours/Semester	75
Text Books	1. Soni. P.L., Text book of Inorganic Chemistry, Sultan Chand & Sons, 20th edition, Reprint 2002. 2. Bahl. B.S.and Arun Bhal, Advanced Organic Chemistry, S.Chand & Company Ltd., 1st Edition , Reprint 2007. 3. Soni . P.L., Text book of Organic chemistry, Sultan Chand & Sons 28 th revised edition, Reprint 2002.. 4. Puri.B.R., Sharma. L.R.and Madan S.Pathania, Principles of Physical chemistry, Vishal Publishing House,.Millennium edition, 2007.	
Reference Books	1. Finar. I.L., Organic chemistry, ELBS edition, Volume I, 2006. 2. Morrison. R.T. and Boyd. R.N., Organic chemistry, NewYork, Allyn and Bacon Ltd., 6th edition, 1976.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY 09	Semester: IV
Title	CORE PRACTICAL -II VOLUMETRIC AND ORGANIC QUALITATIVE ANALYSIS	
Hrs/Week	3	Credit: 4
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. 1) Estimation of Oxalic acid. 2) Estimation of Sodium nitrite. 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. 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, Primaryamines, 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) Bromination of acetanilide to p-bromo acetanilide. 4) Oxidation of Benzaldehyde to benzoic acid. 5) Nitration of nitrobenzene to m-dinitrobenzene. 6) Hydrolysis of ester.	
	Total hours/Semester	39
Reference Books	1. Venkateswaran. V., Veeraswamy. R. and Kulandaivelu. A.R., 1997 Basic principles of Practical chemistry, Sultan Chand & Sons.1 st Edition, 1997. 2. Thomas. A.O., Practical Chemistry for B.Sc., Main Students, Scientific Book Centre, 1 st Edition. .	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13 UCYS 03	Semester: IV
Title	SKILL BASED 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.	
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.	
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.	
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.	
Unit IV	Treatment of water for municipal purposes. Sterilization, Physical and Chemical methods Sea water as a source of drinking water: Desalting, electrodialysis, reverse osmosis and electrolysis.	
Unit V	Industrial wastewater treatment: Removal of Iron, Silica and dissolved Oxygen. Water for boiler use. Industrial wastes and treatment processes : Types of industrial wastes, treatment and disposal of industrial wastes. The nature, effect and treatment of paper, pulp and food processing industrial wastewater.	

	Total hours/Semester	12
Text Books	1. Jain and Jain, Engineering chemistry, Dhanpat Rai Publishing Company(P) Ltd.15 th Edition. 2. B.K.Sharma, Environmental chemistry, Goel Publishing Company(P) Ltd.2 nd Edition.	
Reference Books	1. Dr.N.Ravishanker., Applied chemistry, National Pathippaham. 3 rd Edition.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13 UCYS 04	Semester: IV
Title	SKILL BASED ELECTIVE – II GREEN 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.	
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.	
Unit III	WIND ENERGY Wind power – mean wind velocity- factors affecting velocity- Wind Energy generators-types.-construction of a Wind Turbine - Important Factors for building windmill.	
Unit IV	BIO - ENERGY Biomass, Biogas, Source, Composition, Technology for utilization – Biomass direct combustion – Biomass gasifier – Biogas plant – Digesters – Ethanol production., Bio-Diesel production.	
Unit V	TIDAL – OCEAN THERMAL ENERGY-GEOTHERMAL Wave energy - converting system. Ocean thermal energy -Open and closed OTEC Cycles. Geothermal energy sources-utilizations-environmental aspects.	
	Total hours/Semester	12
Text Books	1. Rai, G.D., Non Conventional Energy Sources, Khanna publishers New Delhi,1999 Edition,	
Reference Books	1. Sukhatme, S.P. Solar Energy., Tata McGraw-Hill Publishing Company Ltd. , New Delhi,, 1997 Edition 2. Asim K Das, Environmental chemistry with Green chemistry, Books and Allied (P) Ltd , Kolkata, 2010 Edition.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY12	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 C ¹⁴ 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. Disposal of nuclear wastes.	10
Unit II	Co-ordination chemistry: Basic concepts of Co-ordination Chemistry. Definitions of terms: Ligands and Co-ordination number. Classification of ligands. Nomenclature of Co-ordination compounds. Theories of Co-ordination compounds: Werner's Theory: Designation and formation 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. Chelates: Definition, classification, sequestration and sequestering agents. Detection and structure determination of Complexes: Solubility method, change in colour, pH measurements and conductance measurements.	11
Unit IV	Isomerism in Co-ordination compounds: Structural isomerism: Ionisation , hydrate and linkage isomerisms. 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. Ligand substitution in octahedral complexes: Inert and Labile complexes – Nucleophilic ligand substitution reactions, S_N^1 and S_N^2 mechanisms. Trans effect: Definition and illustration only.	10
Unit V	Carbonyls: Mono and Binuclear carbonyls of Ni, Fe, Co, Mn and Cr - 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.	10
	Total contact Hrs/Semester	52
Text Books	1. Puri and Sharma and Kallia. K.C., Principles of Inorganic Chemistry, Milestone Publishers and Distributors, 30 th Edition, 2007. 2. Soni. P.L., Text book of Inorganic Chemistry, Sultan Chand & Sons, 20th edition, Reprint 2002. 3. Madan, Malik and Tuli., Selected Topics in Inorganic Chemistry, Sultan Chand & Sons, Reprint 2006.	
Reference Books	1. Lee. J.D., Concise Inorganic Chemistry., Black Well Science Ltd., London, 5 th Edition, 2006. 2. Jain. P.C. and Monaka Jain, Compiled by Trishla Jain and Jyothika Jain, Engineering Chemistry, Dhanpar Rai Publishing Company (P) Ltd., 15 th Edition, 2005.	

	3. Gopalan. R. and Ramalingam V., Concise Coordination Chemistry, Vikas Publishing house, 3rd Edition, 2006.	
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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13 UCY13	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, Isatin 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 – 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, Geraniol, α - terpineol and Menthol	10
	Total hours/Semester	52

Text Books	1. Bahl and Arun Bhal.B.S., Advanced Organic Chemistry, S.Chand & Company Ltd, 1 st Edition, Reprint 2007. 2. Soni. P.L., Text book of Organic Chemistry, Sultan Chand & Sons, 28 th revised edition, Reprint 2002.	
Reference Books	1.Gurtu. J.N. and Kapoor. R., Organic Reactions and Reagents, S.Chand & Company, 1 st Edition, 1998. 2. Gurdeep. R. Chatwal., Organic Chemistry of Natural Products, Goel Publishing House, Volume I and II, 30 th Edition, 2004. 3. Finar. I.L., Organic Chemistry, ELBS Edition, Volume I and II, 2006.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY14	Semester: V
Title	CORE PAPER – VII ELECTROCHEMISTRY	
Hrs/Week	4	Credit: 5
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:	10

	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.	
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: EMF of a cell and it's measurement. Thermodynamic quantities of cell reactions: ΔH, ΔS and ΔG from EMF data. Nernst equation. 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. Determination of degree of hydrolysis (conductance method and Freezing point depression method).	10

Unit IV	Electrochemical cells: Concentration cells with and without trans-ference. Liquid junction potential - Formation and elimination. Applications of EMF measurements: Calculation of valency of ions in doubt full cases, equilibrium constant of a electrochemical reaction, determination of transport number, determination of solubility of sparingly soluble salts and potentiometric acid-base and redox titrations.	11
Unit V	Fuel Cell: Hydrogen - Oxygen fuel cell. Dry Cell, Lead-Acid storage cell and Nickel- Cadmium accumulator. 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 only).	10
	Total hours/semester	52
Text Books	1. . Puri, Sharma and Pathania., Principles of Physical Chemistry, Vishal Publishing House, Millennium Edition, 2007. 2. Soni. P.L. and Dharmarha. O.P., Text book of Physical Chemistry, Sultan Chand & Sons, 7th Edition, 2005. 3. Jain. P.C. and Monica Jain., Engineering Chemistry, Dhanpat Rai Publishing Company(P) Ltd., 17th Edition, 2005.	
Reference Books	1. Samuel H. Maron. and Carl F. Prutton., Principle of Physical Chemistry, Amerind publishing Co. Pvt. Ltd., 4th Edition, 1972. 2. Negi. A.S. and Anand. S.C., A Text book of Physical Chemistry, New Age International (P) Ltd., 4th Edition, 1995. 3. Atkins. P.W., Physical Chemistry, ELBS/ Oxford University Press, 1987.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY15	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. Theories of colour and constitution: Witt's theory, Quinonoid theory and Molecular orbital theory of various transitions. Requisites of a true dye: Classification of dyes according to their chemical constitution and classification according to their applications.	10
Unit II	Nitrodyes: Picric acid, Martius yellow, Naphthol Yellow S – synthesis and applications. Nitroso dyes: Fast Green O, Naphthol Green Y - synthesis and applications Azo dyes: Diazotisation, Mechanism of diazotization, Effects of	10

	substitutents 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, Pararosaniline, Crystal violet and Aurin - Synthesis and uses. Phthalein and Xanthene dyes: Phenolphthalein, Fluorescein, Eosin, Erythrosin and Rhodamine B - Synthesis and uses. Indigoid dyes: Indigotin – Synthesis and application to fibre. Indigosol O -Synthesis.	11
Unit IV	Anthroquinone dyes: Anthraquinone acid dyes – Alzarin 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.	10
Unit V	Types of textile fibres: Natural, Semisynthetic and Synthetic fibres – Cotton, Wool, Silk, Cellulose acetate, Viscose rayon, polyamides, polyacrylonitrile, polyester and polyolefin fibres. Forces of Dye-Fibre attachment. 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., Text Book of Synthetic Dyes, Anmol publications Pvt. Ltd., 1 st Edition 1990, Reprint 2001. 2. Bahl and Arun Bhal. B.S., Advanced Organic Chemistry, S.Chand & Company Ltd., 1 st Edition, Reprint 2007.	
Reference Books	1. Rao. R.S., Dr.Vidya Chawathe and. Shah. S.J., An Introduction to Synthetic Drugs and Dyes, Himalaya publishing House, 3 rd Edition, 1997. 2. Lubs. H.A., The Chemistry of Synthetic Dyes and Pigments, Robert E.Krieger Publishing Company, 1 st Edition, Reprint 1977. 3. Arora. M.G., A Text Book of Synthetic Dyes, Anmol publications Pvt.Ltd., 1 st Edition, 1996.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY16	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 and instrumentation. Applications: Evaluation of gravimetric precipitation, curie point determination and study of organic compounds. Differential thermal analysis (DTA): Principle, factors affecting the DTA curve. Applications: heat of reaction, specific heat and quality control. Thermometric titrations (TTA): Principle and applications of thermometric titrations.	10
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	11

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

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13 UCY 17	Semester: V
Title	CORE PRACTICAL IV APPLICATION ORIENTED PRACTICALS	
Hrs/Week	2	Credit: 2
Objectives	1. To apply the theoretical knowledge acquired in analytical chemistry to laboratory work. 2. To enable the students to acquire the quantitative skills in the preparation of inorganic complexes and Dyes.	
Unit	Content	Hrs
	1. Determination of Melting and Boiling point of an organic substance 2. Preparation of Tetrammine Copper(II) Tetrahydrate 3. Preparation of Potassium Trioxalato Chromate(III) 4. Preparation of Methyl Orange 5. Preparation of p-Nitrobenzene Azo- β -Naphthol 6. Estimation of Hardness of Water using EDTA 7. Colorimetric estimation of Ferric ion with Ammonium thiocyanate. 8. Colorimetric estimation of Ni as Nickel Dimethyl glyoximate. 9. Determination of saponification value of an oil	24
	Total hours/Semester	12
Text Books	1. Venkateswaran.V., Veeraswamy. R.and Kulandaivelu. A.R., Basic principles of Practical chemistry, Sultan Chand & Sons, 1997 Edition.	
Reference Books	1. Thomas. A.O., Practical Chemistry for B.Sc., Main Students, Edition, Scientific Book Centre, 1985.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCYS 05	Semester: V
Title	NON MAJOR SKILL BASED ELECTIVE FOOD SCIENCE AND TECHNOLOGY	
Hrs/Week	1	Credit: 2
Objectives	To have an exposure to food preservation techniques, 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- 1. Bacterostatic methods – Dehydration, Pickling ,Salting , Smoking and Freezing. 2. Bacterocidal methods – Canning , Cooking and Irradiation.	3
Unit III	Milk Processing – Pasteurisation and milk products Food Additives : Emulsifiers, Antioxidants , Food Colours, Food enzymes, Spices and flavouring agents. Merits and demerits of additives and preservatives.	2
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 detection of food adulterants.	2

Unit V	Packaging hazards, Food poisoning and food borne diseases, Prevention of food adulteration act. ISI Standards, Agmark Standard . Food Corporation of India.	2
	Total hours/Semester	12
Text Books	1. Swaminathan M., Essentials of Food and Nutrition, Ganesh Publishers, Madras, Volume I and II, 2 nd Edition, 2. Sumati R. Mudambi and Rajagopal M.V., Fundamentals of Foods and Nutrition, Wiley Eastern Ltd., New Delhi.	
Reference Books	1. Jayashree Ghosh., Applied Chemistry, S.Chand and company Ltd., New Delhi, 1 st Edition, 2006.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCYS 06	Semester: V
Title	NON MAJOR SKILL BASED ELECTIVE CHEMISTRY OF CONSUMER PRODUCTS	
Hrs/Week	1	Credit: 2
Objectives	To acquire the basic knowledge in consumer product chemistry and 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. Foam boosters. 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. Hand cream: Formulations and uses. Nail preparations: Nail bleach, nail lacquers, nail lacquers and nail removers – requirements ingredients and formulations.	2
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	12
Text Books	1. Thangamma Jacob., Text book of Applied Chemistry, Macmillan 1 st Edition, 1987.	

Reference Books	1. Gobala Rao, . S., Outlines of chemical technology, Affiliated East West press,1998.	
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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13 UCY18	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. Raman spectroscopy: Origin of Raman lines, Characteristics of Raman lines, Mechanism of Raman effect, Differences between Raman and Infrared spectra.	10
Unit II	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. Mass spectroscopy: Theory, Instrumentation, Types of ions produced in spectrometer – Molecular ion, Multiple charged ions, Metastable ions. Fragmentation of saturated hydrocarbons – Methane, Neopentane and n - butane .	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, Hyperfine splitting, line width. Application to species $\text{CH}_3^\bullet$, $\text{C}_6\text{H}_6^{\bullet-}$ 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. The radius-ratio rules, Geometrical requirement in covalent crystals. Diamond and graphite. Space lattice, crystal system, Law of rational indices, Miller indices. X-Ray examination of crystals – Bragg's and Debye-Scherrer method.	11
Unit V	Electrical properties of Molecules: Polar and non-polar molecules, Dipole moment, Meaning of the terms – total molar polarisation, orientation polarisation and distortion polarisation. Determination of dipole moment of polar gas, Application of dipole moment 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 and Curie-Weiss law. Determination of magnetic susceptibility of paramagnetic substance using Gouy 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., Principles of Physical Chemistry, Vishal Publishing House, Millennium Edition, 2007. 2. Sharma. Y.R., Elementary Organic Absorption Spectroscopy, Sultan Chand & Sons, 3rd Edition, 2007. 3. Gurdeep Chatwal & Sham K. Anand., Instrumental Methods of Analysis, Himalaya Publishing House, 5th Edition, 2005.	
Reference Books	1. Soni. P.L, Text book of Organic Chemistry, Sultan Chand & Sons, 28th Revised Edition, Reprint 2002. 2. William Kemp., Organic Spectroscopy, ELBS edition, 1985.	

	3. Manas Chanda., Atomic Structure and Chemical bonding, Tata Mc Graw Hill Company, 2 nd Edition, 1988 Reprint.	
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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY19	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 and 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

	iii) Nucleic Acids: Nucleosides, Nucleotides, Structure of DNA	
Unit III	i) Lipids: Classification according to Bloor. Extraction, properties and analysis of oils and fats. ii) Food chemistry: Food processing - Drying, freezing, freeze drying and canning milk processing. Food irradiation, .Food additives.: Food enzymes. Food colours and preservatives. Food adulteration.	11
Unit IV	Vitamins: Introduction, fat and water soluble vitamins, occurrence, deficiency diseases. Constitution and synthesis of the following: Vitamin A1(retinol), Vitamin B1, Pyridoxine and Ascorbic acid.	10
Unit V	Chemotherapy: Introduction, classification of drugs. i) Sulphadruugs: Mode of action. Structure and uses of 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, Iodoform and Chloro-m-xyleneol. 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., Text Book of Organic Chemistry, Sultan Chand & Sons, New Delhi,1992 Edition. 2. Gurdeep R. Chatwal., Organic Chemistry of Natural Products, Himalaya Publishing House, Volume II, Edition 2006. 3. Bahl. B.S and Arun Bhal., Advanced Organic Chemistry, S.Chand & Company Ltd., 1 st Edition, Reprint 2007.	
Reference Books	1. Finar. I.L., Organic Chemistry - Volume I and II, ELBS Edition, 2006.	

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Department	CHEMISTRY		
Course :	B.Sc., CHEMISTRY		Effective from 2013-2014
Subject code	13UCY20		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 Rates of chemical Reactions – 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.		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, 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., Principles of Physical Chemistry, Vishal Publishing House, .Millennium Edition, 2007. 2. Gurdeep Raj., Chemical Kinetics, Goel publishing house unit of Krishna Prakashan Media (P) Ltd., 6th Revised Edition, 1997. 3. Jain and Jain., Engineering Chemistry Dhanpat Rai Publishing Company (P) Ltd., 5th Edition-2005.	
Reference Books	1. Samuel H.Maron and Carl F.Prutton., Principle of Physical Chemistry, Amerind publishing Co. Pvt.Ltd., 4th Edition, 1972. 2. Negi. A.S. and Anand.S.C., A Text book of Physical chemistry, New Age International (P) Ltd ., 4th Edition, 1995.	

	3. Chakrabarty. D.K., An introduction to Physical Chemistry, Narosa Publishing House, ISBN – 81-7319-393-2. 1996.	
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Department	CHEMISTRY		
Course :	B.Sc., CHEMISTRY		
Subject code	13UCY21		
Title	CORE ELECTIVE PAPER - II POLYMER CHEMISTRY		
Hrs/Week	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. Polymerization Techniques: Bulk, Solution, Suspension and Emulsion Polymerization.	11	
Unit II	Different types of polymerisation: Addition Polymerisation – Free radical Mechanism: Initiation, Propagation & termination processes –	10	

	Inhibitors – Initiators – Chain transfer agents. Ionic Polymerisation: Anionic and Cationic Polymerizations. 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. Tg and Tm. Determination of Tg by differential scanning calorimeter. Tg of copolymers. Degradation - Types of degradation - Photo, High energy radiation, Oxidative and Thermal.	11
Unit IV	Molecular weights of polymers: Number-Average, Weight-Average, Sedimentation-Average & Viscosity-Average molecular weights. Molecular weight distribution – GPC method – Average molecular weight and Degree of polymerisation. Determination of Average molecular weight: Ebulliometric (Ebullioscopic) method, Cryoscopic method, Light Scattering method, Viscosity method.	10
Unit V	Polymer processing techniques: Calendering, film casting, compression moulding, injection moulding, blow moulding, extrusion moulding and foaming. 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, Polymer Science, New Age International (P) Limited, Publishers.13th reprint, 1999. 2. Fred.W.Billmeyer, Jr., Text Book of Polymer Science, Wiley – Interscience and Sons.Inc 2nd edition, 2011. 3. Jain. P.C.and Monika Jain., Compiled by Trishla Jain and Jyothika Jain, Engineering Chemistry, Dhanpar Rai Publishing Company (P) Ltd., 15th Edition, 2005.	

Reference Books	1. Misra. G.S. Polymer Chemistry, New age International(P) Ltd., 2 nd Reprint 1989. 2. Charles G.Geberlein, Brown. Wm.C., Chemistry and Our World, Publishers(Singapore), ISBN 069716574-4, 1997. 3. M.Gopala Rao and Marshall Sitig, Drydens Outlines of Chemical Technology for the 21 st Century, East-West Press, 3 rd Edition, 1997.	
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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY 22	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 mathematical functions.	10

Unit II	Managing input and output operations: Reading a character - Writing a character - Formatted input - Formatted 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 : The WHILE Statement - the DO Statement – the FOR Statement.	11
Unit III	Arrays and string functions: One dimensional arrays - Two dimensional arrays - initializing two dimensional 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 - 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., Programming in C, Tata McGraw-Hill Education, 2004 Edition.	
Reference Books	1. Yashavant P.Kanetkar, Let us C, Infinity Science Press, 5 th Edition 2008. 2.Kernighan, B. W. and D. M. Ritchie, The C Programming Language. Prentice-Hall, 1978.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCY 23	Semester: VI
Title	CORE PRACTICAL III GRAVIMETRIC ANALYSIS AND PHYSICAL CHEMISTRY	
Hrs/Week	6	Credit: 7
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 iodination of acetone. b) Acid catalysed hydrolysis of methyl acetate c) 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 Experiments a) Determination of single electrode potential of Copper and Zinc electrodes b) Potentiometric Titrations (i) Acid – Base titration (HCl X NaOH). (ii) Redox titrations (FeSO_4 X $\text{K}_2\text{Cr}_2\text{O}_7$)	
	Total hours/Semester	
Text Books	1. Venkateswaran. V., Veeraswamy. R. and Kulandaivelu. A.R., Basic principles of Practical chemistry, Sultan Chand & Sons, 1997 Edition.	
Reference Books	1.. Thomas. A.O., Practical Chemistry for B.Sc., Main Students, Scientific Book Centre, 1985 Edition.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCYS 07	Semester: VI
Title	NON MAJOR ELECTIVE Water and Water Treatment Processes	
Hrs/Week	1	Credit: 2
Objectives	To create awareness on softening methods of hard water and industrial wastewater treatment.	
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	Treatment of water for municipal purposes. Sterilization, Physical and Chemical methods Sea water as a source of drinking water: Desalting, electrodialysis, reverse osmosis and electrolysis.	2
Unit V	Industrial wastewater treatment: Removal of Iron, Silica and dissolved Oxygen. Water for boiler use. Industrial wastes and treatment processes : Types of industrial wastes, treatment and disposal of industrial wastes. The nature, effect and treatment of paper, pulp and food processing industrial wastewater.	2
	Total hours/Semester	12

Text Books	1. Jain and Jain, Engineering chemistry, Dhanpat Rai Publishing Company(P) Ltd.15 th Edition.2005. 2 Sharma, B.K., Environmental chemistry, Goel Publishing Company(P) Ltd., 2 nd Edition. 2000.	
Reference Books	1. Dr.N.Ravishanker., Applied chemistry, National Pathippaham. 3 rd Edition. 2002.	

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Department	CHEMISTRY	
Course :	B.Sc., CHEMISTRY	Effective from 2013-2014
Subject code	13UCYS 08	Semester: VI
Title	NON MAJOR SKILL BASED ELECTIVE- IV 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. Mechanism of enzyme action. Co-enzymes and examples Digestion and absorption of carbohydrates, fats and proteins.	3

Unit II	Metabolism of carbohydrates. Glycolysis, Glycogenesis, glycogenolysis and citric acid cycle - A brief discussion. Regulation of blood sugar : Difference mechanism to maintain 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 : Internal structure and properties of Haemoglobin. Conversion of Haemoglobin to Bilepigments. Jaundice –Types and diagnosis.	2
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	12
Text Books	1. Ambika Shanmugam, Fundamentals of Biochemistry for Medical Students, Navabharath offset works, 1986.	
Reference Books	1. Soni, P.L., Text book of Organic Chemistry, Sultan Chand & Sons. 28 th Revised Edition, Reprint 2002.	

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Department	CHEMISTRY	
Course :	B.Sc., PHYSICS	Effective from 2013-2014

Subject code	13 UPS 10	Semester: III
Title	ALLIED CHEMISTRY PAPER – I ORGANIC AND PHYSICAL CHEMISTRY	
Hrs/Week	6	Credit: 4
Objectives	1. To understand the principles involved in conductance and electro chemical cells 2. To apply electro chemical principles to corrosion, fuel cells and batteries 3. To understand the chemistry of biologically important molecules.	
Unit	Content	Hrs
Unit I	Amino acids and Proteins : Classification of amino acids. Preparation and properties of Glycine. Action of heat on alpha, Beta and Gamma amino acids. Peptides- Synthesis of glycylalaine by carbobenzoxy method. Proteins : Simple and conjugated proteins. Biological functions & colour reactions of proteins, denaturation and structure of the protein.	15
Unit II	Carbohydrates : Classification – preparation and properties of Glucose and Fructose. Elucidation of structure of Glucose. Conversion of Glucose to Fructose and Fructose to Glucose. Sucrose : Preparation, properties and structure. Starch and Cellulose : Preparation, properties and structure.	15
Unit III	Electrochemistry: Electronic and electrolytic conductors – Faraday's laws of electrolysis – Arrhenius theory of electrolytic dissociation. Conductance - Specific, equivalent and molar conductance and their determination – Variation of conductance with dilution – Kohlrauch's law and its application. Ostwald dilution law Applications of conductance measurements – determination of degree of dissociation of weak electrolyte. Ionic product of water and conductometric titrations.	15
Unit IV	Electrochemical cells: Relation between free energy and electrical energy. E.M.F and its measurement – thermodynamic quantities of cell reactions. ΔH, ΔS and ΔG from EMF data. Thermodynamics of a Reversible cells. – Nernst equation - problems.	15

	Electrodes and their types: Metal/metal ion, metal/insoluble salt, gas/ion and redox electrodes – single electrode potential – standard electrode potential – electrochemical series – calculation of EMF of a cell and determination of a cell reaction.	
Unit V	Batteries : Primary, secondary and fuel cell – dry cell (Laclanche cell) – alkaline battery – Nickel – cadmium battery. Lead /Acid Storage cell – Discharging /Charging – uses. Fuel cell : Fuel cell efficiency - Hydrogen/Oxygen. Corrosion of metals: Causes of corrosion – Types of corrosion – Electrochemical corrosion. Protection of metals from corrosion. Metallic coating – electroplating and hot dipping process. Organic coating – paints, varnishes and lacquers – characteristics, constituents and their uses.	15
	Total hours/Semester	75
Text Books	1. Veeraiyan. V. and Vasudevan. A.N.S., Text Book of Ancillary chemistry, Ajantha Book Centre, 1st Edition, 1986. 2. Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal Publishing House, Vishal Millennium Edition, 2007.. 3. Bahl. B.S.and Arun Bhal., Advanced Organic Chemistry, S.Chand & Company Ltd., 1st Edition, Reprint 2007.	
Reference Books	1. Soni. P.L. and Dharmarha. O.P., Text book of Physical Chemistry, Sultan Chand & Sons,, 7th Edition, 2005. 2. Jain and Jain., Engineering chemistry, Dhanpat Rai Publishing Company (P) Ltd., 15th Edition, 2005.	

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Department	CHEMISTRY	
Course :	B.Sc. Zoology/Botany	Effective from 2013-2014
Subject code	13 UZY 08/13 UBY 08	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 H₂, N₂, O₂, F₂, 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 .	15
Unit II	Volumetric Analysis: Primary and Secondary standard substances. Principles of volumetric analysis. Preparation of normal, molal and molar solutions. 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.	15

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, Sulphadruugs : 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. (Note : In Unit – IV structure of the compounds are not required.)	15
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 it.s applications.	15
	Total hours/Semester	75
Text Books	1. Yadav, M.S., Electrochemistry, Anmol Publications, 2nd Edition, 2001. 2. Veeraiyan., V. and Vasudevan, A.N.S., Ancillary chemistry, Einstein publishing house, 1st Edition, 2001. 3. Vaidyanathan, K., Venkateswaran, A. and Ramasamy, R., Allied chemistry, Priya publications, 1st Edition, 2005.	

Reference Books	1. ,Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal Publishing House, Millennium Edition, 2007. 2. Jain, P.C. and Monica Jain, Engineering Chemistry Dhanpat Rai Publishing Company(P) Ltd., 17 th Edition, 2005.	
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Department	CHEMISTRY	
Course :	B.Sc., BOTANY & B.Sc. ZOOLOGY	Effective from 2013-2014
Subject code	13 UBY 08/ 13 UZY 08	Semester: VI
Title	ALLIED CHEMISTRY PAPER – II ORGANIC 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. 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.	15
Unit II	Synthetic Dyes : Definition, classification based on structure and application. Colour	15

	and constitution – Chromophore – Auxochrome Theory. Synthesis and uses of the following dyes : Azo dyes – methyl orange Vat dyes – Indigo (from anthranilic acid) Anthraquinone dyes (Alizarin) Phthalic 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.	15
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. Emulsions and gels: Preparation, properties and applications. Catalysis: Characteristics, types, mechanism of catalytic action and Industrial application.	15
	Total hours/Semester	75
Text Books	1. Vaidyanathan, K., Venkateswaran, A. and Ramasamy, R., Allied chemistry, Priya publications, Karur. 1st Edition, 2005. 2. Bahl, B.S. and Arun Bahl, Advanced Organic Chemistry, S.Chand & Company Ltd., 1st Edition, Reprint 2007.	

Reference Books	1. Tyagi, O.D., Yadav, M., .A Text Book of Synthetic Dyes, Anmol publications Pvt. Ltd., 1 st Edition 1990, Reprint 2001. 2. Soni, P.L., Text book of Organic Chemistry, Sultan Chand & Sons. 28 th Revised Edition, Reprint 2002. 3. Lubs, H.A., The Chemistry of Synthetic Dyes and Pigments, Robert E. Krieger publishing company, 1 st Edition, 1955.	
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Department	CHEMISTRY	
Course :	B.Sc., PHYSICS	Effective from 2013-2014
Subject code	13 UPS 14	Semester: IV
Title	ALLIED CHEMISTRY PAPER – II PHYSICAL CHEMISTRY AND INDUSTRIAL CHEMISTRY	
Hrs/Week	6	Credit: 4
Objectives	1. To gain knowledge in industrially important materials. 2. To understand the principles of volumetric analysis. 3. To understand the concept of rate of reaction.	
Unit	Content	Hrs
Unit I	Fuels : Classification of fuels – Characteristics of a good fuel – Calorific value of a fuel. Refining of crude petroleum, uses of various fractions. Octane number, knocking. Coal – types, analysis of coal- proximate analysis - Carbonization of coal – Metallurgical coke - manufacture. Match Industry: Pyrotechnique – Explosives – Characteristics – Classification – Primary Explosives – Lead azide, Mercury fulminate and tetracene – Low explosives – Black powder (gun powder), Nitrocellulose – High explosives – single and binary explosives –	15

	ammonium nitrate, TNT, PETN, RDX and Dynamites. Precautions during storage of explosives.	
Unit II	Silicones: Preparation, properties, and their uses. Glass : Manufacture, types of glass – Soft glass, Hard glass, Flint glass, Pyrex glass and coloured glass. High polymers : polymerization – Types of polymerization – Addition and condensation polymerization. Types of plastic : Thermoplastic and Thermosetting plastics. PVC, Teflon, Nylon-6,6, Urea-Formaldehyde, Phenol – Formaldehyde and Polyester resins. Preparation and their uses.	15
Unit III	Volumetric Analysis : Primary and Secondary standard substances. Principles of volumetric analysis. Preparation of normal, molal and molar solutions. Principles of Acid-base titrations. Theory of indicators and choice of indicators. 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.	15
Unit IV	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.	15

Unit V	Chemical kinetics: The Rates of chemical Reactions - 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 ($2A \rightarrow$ products) and Zero order reactions. Psudounimolecular reactions. Half-life time of a reaction – Expressions for $t_{1/2}$ - for first and second reactions. Methods of determining order of a reaction – Differential rate expressions and Half-life method. Effect of Temperature on reaction rates – Temperature co-efficient: The Arrhenius equation – Derivation, activation energy and its determination.	15
	Total hours/Semester	75
Text Books	1. Veeraiyan V.and Vasudevan. A.N.S. Text Book of Ancillary Chemistry, Ajantha Book Centre, Year1986. 2. Puri, B.R., Sharma L.R. and Madan S.Pathania, Principles of Physical Chemistry, Vishal Publishing House, .Millennium edition , 2007. 3. Gurdeep Raj, Chemical Kinetics, Goel publishing house unit of Krishna Prakashan Media (P) Ltd., 6th Revised edition, 1997.	
Reference Books	1. Jain, P.C. and Monica Jain, Engineering Chemistry, Dhanpat Rai Publishing Company(P) Ltd., 17th Edition, 2005. 2. Chakrabarty, D.K., An introduction to Physical Chemistry, Narosa Publishing House, ISBN – 81-7319-393-2.	

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Department	CHEMISTRY	
Course :	B.Sc., PHYSICS, B.Sc., BOTANY & B.Sc., ZOOLOGY	Effective

		from 2013-2014
Subject code	13UPS11/12 UBY 08/ 13 UZY 08	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 ferrous iron using internal indicator. 6. Estimation of potassium dichromate using sodium thiosulphate 7. Estimation of copper using Sodium thiosulphate. 8. Estimation of temporary, permanent and total hardness of water 9. Estimation of Zinc using EDTA. 10. Estimation of Mg using EDTA. Organic analysis: 1. Detection of elements. Nitrogen, Sulphur and Halogens. 2. To distinguish between aliphatic and aromatic, saturated and unsaturated compounds. 3. Functional group tests for : i) Mono and dicarboxylic acids; ii) Phenols iii) Carbohydrates iv) Aldehydes v) Amines and vi) Amides.	
	Total hours/Semester	24

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

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