



C. U. SHAH UNIVERSITY



**C. U. SHAH UNIVERSITY
WADHWAN CITY
FACULTY OF SCIENCES**

B.Sc. CHEMISTRY SEM- VI

**Syllabi (CBCS) of
Chemistry WEF
June 2016**



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: VI

SUBJECT NAME: Inorganic Chemistry-IV

SUBJECT CODE: 4SC06ICH1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1.5	70	3	--	--	--	100	

Objectives:-

- To determine term symbol and calculate the microstates.
- To understand the structure of metal carbonyl complexes.
- To learn chemical bonding in metal complexes.
- To gain an appreciation for how inorganic chemistry influences your everyday life.

Prerequisites:-

Before studying Inorganic chemistry, all students have basic knowledge of inorganic and organic compounds, molecular structure, Molecular orbital theories and knowledge related to UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1	<p>Term symbol: Russel Saunders coupling and determination of Term symbol of the ground state, Calculation of number of microstates, Pigeon hole diagram of p^2 and d^2 configurations, Hund's rule, Hole formulation.</p> <p>Electronic spectra of metal complexes Electronic spectra of transition metal complexes, Laporte orbital and spin selection rules, Orgel energy level diagram of d^5 and combined diagrams of d^1-d^9, d^2-d^8, d^3-d^7, d^4-d^6 and their spectra, Jahn Teller distortion, Spectrochemical series.</p>



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2	Quantum chemistry : Setting up of operators for different observables, Hermitian operator, important theorems concerning Hermitian operator, Particle in a three dimensional box, The rigid Rotator, The Schrodinger equation in spherical polar coordinates for hydrogen atom, separation of variables, solution of R , θ and ϕ equations.
3	Metal carbonyls : Mono and poly-nuclear metal carbonyls: $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$, $\text{Cr}(\text{CO})_6$, $\text{Fe}_2(\text{CO})_9$, $\text{Fe}_3(\text{CO})_{12}$, $\text{Co}_2(\text{CO})_8$, $\text{Mn}_2(\text{CO})_{10}$, $\text{Ir}_4(\text{CO})_{12}$, $\text{Co}_4(\text{CO})_{12}$. Metal nitrosyl and metal carbonyl hydrides. Co-ordination chemistry Reaction, kinetics and mechanism. Trans effect and trans influence, Theories of trans effect: Polarization theory.
4	Chemical bonding : π -bonding theory, MO theory , MO treatment of $[\text{FeF}_6]^{-4}$, $[\text{Fe}(\text{CN})_6]^{-4}$, $[\text{IrF}_6]^{-4}$ & $[\text{PtCl}_4]^{-2}$. Boron hydrides: Types of bonds found in higher boranes. Structure of B_4H_{10} , B_5H_9 and B_5H_{11} .

Learning Outcomes:-

After the successful completion of the course, students will be able to

- Learn basic concepts of quantum chemistry and its applications.
- Understanding of the calculation and determination of microstates and term symbol respectively.
- They can get idea of chemical bonding in metal complexes.
- Aware about general properties and uses of organic and inorganic reagents in inorganic chemistry.

Books Recommended:-

1. Principles of Inorganic Chemistry: **Puri, Sharma and Kalia**.
2. Concise Inorganic Chemistry: **J. D. Lee**; Wiley India.
3. 'Shriver and Atkins' Inorganic Chemistry: **Atkins, Overton, Rourke, Weller, Armstrong**; Oxford University Press.
4. Advanced Inorganic Chemistry: **F.A. Cotton and Wilkinson G.**; John Wiley.
5. Introductory Quantum Chemistry: **A. K. Chandra**; Tata-McGraw Hill.
6. Advanced Inorganic chemistry: (Vol. 1) **Satya Prakash, Tuli, Basu and Madan**; S. Chand
7. Advanced Inorganic chemistry: **Gurdeep Raj**; Goel Publishing House.

E-Resources:-

1. en.wikipedia.org/wiki/Term_symbol
2. en.wikipedia.org/wiki/Quantum_chemistry
3. en.wikipedia.org/wiki/Chemical_bond



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: VI

SUBJECT NAME: Organic Chemistry-IV

SUBJECT CODE: 4SC06OCH1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1.5	70	3	--	--	--	100	

Objectives:-

- To learn about basic concepts of stereochemistry.
- To understand the applications of reagents in organic chemistry.

Prerequisites:-

- Before learning organic chemistry, student should aware about basics of stereochemistry, conformational isomers, aryl halides and other UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1	Reagents and its applications Aluminium isopropoxide, N-bromo succinimide, Diazomethane, Lithium aluminium hydride, Manganese dioxide, Wittig reagent, Selenium dioxide.
2	Stereochemistry Introduction, isomerism, optical isomerism, stereoisomers, plane polarized light, polarimeter, specific rotation, enantiomers, diastereomers, metamerism, chiral molecules and chiral center, racemic modification and resolution, optical purity, Fischer and Newmann projections, molecules with 1 and 2 chiral centers, absolute configuration, R & S sequence rule.
3	Aryl Halides Introduction, physical properties of aryl halides, low reactivity of aryl halides, structure of aryl halides, nucleophilic aromatic substitution: bimolecular displacement with mechanism, reactivity in nucleophilic aromatic substitution, elimination-addition mechanism for nucleophilic aromatic substitution via benzyne.



4	Conformational Isomerism Conformation and free rotation, conformational analysis of ethane, n-butane, cyclohexane and cyclopentane.
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Learning Outcomes:-

After the successful completion of the course, students will be able to

- Understand geometry of chemistry.
- Determine reactions related to aryl halides, etc.

Books Recommended:-

1. 'Organic Chemistry, The fundamental principles', **I. L. Finar**, *Pearson*.
2. 'Organic Chemistry, Stereochemistry and the chemistry Natural Products', **I. L. Finar**, *Pearson*.
3. 'Organic Chemistry', **S. M. Mukherji, S. P. Singh and R. P. Kapoor**, *New Age International (P) Limited*.
4. 'A textbook of organic chemistry', **Arun Bahl, B. S. Bahl**, *S. Chand*.
5. 'Organic Chemistry', **Robert Thornton Morrison and Robert Neilson Boyd**, *Prentice-Hall of India Private Limited*.
6. 'March's Advanced Organic Chemistry Reactions, Mechanism and Structure', **Michael B Smith and Jerry March**, *Wiley*.
7. 'Reaction Mechanisms and Reagents in Organic Chemistry', **Gurudeep R. Chatwal**,
8. 'Organic chemistry, reaction mechanism', **V. K. Ahluvalia, R. K. Parashar**, *Narosa*.

E-Resources:

1. <http://www.organic-chemistry.org/>
2. http://www.organicdivision.org/?nd=p_organic_web_links
3. <https://www.khanacademy.org/science/organic.../stereochemistry-topic>
4. www.chem.ucalgary.ca/courses/351/Carey5th/Ch23/ch23-0.html
5. https://en.wikipedia.org/wiki/Conformational_isomerism
6. <http://www.masterorganicchemistry.com/resource-guide/>
7. www.askiitians.com > Forum
8. <http://orgchem.iisc.ernet.in/chemlink.html>
9. http://www.mpcfaculty.net/ron_rinehart/organic.htm
10. <http://web.usca.edu/chemistry/NewStudentInfo/helpful-websites-for-studying-organic-chemistry.dot>
11. <http://pubs.rsc.org/en/journals/journalissues/oc#!recentarticles&all>
12. <http://www.chem.ox.ac.uk/vrchemistry/iom/#>
13. <http://ocw.mit.edu/courses/#chemistry>
14. <http://www.stolaf.edu/depts/chemistry/courses/toolkits/247/>
15. <http://iverson.cm.utexas.edu/courses/310M/MainPagesSp06/GoldenRules.html>



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: VI

SUBJECT NAME: Physical Chemistry-IV

SUBJECT CODE: 4SC06PCH1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
4	0	0	4	4	30	1.5	70	3	--	--	--	100

Objectives:-

- To understand concept and theories of physical chemistry.
- To get idea about thermodynamics, Chemical Equilibria and chemical kinetics.
- To understand applications of physical chemistry and colligative properties in daily life.
- To generate interest and curiosity about physical chemistry.

Prerequisites:-

Before learning Physical chemistry, student should aware about basic principles and theories of physical chemistry, thermodynamics and solution, chemical Kinetics, chemical Equilibria and other UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1	Third law of thermodynamics Nernst heat theorem, Third law of thermodynamics, Determination of absolute entropies of solid, liquid and gases, Application of third law of thermodynamics, Test of third law of thermodynamics, The Boltzman entropy equation and Residual entropy. Chemical Equilibria Reversible reaction, Law of Mass action, Equilibrium Constant, Equilibrium Law, Vant-hoffs equation, relation between K_p , K_c , K_x , La Chateliers Principle, Condition for maximum yield in industrial process, Synthesis of ammonia habers process.



2	Chemical Kinetics Chemical Kinetics, Reaction Rates, Rate law, Order of reaction, Molecularity of reaction, zero order reaction, Pseudo-order reaction, First order reaction, second order reaction, Third order reaction and their characteristics, Methods for determining the order of the reaction (i) Graphical Method, (ii) Ostwald's isolation method, (iii) Method of Half Life period, (iv) integration method, Collision theory of reaction rates, transition state theory, Effect of Temperature on rate of reaction, examples.
3	Nuclear Chemistry Radioactivity, isotopes, isobars and isotones, Types of radiation, properties of radiation, detection and measurement of radioactivity, Types of radioactive decay, The group displacement law, radioactive degeneration series, rate of radioactive decay, half-life period, Radioactive dating, Nuclear transformation, nuclear equations, Artificial Radioactivity, Nuclear isomerism, Mass defect, Nuclear binding energy, Nuclear fission process, Nuclear chain reaction, Nuclear reactor, Hazards of Radiation, applications of radio isotopes.
4	Theory of Dilute Solutions Colligative Properties, Lowering of vapour pressure, Measurement of lowering of vapour pressure, Boiling point elevation, freezing point depression, colligative properties of electrolytes, Osmosis, osmotic pressure, measurement of osmotic pressure, theories of osmosis, Reverse Osmosis, laws of osmotic pressure, determination of molecular weight from osmotic pressure, relation between vapour pressure and osmotic pressure .

Learning Outcomes:-

After the successful completion of the course, students will be able to

- Understand Thermodynamics and its applications.
- Understand about dilute solutions, its properties and various colligative properties.
- Concept of Nuclear Chemistry and various applications
- Understand Chemical Kinetics and rate or reactions.

Books Recommended

1. 'Essentials of Physical Chemistry', **B. S. Bahl, Arun Bahl and G. D. Tuli**, S. Chand & Company.
2. 'Textbook of Physical chemistry' **P. L. Soni, O. P. Dharmaraha, U. N. Dash**, Sultan Chand publication
3. 'A Textbook of Engineering Chemistry' **Shashi Chawla**, Dhanpat rai & Co.
4. 'Principles of Physical chemistry' **Puri, Sharama & Pathani**, Vishal Publications
5. 'Thermodynamics for chemist' **S. Glastone**, East west Publications
6. 'Physical Chemistry' **B. K. Sharma**, Goel Publishing House
7. 'A Textbook of Physical Chemistry', **K. L. Kapoor**, Macmillan.
8. 'Principles of physical Chemistry', **Maron Samuel, Carl Prutton**, Oxford Press



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9. 'Elements of Physical Chemistry', **Atkins Petter**, Oxford Press.

E-resources

1. <http://www.allaboutsience.org/third-law-of-thermodynamics-faq.htm>
2. <http://www.chm.davidson.edu/vce/equilibria/BasicConcepts.html>
3. <http://www.science.uwaterloo.ca/~cchieh/cact/c123/massacti.html>
4. <http://www.chm.davidson.edu/vce/Kinetics/ReactionRates.html>
5. <http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch22/rate.php>
6. http://chemwiki.ucdavis.edu/Physical_Chemistry/Nuclear_Chemistry
7. <http://chemed.chem.purdue.edu/genchem/topicreview/bp/ch15/colligative.php>



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: VI

SUBJECT NAME: Analytical Chemistry-III

SUBJECT CODE: 4SC06ACH1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1.5	70	3	--	--	--	100	

Objectives:-

- To understand concept and theories of analytical chemistry.
- To get idea about instrumentation techniques.
- To understand applications of NMR and Mass spectroscopic techniques.
- To generate interest and curiosity about analytical chemistry.

Prerequisites:-

Before learning analytical chemistry, student should aware about basic principles and theories of analytical chemistry, various instrumental methods, spectroscopic techniques and other UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1	Infrared Spectroscopy: Principle, types of stretching and bending vibrations, vibrational frequencies, instrumentation, block diagram, source, monochromator, cell sampling techniques, detector and recorders, identification of organic molecules from characteristic absorption bands. Raman spectroscopy.
2	UV visible spectroscopy: Electronic transition ($\sigma\text{-}\sigma^*$, $n\text{-}\sigma^*$, $\pi\text{-}\pi^*$ and $n\text{-}\pi^*$), relative positions of λ_{max} considering conjugative effect, steric effect, solvent effect, red shift (bathochromic shift), blue shift (hypsochromic shift), hyperchromic effect, hypochromic effect (typical examples).



3	NMR Spectroscopy Introduction, Principle, Nuclear quantum number, equivalence and nonequivalent protons with illustrations; enantiomeric and diastereomeric protons, shielding and deshielding proton, Chemical Shift, Paramagnetic anisotropic effect, Relative intensity of signals, Spin-spin coupling and coupling constant, Deuterium labeling.
4	Mass Spectroscopy Introduction, Classification of spectroscopy origin and basic principles, Instrumentation, General Fragmentation modes, important features for mass spectra of alkanes. Applications of UV, IR, NMR Spectroscopy for structure elucidation of organic molecules.

Learning Outcomes:-

After the successful completion of the course, students will be able to

- Understand various concepts of IR, UV, NMR and Mass Spectroscopy.
- They can be able to apply basics into their experiment as well as their routine life.

Books Recommended:

1. 'Instrumental Methods of Chemical Analysis', **Chatwal Gurdeep R.**, Himalaya Pub. House
2. 'Instrumental methods of chemical analysis', **B. K. Sharma**, Krishna prakashan Merut.
3. 'Basic concept of Analytical Chemistry', **S. M. Khopkar**,
4. 'Analytical Chemistry: An Introduction', **D. A. Skoog, D. M. West and F. J. Holler**, 5th Edition
5. 'Spectroscopy of Organic Compound', **P. S. Kalsi**, New Age Publication

E-resources:

1. http://en.wikipedia.org/wiki/Nuclear_magnetic_resonance_spectroscopy
2. http://www.premierbiosoft.com/tech_notes/mass-spectrometry.html
3. <http://www.seafriends.org.nz/dda/ph.htm>
4. <http://teaching.shu.ac.uk/hwb/chemistry/tutorials/chrom/gaschrom.htm>



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: VI

SUBJECT NAME: Industrial Chemistry-III

SUBJECT CODE: 4SC06IDC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1.5	70	3	--	--	--	100	

Objectives:-

- To understand Industrial chemistry and manufacturing pathways.
- To learn basic principle of Paints, Varnish, Lubricants, Rubber etc.
- To understand the Explosive and Propellants materials.

Prerequisites:-

Before studying Industrial chemistry, all students have basic knowledge of types of organic, industrial manufacturing reaction. Synthesis of different solvents.

Course outline:-

Sr. No.	Course Contents
1	Paints & Pigments: Paints: Introduction, classification, distempers, constituent of paints, manufacturing of paints, setting of paints, requirements of good paints, Emulsion paint, constituent of emulsion paints, methods of manufacturing, Chemical action of emulsion paints, Latex, luminescent, fire retardant and heat resistant paints, Properties and manufacturing of Varnish. Pigments: Introduction, white pigments, white lead, manufacturing methods, Characteristics and uses of pigments.



2	Lubricants: Introduction, Properties of lubricants, Classification of lubricants, Substance used as lubricants, Additives for lubricants oil, Lubricants of mineral origin, synthetic lubricants, Greases, lubricants greases, chemical properties of greases, solid lubricants, lubricants emulsion, some test carried out on lubricants, cutting fluids, selection of lubricants, lubricating oil classification and their uses for different types of machinery.
3	Rubber and Fiber: Introduction, importance of rubber, rubber plants, types of rubber, Cyclo rubber, Latex, coagulation of rubber, crude natural rubber, Gutta percha, refining of crud rubber, drawbacks of raw rubber, rubber fabrication, Vulcanization, techniques of vulcanization, properties of vulcanized rubber, physical and chemical properties of rubber, classification of rubber, synthetic rubber. Introduction and properties of SBR, Neoprene, Buna N, butyl, Thiokol and silicon rubber.
4	Explosive and Propellants: Explosive: Introduction, Classification, Characteristics of explosive, Preparation and application of explosive, Oxygen balance, Blasting fuels, Rocket Propellants, Atom and Hydrogen bomb Propellants: Introduction, Classification, Characteristic and application of propellants

Learning Outcomes:-

After the successful completion of the course, students will be able to understand

- Industrial reactions and manufacturing of rubber, paints and lubricant.

Books Recommended:-

1. Industrial Chemistry' by B.K. Sharma
2. Handbook of Industrial chemistry by Mohammad Farhat Ali
3. Introduction to Chemical Engineering Kinetics and Reactor Design, 2nd Edition by Charles G. Hill, Thatcher W. Root
4. Homogeneous Catalysis: Mechanisms and Industrial Applications, 2nd Edition by Sumit Bhaduri, Doble Mukesh

E-Resource

1. <http://www.mponline.gov.in/Portal/Examinations/MPPSC/Admin/Home.aspx>
2. <http://en.wikipedia.org/wiki/Pigment>
3. <http://en.wikipedia.org/wiki/Paint>
4. <http://www.compoundchem.com/2014/03/21/inorganic-pigment-compounds-the-chemistry-of-paint/>
5. <http://www.earthpigments.com/natural-paints/>
6. <http://www.maklubes.com/displayselector/IndustrialLubricants.aspx>
7. http://en.wikipedia.org/wiki/Natural_rubber
8. <http://www.finitefiber.com/techserv.html>



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: VI

SUBJECT NAME: Biochemistry

SUBJECT CODE: 4SC06BCC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
4	0	0	4	4	30	1.5	70	3	--	--	--	100

Objectives:-

- The course will help the student to have a good understanding of the nutrition.
- To understand the detailed description as well as role of macromolecules in the human body.

Prerequisite:-

Students should have knowledge about basic concepts of nutrition and biomolecules.

Course outline:-

Sr. No.	Course Contents
1	Lipids Organic chemistry of biomolecules, occurrence and composition of fats, hydrolysis of fats, Soaps, Micelles, Fats as sources of pure acids and alcohols, Unsaturated fats, Hardening of oils, Drying oils, Phospoglycerides, Phosphate esters, Phospholipids and cell membranes, Biosynthesis of fatty acids, Steroids, Cholesterol, Bile acids, prostaglandins, Acetyl Co-enzyme A.
2	Amino acids, Proteins: Proteins, Isoelectric point of amino acids, Preparation of amino acids, Peptides. Geometry of the peptide linkage, Determination of structure of peptide, Classification and function of Proteins, Denaturation, Structure of proteins, Electrophoresis, Conjugated proteins. Prosthetic group. Coenzymes. Nucleic acid: Nucleosides, Nucleotides, Bioenergetics, ATP and bioenergetics, Nucleic acids, Structure of DNA, RNA, DNA fingerprinting.



3	Hormones: Hormones - Definition and classification- Thyroid hormone- thyroid function test, male sex hormones and female sex hormone.
4	Enzymes, Co enzymes and Vitamins Biological catalysis, Classification, Specificity of enzyme action, Mechanism of enzyme action, Chymotrypsin, Co enzyme, Function of Co enzymes, Mechanism of action of a carboxypeptidase, Vitamins (Co factor of enzymes), Classification of vitamins, Mechanism of action of some coenzymes.

Learning outcomes:

- The students would have gained knowledge of the Biomolecules.
- Knowledge of the role of Biomolecules in living system would have been gained.

Books Recommended

1. Biochemistry by U. Satyanarayana, Books & Allied Pvt. Ltd. (2008) ISBN-13: 978-8187134800
2. Fundamentals of Biochemistry by Ahil Chandra Deb, New Central Book Agency Pvt. Ltd, 9th revised edition (2001), ISBN-13: 978-8173811449
3. Medical Biochemistry by N. Mallikarjuna Rao, New age international publisher, (2008) ISBN-13: 978-8122418231
4. Instant Notes in Biochemistry by B.D. Hames, N.M. Hooper, Bios Scientific Pub Ltd, 2nd edition (2000) ISBN-13: 978-0387916026
5. Textbook of Biochemistry and Human Biology, by Srivastava L.M., Talwar G.P., PHI; 3rd edition (2002) ISBN-13: 978-8120319653

E-resources

1. <http://en.wikipedia.org/wiki/Biochemistry>
2. http://en.wikipedia.org/wiki/Nucleic_acid
3. http://www.accessexcellence.org/RC/AB/BA/DNA_Fingerprinting_Basics.php



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: VI

SUBJECT NAME: Chemistry in Everyday Life

SUBJECT CODE: 4SC06CEC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester								
Th	Tu	Pr	Total		Theory				Practical				Total Marks
					Sessional Exam		University Exam		Internal		University		
					Marks	Hrs	Marks	Hrs	Pr	TW			
4	0	0	4	4	30	1.5	70	3	--	--	--	100	

Objectives: -

A study of this subject will give information regarding the utility products viz. cleansing property of toilet soaps, detergents function, non-nutritive chemicals present in the packed food items, soft drinks.

Prerequisites:-

Chemistry is a practical art. In our everyday life we come across with 30 many utility materials which all are contributions of Chemistry whether it is food, cloth, drugs, cosmetics and what not. A common knowledge of all the fundamental chemistry behind these utility products will enable us to choose what is essential and discard what are harmful to our life.

Course outline:-

Sr. No.	Course Contents
1	Food additives Functional food additives, adulteration, food laws, Food colours-permitted and non-permitted – Toxicology, Flavours – natural and synthetic – Toxicology other functional additives, Soft drinks – formulation, Health drinks, Analysis of food analysis.



2	Soaps Introduction, detergent action of soap, Toilet soap, bathing bars, washing soaps, liquid soap manufacture – Batch process, cold process, hot process – semi boiled process, boiled process, Additives, fillers and flavours, Significances of acidity and alkalinity, Detergents Introduction, Detergent action, types of detergents – cationic, anionic, amphiphilic detergents, Common detergent chemicals, Additives, excipients colours and flavours. Enzymes used in commercial detergents, Environmental Hazards.
3	Cosmetics Introduction, classification – bathing oils, Face creams, toilet powder, skin products, dental cosmetics, hair dyes, shaving cream, shampoo, General formation for each types, Toxicology of cosmetics.
4	Plastics Plastics in daily use, Polymerization process (brief), Thermosetting and thermoplastic polymers, Use of PET, HDPE, PVC, LDPE, PP, PS, ABS, and others, Recycling of plastics, Biodegradable plastics, Environmental Hazards of plastics, Paper news print, writing paper, paper boards, cardboards, Organic materials, wood, cotton, Jute, coir – International Universal recycling codes and symbols for identification.

Learning outcomes:

The students would have gained knowledge of the Chemistry utility materials like food, cloth, drugs, cosmetics, plastics, etc.

Books Recommended

1. **T. P. Coultate**, Food – The Chemistry of its components. Royal Society of Chemistry London, (paperback)
2. **Shashi Chowls**, Engineering Chemistry, Darpat Rai Publication.
3. **B. K. Sharma**, Industrial Chemistry.
4. **CNR Rao**, Understanding Chemistry, Universities Press

E-resources

1. www.foodsmart.govt.nz/elibrary/food-additives.pdf
2. www.cleaninginstitute.org/assets/1/.../soapsanddetergentsbook.pdf
3. www.epa.gov/ttnchie1/ap42/ch06/final/c06s08.pdf
4. www.drugscontrol.org/pdf/cond_mfg_cosmetics.pdf
5. www.unep.org/yearbook/2014/PDF/chapt8.pdf



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: VI

SUBJECT NAME: Chemistry Practical-VI

SUBJECT CODE: 4SC06PRC1

Teaching & Evaluation Scheme:-

Teaching hours/week				Credit	Evaluation Scheme/semester							
Th	Tu	Pr	Total		Theory				Practical			Total Marks
					Sessional Exam		University Exam		Internal		University	
					Marks	Hrs	Marks	Hrs	Pr	TW		
0	0	12	12	6	--	--	--	--	20	10	70	100

Objectives:-

- To understand the separation and identification of inorganic mixture
- To learn practical principles related to organic chemistry and physical chemistry
- To create interest in students in learning basic chemistry.

Prerequisites:-

Before studying practical of analytical chemistry, all students have basic knowledge of inorganic and organic compounds, properties, molecular structure and knowledge related to UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1.	Refractometer 1. To determine specific refractivity and molecular refractivity of given pure liquid A, B, C, D. 2. To determine specific refractivity and molecular refractivity of glycerin (10%, 5%, 2.5%) and unknown glycerin solution. Potentiometry 1. To determine normality and dissociation constant of benzoic acid using 0.1N NaOH. 2. To determine normality of given acid xN HCl using NaOH solution.



	<p>3. To determine normality and dissociation constant of benzoic acid using 0.1N NaOH.</p> <p>Polarimeter</p> <p>1. To determine specific rotation of three different concentration (10%, 5%, 2.5%) of dextrose solution. From graph find out the unknown concentration by plotting concentration v/s rotation angle.</p> <p>2. Study the inversion rate of sugar in presence of 1N HCl and determine the rate of reaction.</p> <p>Surface tension:</p> <p>1. Find the surface tension of the liquids A, B, and C by using Dropweight method. Find the value of Parachor of liquids and -CH₂ group.</p>
2.	<p>Inorganic Qualitative Analysis: Qualitative Analysis of inorganic mixture containing four/Six radicals.</p> <p>Gravimetric Analysis</p>
3.	<p>Chromatography</p> <p>a. Separation of a mixture of amino acids</p> <p>b. Separation of a mixture of metal ions</p>

Learning outcomes:-

After the successful completion of the course, students will be able to:

- Understand basic principal of chemistry practical's
- Understand Qualitative Analysis of an inorganic mixture by separation method
- Understand the Refractometer, Potentiometry, Polarimeter

Books for References:

1. 'Textbook of quantitative analysis, A. I. Vogel.
2. 'Textbook of quanlitative analysis, A. I. Vogel.
3. Experimental physical chemistry by R. C. Das & B. Bahera 'Practical in inorganic chemistry & analytical chemistry', H.G. Raval, Nirav & Rupal Prakashan.

E-Resources:-

1. <http://pubs.acs.org/journal/inocaj>
2. http://www.chemlin.de/chemistry/inorganic_chemistry.htm
3. <http://www.anorg.chem.uu.nl/home/index.html>
4. <http://www.springer.com/chemistry/inorganic+chemistry/journal/11502>
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