



C. U. SHAH UNIVERSITY



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

**B.Sc.
CHEMISTRY
SEM-V**

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



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Inorganic Chemistry-III

SUBJECT CODE: 4SC05ICH1

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 molecular symmetry which can be used to predict molecule's properties such as its dipole moment and its allowed spectroscopic transitions.
- To learn splitting of orbitals, magnetic properties, hydration enthalpies and spinel structures of transition metal complexes from CFT.
- 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	Molecular symmetry Introduction, symmetry operation and symmetry elements: C_n , σ , S_n , i and E , Point groups for the molecules (excluding S_{2n} and I_h), Use of multiplication tables of C_{2v} , C_{2h} and C_{3v} point groups
2	Inorganic Polymers: Classification of inorganic polymers, polymers containing boron and silicon: methods of preparation, physical and chemical properties, structures and their use. Metal Clusters: Metal clusters, carbonyl clusters, low nuclearity carbonyl clusters, high nuclearity carbonyl cluster, electron counting scheme for HnCCS, Wade's rules, Halides type clusters, Chevrel phases, Zintl ions.



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3	Acids and Bases: Arrhenius concept, Lowry-Bronsted Acid-Base concept, solvent system concept, Luxflood concept, Lewis Acid-Base concept, classification of Lewis Acids and Bases, Pearson's Soft and Hard Acid-Base principle (HSAB), application of HSAB principle, Levelling effect. Non-Aqueous Solvents: Classification of Solvents, general properties of ionizing solvents, liquid NH_3 as non-aqueous solvent, merits and demerits of Liquid NH_3 as solvent, Liquid SO_2 as a solvent, Liquid Hydrogen Fluoride.
4	Crystal Field Theory: Introduction, concept of crystal field theory, splitting of d-orbital in octahedral and tetrahedral crystal field with CFSE concept, factors affecting splitting energy, weak field and strong field ligands, high spin and low spin complexes with pairing energy, magnetic behaviour of transition metal complexes, orbital angular momentum contribution to magnetic momentum of complexes, examples based on CFSE, pairing energy and magnetic momentum.

Learning Outcomes:-

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

- Learn basic concepts of acids and bases and non-aqueous solvents.
- Understanding symmetry element, point group of the molecules.
- They can get idea of pairing energy, magnetic properties of metal complexes and splitting of orbitals.

Books Recommended:-

1. Principles of Inorganic Chemistry: Puri, Sharma and Kalia.
2. Concise Inorganic Chemistry: J.D.Lee; Wiley India, 5th Edition (1996).
3. 'Shriver and Atkins' Inorganic Chemistry: Atkins, Overton, Rourke, Weller, Armstrong; Oxford University Press, 5th Edition (2011).
4. Advanced Inorganic Chemistry: F.A. Cotton and Wilkinson G.; John Wiley, 5th Edition (1988).
5. Advanced Inorganic chemistry: (Vol. 1) Satya Prakash, Tuli, Basu and Madan; S. Chand

E-Resources:-

1. en.wikipedia.org/wiki/Molecular_symmetry
2. en.wikipedia.org/wiki/Cluster_chemistry
3. www.chemtutor.com/acid.htm
4. www.britannica.com/EBchecked/topic/3719/acid.../Nonaqueous-solvents
5. chemwiki.ucdavis.edu/.../Crystal_Field_Theory/Crystal_Field_Theory



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FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Organic Chemistry-III

SUBJECT CODE: 4SC05OCH1

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:-

- Study of carbohydrates, basic concepts of reactive intermediates and the reactions involving active methylene compounds.
- To understand name reactions and rearrangement with their mechanisms.

Prerequisites:-

- Before learning organic chemistry, student should be aware of basic principles and theories of name reactions, rearrangements, carbohydrates and other UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1	Reactive intermediates Homo and heterolytic fission, carbocations, carbanions, free radicals, carbenes, nitrenes, benzynes, ylides and enamines.
2	Name reactions and rearrangements Ullmann reaction, Meerwein-pondorffvarley reaction, Knorr-pyrole reaction, Skraup synthesis, Hantzsch-pyridine synthesis, Neber rearrangement, Stevens rearrangement, Pinacol-Pinacolone rearrangement.



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3	Carbohydrates Introduction, classification and nomenclature, general reactions of monosaccharides (with reference to glucose and fructose), conversion of aldose to corresponding ketose, conversion of aldose to next higher ketose (Wolform method), conversion of aldose to ketose having two more carbon atoms (Sowden method), conversion of ketose to corresponding aldose. Step-up reactions: Kiliani reaction and Swoden nitromethane reaction, Step-down reactions: Ruff method, configuration of monosaccharides, ring structure of aldoses, determination of ring size of glucose by methylation method and periodic oxidation method, mutarotation of D(+) glucose.
4	Active methylene compounds Introduction, synthesis of Ethyl acetoacetate (EAA) and Diethylmalonate Acidic and ketonichydrolysis of β -dicarbonyl compounds, Synthetic applications of β -dicarbonyl compounds. (i) Crotonic acid from EAA (ii) Valeric Acid from diethyl malonate.

Learning Outcomes:-

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

- Understand organic reactions with proper mechanisms.
- Determine reactions related to active methylene compounds, carbohydrates, etc.

Books Recommended:-

1. 'Organic Chemistry, The fundamental principles', **I. L. Finar**. *Pearson*.
2. 'Organic Chemistry, Stereochemistry and the chemistry of 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', **ArunBahl, 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://en.wikipedia.org/wiki/Reactive_intermediate
4. www.eufic.org/article/en/expid/basics-carbohydrates/
5. <http://www.masterorganicchemistry.com/resource-guide/>
6. <http://orgchem.iisc.ernet.in/chemlink.html>



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7. www.chem.ucalgary.ca/courses/351/Carey5th/Ch21/ch21-1-2.html
8. http://www.mpcfaculty.net/ron_rinehart/organic.htm
9. <http://web.usca.edu/chemistry/NewStudentInfo/helpful-websites-for-studying-organic-chemistry.dot>
10. <http://pubs.rsc.org/en/journals/journalissues/oc#!recentarticles&all>
11. <http://www.chem.ox.ac.uk/vrchemistry/iom/#>
12. <http://ocw.mit.edu/courses/#chemistry>
13. <http://www.stolaf.edu/depts/chemistry/courses/toolkits/247/>
14. <http://iverson.cm.utexas.edu/courses/310M/MainPagesSp06/GoldenRules.html>



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Physical Chemistry-III

SUBJECT CODE: 4SC05PCH1

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, Phase rule and electro chemical cells.
- To understand applications of phase change and colloids.
- 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, solutions, electrochemical cells and other UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1	Second Law of Thermodynamics Spontaneous process, entropy, cyclic process, Carnot cycle, derivation of energy from carnot cycle, physical significance of entropy, entropy change in an ideal gas, Gibbs Helmholtz equations, Clapeyron equation, Clausius-Clapeyron Equation, Free energy and work function, Vant-hoff isotherm, Fugacity and activity.



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2	Solutions Solution-homogenous mixture, composition of solution, solution of gases in gases, Henry's law, Solution of Gases in liquids, The ideal Solutions, Raoult's Law of solution, vapour pressure of ideal solution, vapour pressure of non-ideal solution, theory of fractional distillation, Azeotropic mixtures, distillation of immiscible liquids, Steam distillation, solubility of partially miscible liquids, Phenol-water system, Triethylamine-water system, Nicotine-water system, Critical Solution temperature, Solution of solids in liquids, solubility of solids in solids.
3	Phase Rule Phase, Components, degree of Freedom, phase rule, derivation of Phase rule, one component System, phase diagram, two component system, Silver-Lead System, Zn-Cd System, KI-Water System, Sodium Sulphate water System. Colloids Colloidal System, Lyophilic & Lyophobic sol, characteristics of Lyophilic & Lyophobic sol, preparation of sol, dispersion method, aggregation method, purification of sols, optical properties of sol, Tyndal effect, kinetic properties of sols, Brownian motion, electric properties of sols, Electrophoresis, Gold number, Application of Colloids.
4	Electro Chemistry Concentration cells: definition, Electrode Concentration Cell, electrolyte concentration cell, Concentration cell without transference, Concentration cell with transference, Liquid Junction potential, Elimination of liquid junction potential, Application of EMF measurement in determination of: Solubility of sparingly soluble salt, valency of metal ion, dissociation constant of weak acid, Transport number of ion, Ionic product of water, Degree of hydrolysis, pH by different electrodes.

Learning Outcomes:-

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

- Understand Thermodynamics and its applications.
- Understand about solutions, its properties and vapour pressure curves.
- Concept of Electrochemistry and various applications
- Understand phase rule and colloidal systems

Books Recommended

1. 'Essentials of Physical Chemistry', **B.S.Bahl, ArunBahl and G.D.Tuli**, S.Chand&Company.
2. 'Textbook of Physical chemistry' **P. L. Soni, O. P. Dharmaraha, U. N. Dash, Sultan**
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.



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8. 'Principles of physical Chemistry', Maron Samuel, Carl Prutton, Oxford Press
9. 'Elements of Physical Chemistry', **Atkins Petter**, Oxford Press.

E-resources

1. http://en.wikipedia.org/wiki/Second_law_of_thermodynamics
2. http://chemwiki.ucdavis.edu/Physical_Chemistry/Thermodynamics/Laws_of_Thermodynamics/Second_Law_of_Thermodynamics
3. http://chemwiki.ucdavis.edu/Physical_Chemistry/Physical_Properties_of_Matter/Solutions_and_Mixtures/Colloid
4. <http://en.wikipedia.org/wiki/Electrochemistry>



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Analytical Chemistry-II

SUBJECT CODE: 4SC05ACH1

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 error and statistics and various volumetric concepts.
- To generate interest and curiosity about analytical chemistry.

Prerequisites:-

Before learning analytical chemistry, student should aware about basic principles and theories of analytical chemistry, Basics of volumetric analysis, and other UG level chemistry.

Course outline:-

Sr. No.	Course Contents
1	Errors and statistics Introduction, explanation of errors and mistakes, classification of errors, determinant and indeterminant error, operational and personal errors, instrument error and reagent error, additive and proportional error, Accuracy and precision, minimization of error, Explanation of significant figure and its law with complete interpretation, Mean and standard deviation, variance and coefficient of variance, Absolute error and relative error, mean value deviation and relative mean deviation, Importance of Q-test and T-test (Student-T test), Examples on errors, significant figures, Q-test and T-test.



2	Basic principles of qualitative analysis Separations of following species in presence of each other 1. Cl^- , Br^- , I^- 2. NO_2^- , NO_3^- , Br^- 3. S^- , SO_3^{2-} , SO_4^{2-} 4. PO_4^{3-} , AsO_3^{3-} , AsO_4^{3-} 5. CO_3^{2-} , SO_3^{2-} , S^{2-} 6. Cu^{+2} , Cd^{+2} Colourimetry Introduction, Lambert-Beer's Law Derivation and applications Spectrophotometric titration graphically, Deficit of absorbance by product, titrant and reagent
3	Calculation based on pH, normality, molarity, solubility product constant (K_{sp}) etc. Ostwald's law-regarding indicator necessary derivation and formula of indicator used in neutralization, redox, precipitation titration. Neutralization titration Primary and secondary standard explanation, Strong acid-Strong Base, Weak acid – Strong base, Strong Acid –Weak base, Poly protic acid-Strong base titration Redox Titration Principle of external and internal indicators in redox titrations, Iodometry and Iodimetry titration Precipitation titration Argentometric titration (I) Mohr's method (II) Fazan's method (III) Volhard's method with use of proper indicator, graph and its principle.
4	Electro-chemical methods (Conductometry) Electric transport, conductance in metals and in electrolyte solution, specific conductance, equivalent conductance, Importance of conductivity electrodes and platinization of electrodes, Variation of specific conductance with dilution as well as area of cross section of dip type electrodes and distance between two plates of electrodes etc., Kohlrausch law and its importance, cell constant and its importance. Conductometric Titration: Strong acid – Strong base, Strong acid – Weak base, Weak base – strong base, weak acid – Weak base Precipitation Titration: $\text{AgNO}_3 - \text{NaCl}$, $\text{BaCl}_2 - \text{K}_2\text{SO}_4$, $\text{Ba}(\text{OH})_2 - \text{MgSO}_4$ Degree of Hydrolysis and Hydrolysis constant: Importance of conductivity water and temperature for the measurement of conductivity.

Learning Outcomes:-

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

- Understand various concepts of Errors and statistics.
- Concept of Colorimetry and Conductometry.
- Understand about various principles of volumetric and qualitative analysis.
- 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.



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3. 'Principles of instrumental analysis', **Skoog. D. A.**, Thomason, Brooke/Cole
4. 'Quantitative analysis', **R.A. Day Jr. A.L. Underwood**, 5th edition, Prentice Hall of India Private Ltd., New Delhi.
6. 'Basic concept of Analytical Chemistry', **S. M. Khopkar**, New Age International Publishers, New Delhi.
7. 'Analytical Chemistry: An Introduction', **D.A. Skoog, D.M. West and F.J. Holler**, 5th Edition, Saunders college publishing.

E-resource

1. http://en.wikipedia.org/wiki/Errors_and_residuals_in_statistics
2. <http://www.wiredchemist.com/chemistry/instructional/laboratory-tutorials/volumetric-analysis>
3. <http://www.britannica.com/EBchecked/topic/632594/volumetric-analysis>
4. http://books.google.co.in/books/about/Conductometric_analysis.html?id=GrM6AAAAMAAJ&redir_esc=y
5. http://www.monzir-pal.net/Lab%20Manuals/Practical%20Quantitative%20Analysis/main_Pract_Quant/Precipitation_titrations.htm



C. U. SHAH UNIVERSITY

FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Industrial Chemistry-II

SUBJECT CODE: 4SC05IDC1

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 reaction pathways and reaction types.
- To learn basic principle of Unit process and operation.
- To understand the gases and oil fats manufacturing.

Prerequisites:-

Before studying Industrial chemistry, all students have basic knowledge of types of reaction, condition, unit operation, unit operation and perfumes.

Course outline:-

Sr. No.	Course Contents
1	Unit Process and Unit Operation: Unit process: Basic principle and introduction, Nitration, Sulphonation, halogenation, Oxidation, amination, hydrogenation, calcinations, Condensation, alkylation, esterification, hydrolysis, hydrolysis, polymerization. Unit Operation: Basic principle, introduction, Distillation, filtration, Crystallization and Extraction.
2	Industrial organic Synthesis: Introduction, Raw material and basic process, Chemical process used in industrial organic synthesis, Petrochemicals Industrial synthesis of Methanol, Ethanol, Phenol, Acetic acid, Ethylene glycol, Glycerine, Ethyl acetate, Formaldehyde, Acetone, Propenone.



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3	Industrial gases: Introduction, Hydrogen cell, Source of hydrogen, hydrogen from microbes, Industrial production of hydrogen, Industrial uses of hydrogen. Manufacturing and uses of following gases: Oxygen Nitrogen, Carbon dioxide, Acetylene, Ammonia and Nitric Acid
4	Oil, Fat and Perfumes: Oil and Fat Introduction, Difference between oil and fats, physical and chemical properties. Classification, manufacturing of Soybean oil by solvent extraction, Mineral oil, Animal oil, Silicon oil, Ester oil, Iodine oil Synthetic perfumes: Introduction, Esters, Alcohols, Ketones, Ionones, Nitro masks, Aldehydes, Production of natural perfumes. Flower, fruits and artificial perfumes.

Learning Outcomes:-

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

- Industrial process in large scale.
- Esterification, Nitration, gases, sulfonation and oil and fats.

Books Recommended:-

1. 'Industrial Chemistry' by **B.K. Sharma**.
2. 'Advanced Organic Chemistry, Part B', **F. A. Carey & R. J. Sundberg**, Plenum Press.
3. 'A Text Book of Organic Chemistry', **R.K. Bansal**, New Age International (P) Ltd.
4. 'Advanced Organic Chemistry', **Jerry March**.
5. 'Reaction Mechanism and Problems in Organic Chemistry', **P. Chattopadhyay**, Asian Book Pvt Ltd, New Delhi.
6. 'Principles of Organic Synthesis', **R.O.C Norman, J.M. Coxon**, CRC Press.
7. 'Organic Chemistry', **J. Clayden, N. Greeves, S. Warren, P. Wothers**, Oxford University Press.
8. 'Organic Chemistry', **J. McMurry**, Asian Books Pvt. Ltd.

E recourses

1. <http://www.engineering.unsw.edu.au/chemical-engineering/industrial-chemistry>
2. http://en.wikipedia.org/wiki/Unit_operation
3. <http://www.essentialchemicalindustry.org/processes.html>
4. <http://www.avu.org/Chemistry/chm-4101-industrial-chemistry.html>
5. <http://www.petrochemistry.eu/about-petrochemistry/what-are-petrochemicals.html>
6. <http://chemicals.nic.in/MLCPCSTAT14.pdf>
7. http://en.wikipedia.org/wiki/Industrial_gas
8. <http://nzic.org.nz/ChemProcesses/production/1K.pdf>
9. http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/fats_and_oils



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FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Applied Chemistry

SUBJECT CODE: 4SC05APC1

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 provide basic knowledge of applied chemistry.

Prerequisites:-

- Knowledge of basics of chemistry is essential.

Course outline:-

Sr. No.	Course Contents
1	Medicinal Chemistry Introduction, Classification and Nomenclature of Drugs, Mechanism of Drug Action and Metabolism of Drugs, Causes of Common Diseases and their Treatment by Drugs, Some Medicinally Important Inorganic Compounds, Biological Role of Some Inorganic Compounds,
2	Biological Chemistry Nutrients Digestion and Absorption, Enzymes, Hormones, Micro Nutrients and their Biological Role
3	Dairy Chemistry Sampling of milk, butter, and cheese, Qualitative exercises and tests, Extraction of fat from milk, Microscopic examination of milk and butter, Examination of milk fat, Oxidised taint in milk, Kreis test for oxidised fat, Detection of the presence of peroxides in oxidised fat, Separation and examination of casein, Film formation, Albumin and globulin, Preparation and examination of milk ash, Action of rennet on milk, Tests for some preservatives and colouring agents in milk, Estimation of fat in milk.



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4	Agriculture Chemistry Soil Chemistry, Insecticides, Fungicides And Herbicides, Fertilizers, Manures, Compost And Saw Dust
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Learning Outcomes:-

- At the end of the course the student would have sufficient knowledge of basics of pharmaceutical chemistry, biological chemistry, agriculture chemistry and about milk and milk products.

Books Recommended:-

1. Fundamental concepts of applied chemistry by **Jayashree Ghosh**, S. Chand
2. Medicinal Chemistry: An Introduction By **Gareth Thomas**, Wiley
3. Fundamentals of Dairy Chemistry by **Elmer H. Marth**, Springer Science & Business Media, 30-Sep-1988
4. Elements of Agricultural Chemistry By **Thomas Anderson MD**, Betmillard USA

E-resources

1. <http://krishikosh.egranth.ac.in/bitstream/1/22039/1/BPT4178.pdf>
2. http://en.wikipedia.org/wiki/Agricultural_chemistry
3. http://en.wikipedia.org/wiki/Medicinal_chemistry
4. http://chemwiki.ucdavis.edu/Biological_Chemistry



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FACULTY OF SCIENCES **DEPARTMENT OF CHEMISTRY**

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Environmental Chemistry

SUBJECT CODE: 4SC05EVC1

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 provide basic knowledge of environmental protection and improvement.

Prerequisites:-

Environmental Science chemistry plays a key role in understanding the environment and preserving its quality.

Course outline:-

Sr. No.	Course Contents
1	Environment Environment, nature of environmental threats and the role of chemistry, Chemistry of the air, water and soil environment, Factors affecting environment, Types of environment, Structure and composition of atmosphere, Air as an ecological factor, Biosphere, Current environmental problems, Importance of clean air.



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2	Air pollution Pollution, origin of pollution, Classification of pollutants, Air pollutants – Oxides of carbon, sulphur, nitrogen, hydrocarbons, VOC and SPM, Persistent organic pollutants, Chlorofluorocarbons, Dioxins, automobile exhaust, Alternate refrigerants, Health and environmental effects of pollutants. Water pollution Importance of water, self-purification capacity of the water body, visible signs of water pollution, sources of water pollution, fate of pollutants in aquatic systems, effects of water pollution, Water quality standards, Detection of fluoride, chloride, sulphate, nitrate, phosphate, acidity and alkalinity of water, Biological magnification and bioaccumulation.
3	Industrial waste water treatment Method to control water pollution, Aerobic and anaerobic oxidation, Sedimentation, coagulation, filtration, disinfection, desalination and ion exchange, Primary treatment, secondary treatment - trickling filters, activated sludge process, sludge digestion, Tertiary treatment, USAB process and deep well injection, Sewage, sewage analysis-total solids, settleable solids, suspended solids, dissolved oxygen, BOD (winklers titration method and dissolved oxygen metre) and COD.
4	Soil pollution and Soil analysis Types, sources and consequences. Sampling Methods. Specifications for disposal of sewage & effluent on land for irrigation & ground water recharge. Methodology of wastewater disposal on land in India. Impact of usage of land for solid waste disposal both municipal solid waste & industrial solid wastes (fly ash from thermal power station, lime sludge from pulp & paper mills). Determination of moisture, pH

Learning Outcomes:-

- At the end of the course the student would have sufficient knowledge of basics become familiar with chemical processes that occur in the environment and have developed means of directing chemical science towards environmental improvement.

Books Recommended:-

1. **A. K. Dee.**, Environmental Chemistry, 6th Edition, New Age International.
2. **P.K.Goel**, Water Pollution, Causes, Effects and Control, New Age International
3. **B. K. Sharma**, Analytical Chemistry: (Comprehensively Covering the UGC Syllabus).
4. **Kochu Baby Manjooran**, Modern Engineering Chemistry (Kerala University), Kannatheri Publications.
5. **Shashi Chowla**, Engineering Chemistry, Dhanpat Rai Publishing Company.
6. **P.C. Jain and Moniika Jain**, Engineering Chemistry, Dhanpat Rai Publishing Company.
7. **T. D. Biswas and S. K. Mukherjee**, A. Text-Book of Soil Sciences

E-resources

1. www.epa.gov/airtrends/2010/report/airpollution.pdf



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2. www.euro.who.int/_data/assets/pdf_file/0006/74715/E86650.pdf
3. www.unwater.org/downloads/water_quality.pdf
4. <http://waterandme.tamu.edu/WaterPollution/waterpollution.pdf>
5. www.eolss.net/sample-chapters/c09/e4-11-02-02.pdf
6. www.arlington-tx.gov/cityattorney/wp-content/.../INDUSChapter.pdf
7. <http://agricoop.nic.in/dacdivision/mmsoil280311.pdf>



FACULTY OF SCIENCES
DEPARTMENT OF CHEMISTRY

COURSE: B.Sc.

SEMESTER: V

SUBJECT NAME: Chemistry Practical-V

SUBJECT CODE: 4SC05PRC1

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 organic compounds and identification
- 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	Conductometry 1. To determine normality and g/lit of xNHCl and also determine specific conductance by conductometry. 2. To determine normality and g/lit of the mixture of HCl+CH ₃ COOH by conductometry. 3. To determine the normality of weak acid by conductometry. pH metry 1. To determine normality of xNHCl by pH metry. 2. To determine normality and dissociation constant of weak acid (xN CH ₃ COOH) by pH metry. 3. To determine normality and dissociation constant of dibasic acid (xN oxalic



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	acid/malonic acid/maleic acid) using 0.1N NaOH solution. Colourimetry 1. Find out the amount of Ni^{+2} in the given solution by colourimetry method. 2. Find out the amount of Fe^{+3} in the given solution by colourimetry method. Viscosity 1. To determine relative and absolute viscosity of pure liquid A, B, C, D. 2. Prepare three different 10%, 5%, 2.5% aqueous solution of Glycerin. Find viscosity of these three solutions as well as unknown concentration solution.
2.	Organic qualitative analysis: Identification of ordinary mixture of organic compounds containing at least one liquid.

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 organic mixture by separation method
- Understand pH metry, colorimetry and conductometry

Books for References:

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

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>
5. <http://libguides.stanford.edu/content.php?pid=149720&sid=1271547>
6. <http://www.science.uwaterloo.ca/~cchieh/cact/applychem/inorganic.html>