

Programme Outcomes (BSc Degree Course)

Academic year 2016-2017

Name of the Programme : BSc Chemistry
Academic Frame Work & : Following / Adhering to the Curriculum, syllabus and
Content : evaluation system designed by Periyar University,
Salem-7, Tamilnadu

Objectives

1. The student will understand the importance of the Periodic Table of the Elements, how it came to be, and its role in organizing chemical information.
2. The student will understand the interdisciplinary nature of chemistry and to integrate knowledge of mathematics, physics and other disciplines to a wide variety of chemical problems.
3. The student will learn the laboratory skills needed to design, safely conduct and interpret chemical research.
4. The student will acquire a foundation of chemistry of sufficient breadth and depth to enable them to understand and critically interpret the primary chemical literature.
5. The student will develop the ability to effectively communicate scientific information and research results in written and oral formats.
6. The student will learn professionalism, including the ability to work in teams and apply basic ethical principles

Programme Outcomes

- Students have understand the atomic structure, electronic structure, behavior of ideal and real gases.
- Students have learnt reaction mechanism, chemical kinetics, Thermodynamics laws.
- Students have learnt basic knowledge about analytical, pharmaceutical, agricultural and polymer chemistry.
- They have understand simple aliphatic, aromatic and heterocyclic compounds and its synthesis, properties, and chemical reactions.
- Students have learnt various type of spectroscopy and its principle.
- They are understand volumetric principle, Qualitative analysis and Emfmeasurements.
- Students will be able to describe different quantitative methods of analysis of organic and inorganic substances.

Programme specific outcomes

- Students have understand the nature electromagnetic radiation and quantum, the periodic law and significance of atomic no and electronic configuration as the basic for periodic classification.
- Students have learnt classify elements into a s,p,d and f blocks and learn their main characteristics.
- Students have understand the concept of organic reactions mechanism, type of organic reactions and paramagnetic, diamagnetic and ferromagnetic substances.

- Students are understand the use of simple models for predictive understanding of physical phenomena associated to chemical thermodynamics and kinetics
- They are learnt many functional groups and their reactivity and Set up glassware and apparatus to conduct experiments in Organic Chemistry.

Learning Outcomes / Course Outcomes

General Chemistry-I

Atomic Structure

- They are learnt Fundamental particles of matter – their composition – Comparison between Rutherford's model of atom and Bohr's model.
- Students have learnt de Broglie theory-Heisenberg's uncertainty principle- Quantum numbers.
- Students have understand Wave mechanical concept of atom – Schrodinger's wave equation.
- They are understand Differences between an orbit and orbital.

Electronic structure

- Students have understand Pauli's Exclusion principle and its application-Hund's rule- its basis and applications.
- Students have learnt Atomic and ionic radii, Ionization Energy, Electron affinity and Electro negativity.
- They are learnt s, p, d and f block elements-classification and characteristic properties.

Structure and Bonding

- Students have learnt Inductive, inductomeric and steric effects-their effect on properties of compounds.
- They have understand Mesomeric, resonance, hyperconjugation-localised and delocalised chemical bond.
- Students have learnt Cycloalkanes-Nomenclature-methods of formation-Wurtz reaction, Dieckmann ring closure & reduction of aromatic hydrocarbons-Chemical reactions.
- Students are learnt Nomenclature and classification of dienes-isolated, conjugated and cumulated dienes-butadiene.

The Gaseous State

- Students have learnt Kinetic molecular theory of gases-the kinetic gas equation- Derivation of the gas laws-kinetic theory.
- Students have learnt Maxwell's distribution of molecular velocities-types of molecular velocities-Expansivity and compressibility-collision diameter-collision frequency-mean free path.
- They are understand Deviations from ideal behaviour- -Explanation of deviations - Boyle point.
- They have learnt the virial equation of state-derivation of the principle of corresponding states.

Qualitative and Volumetric Analysis

- Student have learnt basic principles of Inorganic semi micro analysis-semi micro techniques-principles involved in Na_2CO_3 extract preparation.
- They are understand common ion effect and solubility product and their applications in qualitative analysis.
- Student have understand Definition of molarity, molality, normality and mole fraction-Definition and examples for Primary and Secondary standards
- Students have learnt theories of acid-base, redox, iodometric and iodimetric titrations.

General Chemistry-II

Chemical bond

- Student have learnt inert pair effect, fajan's rule, valence bond theory, molecular orbital theory, polarisation of ions, born Haber cycle, hetero nuclear diatomic molecules -CO, NO, HF.

Hydrides & Carbides

- Student have understood position in periodic table, ionic hydrides, covalent hydrides ,complex hydrides(NaBH_4 , LiBH_4), silianestudy.<https://meet.google.com/zkp-zpqb-opd>
- Students have learn Carbides-preparation, properties, uses,

Reaction mechanism intermediate

- Student have learn carbonation, carboanion, free radical formation of stability, SN_1 , SN_2 , SN_i , E_1 , E_2 reaction,relative reactivity of ethyl, isopropyl,tertiary, butylvinylbenyl halides.
- Students have learn Hofmann saytzeff rule, 1,2 and 1,4 addition to dienes.

Cycloalkanes and aromatic hydro carbons

- Student have understood nitration, halogenation,fridel crafts acylation.
- Student have learn naphthalene, anthracene properties, synthesis, wurtz reaction, dieckmann reaction, ring closure reaction.

The liquid state & liquid crystal

- Students have learn trouton's rule, surface tension, viscosity and chemical constitution, molar refraction, and chemical constitution.
- Students have understood smetic liquid crystal, nematic liquid crystal, cholesterol liquid crystal.

SBEC-Food and Nutrition

Food sources

- Students have learnt the sources of food, constituents of foods- carbohydrate, protein, fat, oils, colours, flavours, natural toxicants

Nutrition

- Students have understood the nutrition, nutrients, functions, nutritional status-definition, signs of good and poor nutritional status
- They have learnt the malnutrition- definition, forms, causes and remedy
They have learnt the health- definition guidelines for good health

Food poisoning and adulteration

- Students have understood, poisoning sources causes and remedy, causes and remedies for acidity gastritis, indigestion and constipation
- Students have learnt types of adulterants- intentional incidental effects and detection

Food preservation and processing

- Students have learnt the food spoilage cause of food spoilage, types of food spoilage, preservation and processing by heating- sterilization, pasteurization

Vitamins and minerals

Students have understood sources requirements and deficiency diseases of A,C,K E1,B1,B2, minerals elements in food Na, K, Fe, S, P

General Chemistry – III

Transition Elements and qualitative analysis

- Students have learnt Transition Elements – position in the Periodic Table-General characteristics of d-block elements – an objective study of the properties expected, Occurrence, extraction, properties and uses of Titanium, Zirconium, Molybdenum. Chemistry of Titanium dioxide, Titanium tetrachloride, Vanadium pentoxide, Ammonium Vanadate, Zirconium dioxide, Zirconium halides, Ammonium molybdate and Molybdenum blue.
- Students have understood the Principles of Qualitative analysis- Basic principles of inorganic semi micro analysis. Principles involved in Na_2CO_3 extract preparation, Common ion effect, Solubility product and their applications in Qualitative analysis. Separation of cations into Groups.

Reaction mechanism II

- Students have understood the Mechanism of –Kolbe’s reaction, Reimer-Tiemann reaction, Gattermann, Lederer- Manasse and Houben-Hoesch reaction. Students know the Addition to Carbon –heteromultiple bond - Addition of HCN, NH_2OH , 2,4-dinitrophenyl hydrazine, semicarbazide & Grignard reagent.
- Students have understood Mechanisms of Mannich, Stobbe, Darzen, Wittig and Reformatsky reactions, Mechanism of reduction of carbonyl group by NaBH_4 , LiAlH_4 –Wolf-Kishner, Clemmensen and MPV reductions.

Carboxylic acids and Esters

- Students have learnt Unsaturated acids-preparation and properties of acrylic, crotonic, oleic and cinnamic acids, Dicarboxylic acids-preparation and properties of oxalic, malonic, succinic, glutaric and adipic acids.
- They have understood the Hydroxy acids-classification – preparation and reactions of Glycolic acid, Malic acid and Citric acid-Action of heat on α , β and δ acids, Tautomerism-definition-keto-enol and amido-imido tautomerisms.

Solid State

- Students have understood The Solid State - Difference between crystalline and amorphous solids- isotropy and anisotropy- interfacial angles- symmetry in crystal systems- elements of symmetry- space lattice and unit cell- Bravais lattices- Law of rational indices- Miller indices- X ray diffraction- Bragg’s equation- Experimental methods structures of NaCl, CsCl and ZnS.
- Students have learnt Band theory and defects.

Thermodynamics and thermochemistry

- Students have learnt Terminology of Thermodynamics- Thermodynamic equilibrium- Nature of work and heat- Law of conservation of energy- first law of thermodynamics- Internal energy- Enthalpy of a system- Heat capacity of a system- Expansion of an ideal gas- work done in reversible isothermal expansion- work done in reversible isothermal compression- work done in reversible adiabatic expansion – Joule-Thomson effect, Joule-Thomson coefficient- Inversion temperature - zeroth law of thermodynamics- Absolute temperature scale - Kirchoff’s equation.

SBEC-Polymer Chemistry

Structure of polymers

- Students have understood the linear, branched, crosslinked, homo, hetero copolymer, block copolymer, block copolymer
- They have learnt isotactic, syndiotactic, atactic.
- Students have understood crystalline melting point, the glass state, glass transition temperature.

Molecular weight of polymers

- Students have learnt average molecular weight and weight average molecular weight, determination of molecular weight by viscosity and osmometry methods.
- They have understood the calendaring, die casting, and blow moulding, wet spinning.

Poly olefins

- Students have understood polythene, PTFE, freons, pvc, polypropylene, polystyrene, natural rubber, butyl, buna-N, neoprene, thiocol, silicone rubber, polyurethane.

Plastics and resins

- Students have learnt plastics and resins definition, thermoplastic and thermosetting resin, constituents of plastic, fillers, dyes, pigment, plasticizers, lubricant, catalyst, use of thermoplastic resins and thermosetting resins.

General Chemistry –IV

Nuclear chemistry

- Students have learnt nuclear stability-n/p ratio-nuclear forces-Exchange theory and nuclear fluid theory and Natural radioactivity-modes of decay-Geiger Nuttal rule. Units of radioactivity-Kinetics of radioactive disintegration-Half life and average life-Radioactive equilibrium-Numerical problems.

Hetrocyclic compounds

- Students have understood the Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine and Preparation, properties and uses of furan, pyrrole&thiophene.
- Students have understood Synthesis and reactions of pyridine. Comparative study of basicity of pyrrole, pyridine with amines and preparation of indole, quinoline and isoquinoline.

Amines and their derivatives

- Students have learnt Aliphatic amines-separation of amines by Hinsberg's & Hofmann methods - preparation and properties of dimethyl amine, trimethyl amine, (ethylene diamine and hexamethylenediamine).

Second law of thermodynamics- I

- Students have understood limitations of the first law-need for second law- spontaneous processes-cyclic process Carnot cycle –efficiency-Carnot theorem-Thermodynamic scale of temperature and Concept of entropy-Entropy-a state function-Entropy change in isothermal expansion of an ideal gas-entropy change in reversible and irreversible processes-Clausius inequality.

Second law of thermodynamics- II

- Students have learn Work and free energy functions-Maxwell's relationships criteria for reversible and irreversible processes -Gibbs-Helmholtz equation- Partial molar free energy. Clapeyron equation- Clapeyron- Clausius equation-Applications of Clapeyron-Clausius equation.
- Students known the Third law of thermodynamics and Nernst heat theorem-statement of III law- Evaluation of absolute entropy from heat capacity measurements-Test for the validity of the law.

Inorganic Chemistry I

Concept of acids, bases, and non-aqueous solvents

- Student have learnt Arrhenius, bronsted, Lowery, Lewis concepts of acids and bases
- Students have learn Pearson's HSAB concept, non-aqueous solvents.

Chemistry of f-block elements

- Student have lanthanide contraction and its consequences
- Students have learn lanthanide from monozite including the ion exchange resin method.
- Students have learn chemistry of thorium and uranium.

Coordination chemistry

- Student have learn classification of ligands, chelate effect, sidgwick'stheroy, isomerism, types, stereo isomerism, and geometrical isomerism.

Valence bond theory, crystal field theory

- Student have understood valence bond theroy postulates, magnetic properties, outer orbital and inner orbital octahedral, Td complexes square planar complexes.
- They are learntCrystal field theroy postulates-d orbital spitting in octahedral,Td, square planar complexes, spectro chemical series, calculation of CFSE

Reaction mechanism and application of complexes

- Students have learn Trans effect, polarisationtheroy and pi bonding theroy, trans effect series.
- Students have understood separation of cu, cd co ions, identification of cu, Fe, Ni, hardness of water.

Organic Chemistry -I

Optical isomerism

- Students have understood condition for optical isomerism and how to write projection formulas for molecules

- Students have understood Cahn-Ingold-Prelog rules to write R-S notation for optical isomers with 1 and 2 asymmetric carbon atoms
- Students have learned racemization, resolution and how to synthesize asymmetric compounds.
- Students to study about optical activity of allenes, spirans and biphenyls.

Geometrical isomerism

- Students have understood to write cis, trans, syn-anti and E-Z notation for molecules
- They have learned conformational analysis, introduction of terms dihedral angle and torsional strain.
- Students have learned how to write conformational structures for molecules for example Ethane, ethylene glycol and n butane.

Amino acids

- Students have learned essential and nonessential amino acids and also preparation, properties of amino acids.
- They have learned about synthesis and properties of peptides, proteins.
- Students have learned structure of proteins.

Ureides & Nucleic Acids

- Students have learned synthesis of pyrimidine and purine bases.
- Students have the knowledge about biological functions of DNA and RNA and also elementary ideas on replication.
- Students have understood how to synthesize for proteins.

Chemistry of Natural products

- Students have learned structural elucidation of piperine, atropine and nicotine.
- Students have understood about structural elucidation of terpenes.

Elective Physical chemistry-I

- Students have learned about equilibrium constant, degree of advancement of chemical reactions and influence of temperature and pressure on equilibrium constant
- They have acquired knowledge about absorption isotherms
- Students learned about chemical reaction rates, rate constant -effect of temperature on reaction rates and various experimental methods of chemical kinetics
- They have acquired knowledge on theories of chemical kinetics and significance of energy and entropy of activation
- They can understand the concept of conductance and its applications

Spectroscopy

UNIT – I

- Students have learnt Definition of spectrum. Electromagnetic radiation, quantization of different forms of energies in molecules.
- Student have understand U.V-VISIBLE Spectroscopy-Types of electronic transitions, pre-dissociation spectra and dissociation energy.
- They are understand Applications-Beer's- Lambert's law-O.D., chromophore, auxochrome, bathochromic and hypsochromic shifts-Instrumentation.

UNIT-II

- Students have learnt I.R. Spectroscopy-principles-modes of vibration of diatomic, triatomic linear (CO₂) and non-linear triatomic molecules (H₂O)-stretching and bending vibrations-selection rules.
- They are understand Expression for vibrational frequency (derivation not needed) -instrumentation-sampling techniques. Applications.

UNIT-III

- Students have learnt Raman spectroscopy-condition-Rayleigh and Raman scattering, Stokes and anti-Stokes lines. Differences between Raman and I.R. Spectroscopy.
- Students have understand Mutual exclusion principle (CO₂ and N₂O).
- They have learnt Microwave spectroscopy-theory of microwave spectroscopy, selection rule. Calculation of moment of inertia and bond length of diatomic molecules.

UNIT IV

- Students have learnt NMR Spectroscopy principle of nuclear magnetic resonance basic instrumentation-number of signals.
- Students are understand chemical shift- shielding and deshielding-spin-spin coupling and coupling constants-TMS as NMR standard.
- They have understand Interpretation of NMR spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl Bromide, Toluene and Isopropyl phenyl ketone.

UNIT V

- They are learnt Mass spectroscopy- Basic principles- instrumentation- molecular ion peak, base peak, metastable peak, isotopic peak- their uses.
- They are understand Nitrogen rule- ring rule- fragmentation.
- Students have understand Interpretation of mass spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl Bromide, Toluene and Isopropyl phenyl ketone.

Fertilizers

- Students have learnt Effect of Nitrogen, potassium and phosphorous on plant growth.
- Students have understood the Complex fertilizers and mixed fertilizers their manufacture and composition. Secondary nutrients micronutrients their function in plants.

Manures

- Students have understood the Bulky organic manures Farm yard manure handling and storage oil cakes blood meal fish manures.

Pesticides and Insecticides

- Students have learnt Pesticides – classification of Insecticides, fungicides, herbicides as organic and inorganic – general methods of application and toxicity. Safety measures when using pesticides.
- Students have know the Insecticides : Plant products – Nicotine, pyrethrin – Inorganic pesticides – borates. Organic pesticides – D.D.T. and BHC.

Fungicides and Herbicides

- Students have understood Fungicide :Sulphur compounds, Copper compounds, Bordeaux mixture.
- Students have learn Herbicides :Acaricides – Rodenticides. Attractants – Repellants. Preservation of seeds.

Soils

- Students have learn Classification and properties of soils –soil water,soiltemperature,soil minerals, soil acidity and soil testing.

SBEC-Dye Stuffs & Treatment of effluents

Unit 1

- Students have learn colour of the dyes.
- Students mast studied chromophore,auxochrome,bathochromic,hypsochromic effects.
- Students have learn acid,base vat and reactive dyes.
- Students to study what are the special characters of a good dyes.

Unit 2

- Students have understood various methods of dyeing.
- They have learnt about synthesis and application of Alizarin.
- Students have learn Anthroquinone, Mordant dyes.

Unit 3

- Students have learnt about synthesis and application of Auramine.
- They have learn some naming reactions of days like Malachite Green, Crystal Violet,Pararosaniline dyes and their preparation , applications.
- Students must know about preparation and application of Indigo days and their derivatives.

Unit 4

- Students have learn synthesis and application of Phenolphthalein.
- Students have the knowledge about Xanthein dyes and their derivatives.
- Students have understood using Acridine dyes-synthesis and application of Acridine orange NO.
- Students have learn reactive dyes under synthesis and application of Procion Blue HB.

Unit 5

- Students to study about Textile effluent-degradability of wastes.
- Students have learn about Effluent treatment plants.
- Student have the knowledge about Aerated lagoon, photo oxidation process.

Inorganic Chemistry-II

Bioinorganic chemistry

- Student have learnt biological role of haemoglobin, chlorophyll, bonding in carbonyls - mono and binuclear carbonyls of Ni, Fe, cr,co,mn .
- Silicates-classification, properties, uses.

Oregano metallic compounds

- Student have understood boron ferrocene preparation, properties, uses, structure, zeisel's salt, preparation, general properties of organometallic compounds.

Nano science

- Student have learn definition of nano rods fullerenes , carbon nano tubes, plasma arching, chemical vapour deposition, electro deposition.
- Students have learn use of natural nano particles, envionmental and biomedical applications.

Some special compounds

- Student have understood classification and structure of carboranes, borazole metal borides.
- Student have learn basic properties of iodine, uses of Icl, BrF3, IF5, IF7, pseudo halogens, cyanogens, hiocyanogen, preparation, properties, uses.

Symmetry elements & magnetic properties of molecules

- Students have learn point group of simple molecules like H₂, HCl, CO₂ H₂O, NH₃.
- Students have understood diamagnetism, paramagnetism,ferromagnetism,antiferro magnetism, using guoy balance.

Carbohydrates

- Students how learn reactions of glucose and fructose and their ring and open chain structure.
- Students mast study how to interconverted pentose to hexose,aldose to ketose.
- Students have learn structural elucidation of sucrose and maltose.
- Students to study about polysaccharides like starch and cellulose and uses of their derivatives.

Vitamins and antibiotics

- Students have understood to biological functions of vitamin A thiamine, Riboflavin, Ascorbic acid.
- They have learnt about synthesis and structural elucidation of ascorbic acid.
- Students have learn structural elucidation of penicillin G &chloromycetin.

Molecular rearrangement

- Students have learnt about difference between inter and intramolecular rearrangement.
- They have learn some naming rearrangements like Pinnacle Pinnacle and Beckman, benzidine , Hofmann, Curtius, Lassen, Schmidt,benzilicacid,Fries&Cope rearrangements.
- Students have the knowledge to write the mechanisms.

Important reagents

- Students have learn synthesis of reagents how to use in organic chemistry.
- Students have the knowledge about reducing reagents like Lithium aluminium hydride, sodium borohydride, sodium ethanol, hydrogen with Nickel, hydrogen with Palladium.
- Students have understood using oxidising reagent lead Tetra acetate Ocimum trioxide in organic compounds.

Green Chemistry

- Students to study about need of Green chemistry and planning a green synthesis in a chemical laboratory solvent.
- Students have learn about fundamentals of closed vessel heating and sonication.
- Student have the knowledge about water as green solvent reactions in ionic liquid and a solid support organic synthesis.

Elective Physical chemistry-II

- Students learnt about distillation methods used for separation of binary liquid mixture. Nernst distribution law and its application.
- They have acquired knowledge on phase rule and its application to one, two and alloy systems, CST of phenol —water system.
- They have knowledge about different types of cells such as galvanic cell, concentration cell and storage cells, EMF and its significance.
- Students learnt about expression for (ljp) liquid junction potential and storage batteries.
- Acquired knowledge about the decay of electronically excited states, energy transfer photo chemical reactions and photochemical kinetics.

Analytical Chemistry

Chromatographic techniques

- Student learn the column chromatography types of adsorbents, preparation of Column, elution, recovery of substances and applications
- Students learn the TLC principle, choice of the adsorbent, and solvents, preparation of chromatoplates, factors affected by Rf values, significance of Rf values
- Students have learn paper chromatography- principle, development of chromatogram, ascending, descending, and radial chromatography.

Thermo analytical Methods

- Students have learn the principle TGA, DTA discussion of various component Block diagram
CuSO₄.5H₂O, MgC₂O₄.H₂O, Ca(OOCCH₃)H₂O
- DTA-TGA curves of SrCO₃ in air and CaC₂O₄.H₂O in air and in CO₂, factors affecting TGA&DTA curve
- Students learn thermometric titration- principle, apparatus, and application.

Electro analytical method

- Students learn the polarography principle-concentration, polarization, DME advantages, disadvantage, migration, residual, limiting, diffusion current, use of supporting electrolytes-Ilkovic, equation (derivation not required) oxygen wave, half wave potential.

NMR – Spectroscopy

- Students have two NMR principle of NMR instrumentation number of signals -chemical shift, shielding, spin-spin coupling, coupling constants TMS as NMR
- Standard, deshielding
- Students have the NMR spectra acetone, anisole, Benzaldehyde, ethyl acetate, Toluene, Isopropyl phenyl ketone, Ethyl amine, ethyl bromide.

Mass spectroscopy

- Students have understand the mass spectra principles, molecular ion peak, Metastable peak, Isotopic peak, nitrogen rule, ring rule, base peak.
- Students have understand the acetone, anisole, benzaldehyde, ethyl acetate, Toluene, Isopropyl phenyl ketone, ethyl amine.

SBEC-Pharmaceutical Chemistry

Unit 1

- Students have learnt definition of drugs.
- Students must studied pharmacophore, pharmacodynamic, Pharmacology.
- Students have the knowledge of bacteria, virus, fungus.
- Students to study what are the therapeutic uses of drugs.
- Students have learn difference between virus and fungus.

Unit 2

- Students have understood various methods of preparation of sulpha drugs.

- They have learnt about uses of sulphadiazine and sulphapyridine.
- Students have learn classification as broad and narrow spectrum.
- Students must studied structure and mode of action antibiotics penicillin,ampicillin.

Unit 3

- Students have learnt about narcotic and non narcotic analgesics.
- They have learn narcotic analgesics action of morphine heroine and their derivatives.
- Students must known about preparation and uses of salicylic acid derivatives methyl salicylate and aspirin.

Unit 4

- Students have learn anaesthetic agents should have the characteristics
- Students have the knowledge about classification of anaesthetic
- students have understood which are general anaesthetic and local anaesthetic
- Students have learn general anaesthetic preparation and mode of action and advantages of ether, chloroform,nitrous oxide.
- Students have the knowledge about advantage of Folic acid vitamin B12 ferrous sulphate.

Unit 5

- Students to studied about diabetes and hypoglycemic drugs.
- Students have learn how to control diabetes and advantage of oral hypoglycemic agent's sulphonyl urea, biguanides.
- Student have the knowledge about causes, prevention and control of AIDS.
- Students have studied about Indian medicinal plants and uses Thulasikeelanelli mango sembaruthiAdododai,Thoothuvalai.

SBEC-Industrial Chemistry

Chemical Explosives

- Student have learnt Preparation and chemistry of lead azide, nitroglycerine, nitrocellulose, TNT, RDX,Dynamite, cordite, picric acid, gunpowder, introduction to rocket propellants.

Leather Industry

- Student have understood Curing, preservation and tanning of hides and skins, process of dehairing and dyeing.Treatment of tannery effluents.

Electrochemical Industries

- Student have lean Production of materials like chlorine, caustic soda, sodium chlorate, Batteries – primary and secondary cells, solar cells, fuel cells.

Paints, Varnishes & Cleaning Agents

- Student have understood Paints & Varnishes: Primary constituents of paints, Dispersion medium (solvent), binder, Pigments, formulation of paints and varnishes. Requirements of a good paint, manufacture.
- Student have learn Cleansing Agents: Preparation of toilet and washing soaps, synthetic detergents-alkyl aryl sulphonate and cleansing action of soaps.

Cement & Glass

- Students have learn Cement: Manufacture – Wet Process and Dry process, types, analysis of major constituents, setting of cement, reinforced concrete. Cement industries in India.
- Students have understood Glass: Composition and manufacture of glass .Types of glasses- optical glass, coloured glasses and lead glass.

Allied Chemistry – I

Chemical bonding:

- ★ Students have learnt types of bonding and molecular orbital theory.
- ★ They have understood molecular orbital diagrams of hydrogen, helium and nitrogen molecules.
- ★ Students have learnt about hydrides borazole $NABH_4$ and $LiAlH_4$

Nuclear chemistry:

- ★ Students learn about natural radioactivity radioactive series.
- ★ They have knowledge about nuclear binding energy and mass defects.
- ★ Students learn about the difference between nuclear fission and nuclear fusion.
- ★ Students learn about uses of radioisotopes

Stereoisomerism:

- ★ Students learn about the geometry of organic methane, ethylene and acetylene.
- ★ Students have learned Electron displacement effect Inductive, Resonance Hyperconjugative.
- ★ Students have understood geometrical isomerism of maleic and fumaric acids.

Aromatic compounds:

- ★ Students have understood Huckel's rule.
- ★ Students have learned about electrophilic substitution in benzene..
- ★ They have knowledge of naphthalene.
- ★ Students have learned about heterocyclic compounds furan, thiophene, pyrrole.

Solutions of chromatography:

- ★ Students have learned about Raoult's law, fractional distillation and azeotropic distillation.
- ★ Students have knowledge about chromatography column paper and thin layer chromatography.

Allied Chemistry – II

Coordinationchemistry:

- ★Students have learned about classification of ligands nomenclaturechelation.
- ★Studentslearntwernerstheory,Sidgwick'stheoryandPoulingstheory.
- ★Theyhaveknowledgeaboutthaemoglobinandchlorophyll

CarbohydratesandAminoacids:

- ★Students have learnt classifications ofcarbohydrates,Glucose,Fructose,starchandcellulose.
- ★Theyhaveunderstoodinderconversionofglucosetofructoseandfructose toglucose.
- ★Studentshavelearntglucoseandalaninepreparationandproperties.

Pharmaceuticalchemical:

- ★Studentshaveacquiredtheskillofusingsulphadrugs.
- ★Theyhaveunderstoodtheusageofpenicillinandchloramphenicol.
- ★Students have knowledge about cancer and AIDS.Photochemistry:

- ★Studentslearnaboutphotochemicalequivalenceandquantumyield.
- ★Theyhaveunderstoodusesofphosphorescenceandfluorescence.
- ★Students have learnt Phase rule For water systems and lead silversystems.

Electrochemistry:

- ★Studentslearnaboutkohlrauschlaw,PHdeterminationsandconductometrictitration.
- ★StudentshaveKnowledgeaboutgalvaniccellsreferenceelectrodes.
- ★Studentshaveunderstoodmethodsofpreventionofcorrosion

Practical

Volumetric estimations and inorganic Preparation.

Acidimetry-alkalimetry&permanganometry&dichrometry

- Student have learnt estimation of NaOH- Std sodium carbonate, estimation of oxalic acid-std oxalic acid, estimation of ferrous ion Std Oxalic acid, estimation of ferrous iron using diphenylamine internal indicator Std Feso₄.

Iodometry&iodometry&complexmetric titrations

- Students have learn estimation of potassium dichromate Std potassium dichromate, estimation of arsenious oxide Std Arsenious oxide, Estimation of hardness of water, estimation of Zn and mg Using EDTA.

Inorganic preparation

- Student have learn ferrous ammonium sulphate, microcosmic salt, tetra mine copper(II) sulphate, bis acetyl acetonato nickel (II) or cu (II).

Inorganic Qualitative Analysis

- Students have learnt what are apparatus used and how to handle in inorganic semi microanalysis.
- Students have learnt Principles involved in Na₂CO₃ extract preparation.
- Students have understood identification and confirmatory tests of given acid radical.
- Students have learnt Common ion effect, Solubility product and their applications in Qualitative analysis
- Students have learnt Separation of cations into Groups and what are cation present in each group.
- They are understood identification and confirmatory tests of given basic radical.

Physical Chemistry Practical

- Students have learnt titration for acid catalysed hydrolysis of ester, Iodination of acetone, reaction with persulphate -kl.
- Students have learnt cell constant, conductometric titration- acid base .titration. , Equivalent conductance strong electrolyte, potentiometric titration- acid base titration.
- Students have understood the CST of phenol water system determination of concentration of sodium chloride, determination of transition temperature.
- Students have learnt simple eutectic system-naphthalene- biphenyl, molecular weight of rast method.

Organic Qualitative Analysis

Students have learnt which apparatus are used in organic analysis, preparation and how to handle it..

- Students must have the knowledge to clean silica and sintered crucibles using gravimetric estimations.
- Students have learn characterisation of organic compounds by their functional groups and confirmation by preparation of derivatives.

- Students have studied the functional groups aldehydes, ketones, esters, acids, primary amines, amides, diamide, monosaccharides.
- Students have learnt about weight of inorganic compounds present in unknown solution by gravimetrically.
- They are understood what are the principles involved in organic reactions for example oxidation, hydrolysis, bromination, Nitration reactions.

Allied Chemistry Practical

★ Students must know what is the apparatus used in volumetric estimation and organic analysis and also how to handle it.

★ Students have learnt about unknown solution containing sodium hydroxide, hydrochloric acid, ferrous sulphate and oxalic acid by volumetrically.

★ They have learned principles involved in volumetric estimation.

★ Students have learnt organic compounds.

★ They are understood to identify special elements, nitrogen, sulphur and halogens, aliphatic or aromatic, saturated or unsaturated.

★ Student knowledge about functional groups phenol, acids, urea and amines etc.

Programme Outcomes (MSc Degree Course)

Academic year 2016-2017

Name of the Programme : MSc Chemistry
Academic Frame Work & Content : Following / Adhering to the Curriculum, syllabus and evaluation system designed by Periyar University, Salem-7, Tamilnadu.

Objectives

1. To impart knowledge in advanced concepts and applications in various fields of Chemistry.
2. To provide wide choice of elective subjects with updated and new areas in various branches of Chemistry to meet the needs of all students.

Programme Outcomes

- Students have learnt advanced level mechanism in the chemical reactions.
- Students have learnt various type of electrophilic and nucleophilic substitution reaction.
- Students have understood photo chemistry, Pericyclic reactions and important reagents.
- Students have learnt synthesis and structure elucidation
- Students have learnt inorganic reaction mechanism and inorganic cluster.
- They are understand quantum chemistry and group theory.
- Students are learnt about organic, inorganic estimations and double stage preparations.

Programme specific outcomes

- Students have got knowledge about reaction intermediate and their relative name reactions. , Determination of kinetic and non kinetic mechanisms.
- They are understand reaction condition, reagents in chemical synthesis
- Students have learnt Structure and Bonding of organometallic compounds.
- Students have got knowledge about Hard and Soft acids and bases-classifications.
- Students have learnt Electronic Spectroscopy of transition metals and Inorganic Photochemistry.
- They are understood basic knowledge of Nano and Green chemistry.
- Students have learnt about semi micro analysis and less common radicals, photo colouric metric estimation.
- Students are learnt systematic procedure of detection of functional groups given organic compounds.
- They are understood isolation of metal from its ore and emf measurements.

Course Outcomes / Learning Outcomes

Organic chemistry –I

Stereochemistry

- Students have learnt R & S Notation, Axial chirality, planar chirality. And stereoselective, Stereospecific reactions.
- Students have understood Conformations and stereo chemistry of cis and trans-Decaline.

Reaction intermediates, Structure and Reactivity

- Students have learnt formation, stability and structure of carbonium ions, carbanions, carbenes, nitrenes and free radicals
- Students have understood effect of structure on reactivity – resonance and field effects, steric effects, quantitative treatment
- Students have learnt thermodynamic and kinetic requirements for reactions, thermodynamically and kinetically controlled reactions

Aliphatic Nucleophilic Substitution Reactions

- Students are able to understand the neighbouring group mechanism, neighbouring group participation by π and σ bonds, anchimeric assistance.
- Students have got knowledge of reactivity effects of substrates structure, attacking nucleophile, leaving group and reaction medium, ambident nucleophile, regioselectivity.

Aromatic electrophilic and nucleophilic substitution reactions

- Students have understood the arenium ion mechanism, typical reactions like nitration, sulphonation, halogenation, Friedel – Crafts alkylation, acylation and diazonium coupling, electrophilic substitution on monosubstituted benzene.
- Students have learnt the S_NAr mechanism, the aryl cation mechanism, the benzyne intermediate mechanism

Alkaloids, Flavones and Isoflavones

- They have learnt about synthesis and Structural elucidation of Quinine, Papaverine, Morphine and Reserpine, flavones, isoflavones and anthocyanins.

Inorganic chemistry –I

Structure and Bonding

- Students have learnt Acid-Base strength, hardness, symbiosis, Theoretical basis of Hardness and Softness, applications of HSAB.
- Students have knowledge about Rings-Phosphazenes-Structure, Craig and Peddock model, Dewar model, polyorganophosphazenes, Polysulphur –nitrogen compounds.
- They have learnt Inorganic polymers-Silicates-structure, Pauling's rule, properties, correlation and application; Molecular sieves.

Metal - Ligand Bonding

- Student have learnt Crystal field theory – splitting of d- orbitals under various geometries, factors affecting splitting, CFSE, evidences for CFSE
- They have the knowledge about Spectrochemical series, Jorgensen relation, site preferences, Jahn – Teller distortion – splitting pattern in trigonal pyramid, square pyramidal and cubic symmetries, Dynamic and Static J.T. effect, Jahn – Teller effect and Chelation.
- Students have understood Limitations of CFT Evidences for metal – ligand overlap; M.O. theory and energy level diagrams, concept of weak and strong fields, sigma and pi bonding in complexes.
- Students have learnt nephelauxetic effect, magnetic properties of complexes.

Electronic Spectroscopy of transition metals and Inorganic Photochemistry

- Students have learnt Spectroscopic Term symbols for dn ions – derivation of term symbols and ground state term symbol, Hund's rule; Selection rules – break down of selection rules, spin-orbit coupling, band intensities, weak and strong field limits- correlation diagram.
- They have learnt Energy level diagrams; Orgel and Tanabe – Sugano diagrams; effect of distortion and spin orbit coupling on spectra.
- Student have learnt Evaluation of Dq and B values for octahedral complexes of Nickel Charge transfer spectra. Spectral properties of Lanthanides and Actinides.
- Students have learnt Inorganic photochemistry-Photosubstitution, Photoredox and isomerization processes application of metal complexes in solar energy conversion.

Inorganic Reaction mechanism

- Students have understood Electron transfer reactions – Outer and inner sphere processes; atom transfer reaction, formation and rearrangement of precursor complexes.
- Students have Cross reactions and Marcus – Hush theory
- They have learnt about Reaction mechanism of coordination compounds – Substitution reactions, Labile and inert complexes. Substitution in square planar complexes – General mechanism reactivity of Platinum complexes influences of entering and leaving groups; the trans effect - theories, trans influence.

- Students have learnt Substitution in octahedral complexes – general mechanism, discussion of A, D, IA, ID and DCB mechanism, replacement of coordinated water; mechanism of acid hydrolysis and base hydrolysis – Conjugate base mechanism.

Boron compounds and Clusters

- Students have learnt Boron hydrides – polyhedral boranes, hydroborate ions – a general study of preparation, properties and structure, styx numbers, Wade's rules.
- They have learnt Carboranes – types such as closo and nido – preparation, properties and structure. Metallocarboranes
- Students have learnt Metal clusters – Chemistry of low molecularity metal clusters only – structure of Re_2Cl_8 multiple metal – metal bonds.

Physical Chemistry-I

Classical thermodynamics I&II

- Students have learnt the Maxwell relations pressure, volume, entropy & enthalpy, etc.
- Students have understood the thermodynamics of ideal and real gases.
- They are got some basic knowledge of standard States for solid, liquid, gases and component of solutions.
- Students have learnt the partial molar free energy and gibbs-buhem equation.
- Students have learnt the concept of ionic strength. Mean ionic activity and mean ionic activity coefficient.

Chemical kinetics-I

- Students have learnt the concept of Arrhenius theory and activation energy of molecule.
- Student have got the knowledge of rate of the reaction, order and slope of molecules.
- Students have understood the theories of unimolecular reaction by Lindemann and Hinshelwood methods.

Quantum chemistry-I

- Students have learnt the Planck's theory, photoelectric effect and de-Broglie equations.
- Students have understood the Schrodinger wave equation and harmonic oscillator.

Group theory-I

- Students have learnt the symmetry operation and elements.
- Students have understood how to calculate the point group of various molecules.

Polymer Chemistry

Basic Concepts:

- ★ Students have learnt monomers, repeat units branched and network Polymer.
- ★ They have Understood Free Radical, Cationic and anionic polymerization.
- ★ Students have learnt homogeneous and heterogeneous systems.

Coordination polymerization:

- ★ Students are able to understand various types of Co-polymerization.
- ★ Students learn about kinetics, mono and bimetallic mechanisms of coordination polymers.

Molecular Weight and Properties:

- ★ Students have studied average molecular weight concepts, number, weight and viscosity average molecular weight.
- ★ They have knowledge about Relationship between T_m and T_g .

Polymer Processing:

- ★ Students have learnt plastic elastomers and fibers.
- ★ They have studied compounding and processing techniques.

Properties of commercial polymers:

- ★ Students learn about polyethylene, polyvinyl chloride and polyester.
- ★ They have learnt how to use Biomedical polymers. artificial heart, kidney, skin and blood cells.
- ★ Students have gained enough knowledge in polymers.

Organic Chemistry –II

Elimination Reactions

- Students have learnt Orientation of the double bond- Hofmann and Saytzeff rule, competition between elimination and substitution.
- Students have understood the stereochemistry of E_2 eliminations in cyclohexane ring systems, mechanism of pyrolytic eliminations.

Aromaticity

- Students have understood the Huckel's theory of aromaticity, concept of homoaromaticity and antiaromaticity.

- They have learnt how to use the NMR concept of aromaticity and antiaromaticity & Mobius aromaticity.
- Students have understood Bonding properties of systems with $(4n+2)$ π -electrons and $4n\pi$ - electrons, alternant and non-alternant hydrocarbons.

Aromatic electrophilic and nucleophilic substitution reactions

- Students have learnt The arenium ion mechanism, typical reactions like nitration, sulphonation, halogenation, Friedel – Crafts alkylation, acylation and diazonium coupling, electrophilic substitution on monosubstituted benzene, orientation and reactivity
- They have understood Aromatic nucleophilic substitution reactions, the S_NAr mechanism, the aryl cation mechanism, the benzyne intermediate mechanism, aromatic nucleophilic substitution of activated halides.

Conformational Analysis

- Students have understood Conformational analysis of simple cyclic and acyclic (n-butane) systems, conformation of simple 1,2 disubstituted derivatives.
- Students have learnt conformation and stereochemistry of cis and transdecalins, effects of conformation on reactivity in acyclic and cyclohexanes, Oxidation and acylation of cyclohexanols.

Reagents in Organic Synthesis

- Students have learn how to prepare the important reagents and their uses in organic synthesis like DCC, DDQ, DBU, DIBAL, 9BBN, NBS etc.,

Physical chemistry-II

Statistical and irreversible thermodynamics

- Students have learnt the consent of thermo dynamical and mathematical probabilities.
- Students have understood the heat capacity of solids.

Chemical kinetics-II

- Students have learnt to study the fast reactions of same methods.
- Students have learnt the kinetics of complex reaction.

Surface chemistry and catalysis

- Students have learnt the langmuir, freundlich and BET adsorption catalysis.

Quantum chemistry -II

- Students have learnt the origin of quantum numbers.
- They are understood the approximation method and its applications.

Group theory-II

- Students have learnt the vibrational modes of nonlinear molecules.
- They are understood the hybridization of non-linear molecules.

Co - Ordination Chemistry

Metal - Ligand Bonding

- Students have understand Crystal field theory – splitting of d- orbitals under various geometries, factors affecting splitting, CFSE, evidences for CFSE
- They have knowledge about the Jahn – Teller distortion – Splitting pattern in trigonal pyramid, square pyramidal and cubic symmetries, Dynamic and Static J.T. effect.
- Students are understand M.O. theory and energy level diagrams, concept of weak and strong fields, sigma and pi bonding in complexes, nephelauxetic effect, magnetic properties of complexes.

Stability and stereochemical aspects of complexes

- They are understand Stability of complexes – Factors affecting stability of complexes, thermodynamic aspects of complex formation.
- Students have learnt Determination of stability constant – Polarographic, photometric and potentiometric methods.
- Students have understand Stereochemical aspects – Stereoisomerism in inorganic complexes, isomerism arising out of ligand distribution and ligand conformation, chirality and nomenclature of chiral complexes.
- They are understood Macrocyclic ligands – types – porphyrins, corrins, Schiff's bases, crown ethers and cryptates.

Reaction mechanisms in Complexes

- Students have understand Electron transfer reactions – Outer and inner sphere processes; atom transfer reaction.
- They are learnt Cross reactions and Marcus – Hush theory.
- Students have learnt Reaction mechanism of coordination compounds – Substitution reactions, Labile and inert complexes. Substitution in square planar complexes.
- They have learnt Substitution in octahedral complexes – general mechanism, discussion of A, D, IA, ID and DCB mechanism.

Organometallic Chemistry

- Students have learnt Carbonyls – 18 electron rule, isolobal concept – application to structure of carbonyls.
- Students have learnt Synthesis, structure and bonding; Cyclic carbon donors -Metallocene – synthesis, structure and bonding.

- They are understand Substitution – electrophilic and nucleophilic attack on ligands. Carbonylation and decarbonylation; oxidative addition and reductive elimination to organometallics; fluxional isomerism.

Catalysis

- They have learnt Hydrogenation of olefins (Wilkinson's catalyst); hydroformylation of olefins using Cobalt or Rhodium catalysts (oxo process); Oxidation of olefins to aldehydes and ketones (Wacker process); polymerization (Zeigler- Natta catalyst).
- Students are understand oligomerization of acetylene using Nickel catalyst (Reppe's catalyst); polymer bound catalysts.

Organic Chemistry -III

Addition to Carbon – Carbon and Carbon – Hetero atom multiple bonds

- Students have understood Addition of halogen and nitrosyl chloride to olefins, hydration of olefins and acetylenes, hydroboration, hydroxylation – cishydroxylation.
- Students have understood Mechanism and applications of Mannich, Stobbe, Darzen Glycidic ester condensation. Benzoin condensation, Peterson olefination.

Molecular Rearrangements

- Students have detailed understood ofWagner –Meerwin, Demyanov, Dienone- Phenol, Favorski, Baeyer – Villiger, Wolff, Stevens, Von– Richter Beckmann, Hydroperoxide, Smiles, Jacobsen, and Hofmann – Martius rearrangement.

Oxidation and Reduction Reactions

- Students have understood Oxidation of alcohols by CrO_3 , DMSO alone, DMSO in combination with DCC.
- They are understood Reduction of carbonyl compounds by complex metal hydrides (LAH, NaBH_4 , and NaBH_3CN), clemmensen and Wolff Kishner reductions, Birch reduction, and MPV reduction.

Steroids

- Students have learnt about theStructure and Stereochemistry of Cholesterol. Total synthesis of Cholesterol and Oestrone. Reactions of Oestrone, Conversion of cholesterol into progesterone, testosterone and Oestrone

ORD - CD and Mass Spectrometry

- Students have learntDefinition, deduction of absolute configuration, octant rule for ketones, Cotton effect-axial haloketone rule.
- Students have understood about theMass spectra – Basic principle, molecular ion peak, base peak, Meta stable ion peak, isotopic peaks, Nitrogen rule, ring rule, McLafferty rearrangement, rules for fragmentation pattern.

Inorganic chemistry –II

Crystal Systems and Structural Analysis

- Students have learnt the crystal systems and Bravais lattices – Miller indices and labelling of planes
- Students have knowledge about symmetry properties - crystallographic point groups and space groups - fundamentals of X-ray diffraction - powder and rotating crystal
- They have learnt systematic absences and determination of lattice types - analysis of X-ray data for cubic system
- They have also learnt structure factor and Fourier synthesis - electron and neutron diffraction and structure determination.

Solid State - I

- Student have learnt close packing of atoms and ions - bcc , fcc and hcp voids -Goldschmidt radius ratio - derivation - its influence on structures
- They have the learnt about structures of rock salt - cesium chloride - wurtzite - zinc blende - rutile - fluorite - antiferite – diamond and graphite
- Students have understood spinel - normal and inverse spinels and perovskite
- Students have learnt lattice energy of ionic crystals - Madelung constant - Born-Haber cycle and its applications.

Solid State - II

- Students have learnt Metallic state - free electron and band theories - non - stoichiometry - point defects in solids - Schottky and Frenkel defects - linear defects -
- They have learnt dislocations - effects due to dislocations - electrical properties of solids
- Student have learnt insulators - intrinsic semiconductors -impurity semiconductors (n and p- type) and superconductors
- Students have learnt elementary study of liquid crystals.

Nuclear Chemistry - I

- Students have understood nuclear structure - stability of nuclei - packing fraction - even - odd nature of nucleons - n/p ratio - nuclear potential
- Students have binding energy and exchange forces – shell model and liquid drop model. Decay of radionuclei: rate of decay
- Students learnt about determination of half-life period - secular equilibrium and decay series. Modes of decay: alpha, beta,gamma and orbital electron capture - nuclear isomerism - internal conversions – Q value - nuclear cross section - threshold energy and excitation functions.
- Students have Particle acceleration and counting techniques: linear accelerator - cyclotron and synchrotron - betatron - G. M. counter - proportional and scintillation counters.

Nuclear Chemistry - II

- Students have learnt Different type of nuclear reactions with natural and accelerated particles - transmutation - stripping and pick-up - spallation - fragmentation, etc.
- They have learnt fission -characteristics of fission reaction - product distribution and theories of fission – fissile and fertile isotopes – U235 , U238 , Th232 and Pu239 - atom bomb - nuclear fusion – stellar energy - synthesis of new elements
- Students have principles underlying the usage of radioisotopes in analysis - agriculture - industry and medicine - mechanism of chemical reactions -uses of radioisotopes in analytical chemistry - isotopic dilution analysis – neutron activation analysis and dating methods.

Physical chemistry-III

Statistical and irreversible thermodynamics

- Students have learnt the consent of thermo dynamical and mathematical probabilities.
- Students have understood the heat capacity of solids.

Chemical kinetics-II

- Students have learnt to study the fast reactions of same methods.
- Students have learnt the kinetics of complex reaction.

Surface chemistry and catalysis

- Students have learnt the langmuir, freundlich and BET adsorption catalysis.

Quantum chemistry -II

- Students have learnt the origin of quantum numbers .
- They are understood the approximation method and it's applications.

Group theory-II

- Students have learnt the vibrational modes of non linear molecules.
- They are understood the hybridisation of non-linear molecules.

Electrochemistry and Photochemistry

Electrochemistry – I

- Students have learnt Ions in solutions – Debye – Huckel theory of strong electrolytes – Debye – Huckel – Onsager equation.
- They are understand Electrode – Electrolyte interface - adsorption at electrified interface – electrical double layers.

- Students have understand electro kinetic Phenomena – Tiselius method of separation of proteins – Membrane potential.

Electrochemistry – II

- They are learnt Mechanism of electrode reactions – Polarisation and Over Potential – the Butler Volmer equation for one step and multi step electron transfer reactions.
- Student have learnt Theory and applications of dropping mercury electrode – Polarography, Amperometry and Cyclic voltammetry.
- Students have learnt Principles and applications – mechanism of Hydrogen and Oxygen evolution reactions.

Electrochemistry – III

- Students have learnt Electrochemical inorganic and organic reactions of technological interest.
- They are understand Corrosion and Passivation of metals – construction of Pourbaix and Evans diagrams – Prevention of Corrosion.
- Students are learnt Electrochemical energy systems – Primary and Secondary batteries, Fuel cells – Electrodeposition – Principles and applications.

Photochemistry – I

- Students learn about bsorption and emission of radiation – Franck – Condon principle – decay of electronically excited state.
- Students have understand Non – radiative process – theory of radiation less transition – Internal conversion and intersystem crossing.
- They are understand Radiative processes – Fluorescence and Phosphorescence – Theory of Fluorescence and Phosphorescence. Factors affecting Fluorescence and Phosphorescence – Prompt and delayed Fluorescence.
- Students have learnt Stern – Volmer equation – concentration dependence of quenching and Excimer formation – quenching by added substance – Exciplex formation and decay.

Photochemistry – II

- They are learnt Techniques and applications of Photochemistry – Quantum yield – Experimental determination of quantum yield.
- Students are understand Actinometry – chemical Actinometry – Steady state treatment of quantum yield – Reasons for high and low quantum yield – life time measurements.
- They are learnt Photovoltaic and Photogalvanic cells – Photoelectrochemical cells – Photoassisted electrolysis of water – aspects of solar energy conversion.

Inorganic Chemistry – III

Bonding in Organometallic Complexes and metal carbonyls

- Students have learnt 18 electron rule, EAN, classification of organometallic compounds.
- Students know that the synthesis - structure and reactions involved in metal carbonyls.

Metal alkyl, Alkylidene and Alkylidyne complexes

- Students have understand the structure – synthesis and stability alkylidene and alkylidyne complexes.
- Students have learnt that the nature of bond between M-C and C-O in organometallic compounds.

Metal Alkene and Alkyne complexes

- Students have understand how to synthesis metal alkene and alkyne complexes and know that its characteristics and structure, bonding it.
- Students have learnt about Wacker process hydrogenation – hydrosilation process.

Organometallic Sandwich complexes

- Students have achieve knowledge about synthesis metallocenes complexes and elaborate study about sandwich compounds.
- Students have understand that the synthesis and characterization arene and mutidecker complexes.

Organometallic Chemistry applications in catalysis

- Students knows about the application of the organometallic compounds in homogenous catalytic reactions.
- Students understand about isomerisation of alkenes, hydrogenation, hydroformylation and hydrosilation of alkenes and fluxional molecules.

Organic spectra, Photochemistry and Pericyclic Reactions

UV -Visible and IR Spectroscopy

- Students have learnt various types of absorption bands, factor affecting intensity and solvent effect of absorption.
- Students have understood the various mode of vibration, stretching frequencies such acid, Aldehyde, ketone, ester, and anhydride.

NMR Spectroscopy

- Students have understood the principle, chemical shift, factors affecting the chemical shift, shielding and de shielding of different protons.
- They have learnt how to use the NMR concept of coupling constant, calculation and mechanism of coupling constant.
- Students have understood first order, non first order spectra and shift reagent.
- Students have learnt C-13 NMR, double resonance technique, Homo and heteronuclear coupling.
- They have understood the broadband decoupling, offresonancedecoupling, Gauche effect.

EPR and Mossbauer spectroscopy

- Students have understood principle, hyperfine splitting, and instrumentation of EPR spectroscopy.
- Students have learnt principle of Mossbauer spectra, isomeric shift, quaterpole splitting of metal complexes.

Organic Photochemistry

- Students have learnt Fate of excited molecules, Jablonski diagram, Norrish Type I and Norrish Type II reactions & Paterno Buchi reaction.
- They have understood the Photooxidation, Photoisomerization, Photo addition of olefins Photo – Fries rearrangement and Photo rearrangement of 2, 5 – Cyclohexadienones.

Pericyclic Reactions

- Students have understood orbital symmetry, Woodward Hofmann rules, selection rules and stereochemistry of electrocyclic reactions.
- Students have learnt analysis by correlation diagram method and Frontier molecular orbital method and their related name reaction.

Practical

Organic Chemistry Practical -I

- Students have learnt what are apparatus used and how to organic apparatus.
- Students have learnt Principles involved in separation of organic compounds.
- Students have understood 2-naphthyl methyl ether from 2-naphthol.
- Students have learnt preparation of resacetophenone from acetophenone.
- Students have preparation of methyl orange from sulphanilic acid.
- They are understood principle and preparation organic techniques.

Inorganic Chemistry Practical –II

- Students can able to analysis the given sample mixture.
- They learnt about the preparation of complexes and colorimetric estimation of metal ions.

Physical Chemistry Practical-I

- Students have learnt the definition molarity, molarity and normality.
- Students have learnt how to prepare the concentrated solution and weight calculation.
- Students have learnt the order of the chemical reaction in acid catalyst hydrolysis of an ester.
- They are understood the association factors of acids in organic solvents by distribution method.
- Students have learnt the conductance, specific conductance and equivalent conductance of strong electrolyte.
- Students have understood the acid-base titrations by conductometry methods.
- They are understood the identification of eutectic composition and eutectic temperature of the given compounds.

Organic Chemistry Practical-II

- Students have learnt organic estimation such as phenol, aniline, and glucose.
- Students have learnt preparation of organic compounds such as aspirin from methyl salicylate, benzanilide from benzophenone.
- Students have understood extraction of natural products such as caffeine from tea leaves.
- Students have learnt preparations of citric acid from lemon.
- Students have learnt the separation of mixture of orthodontist and para nitroaniline by chromatographic technique
- They are understood principle and preparation of paper and thin layer chromatography.

Inorganic Chemistry Practical -II

Quantitative analysis of complex materials

- Students have learnt how to estimate quantitative materials like Fe and Mg, Fe and Ni, Cu and Ni, Cu and Zn Volumetrically as well as gravimetrically.

Analysis of Ores

- Students have understand the procedure in determination of Percentage of martials present in the given Ores like Ca and Mg in Dolomite, Percentage of MnO₂ in Pyrolusite and Lead in Galena.

Analysis of Alloys

- Students have gained practical knowledge by determination of individual metal present in the metal alloys. Like Sn and Pb in Solder, Cu and Zn in Brass and Cr and Ni in stainless steel.

Preparation of the complexes

- Students know how to prepare some inorganic complexes in laboratory scale, like Sodium hexanitro cobalt (III), Hexaammine cobalt (III) chloride, Prussian Blue.
- Students learnt about the laboratory conditions, safety hygienic and how to handle the laboratory chemical and instruments.

Physical Chemistry Practical-II

- Students have learnt the electrode potential of Cu, Ag, and Zn.
- They have learnt stability constant of complexes.
- Students have understood solubility product of a sparingly soluble salt, Redox titrations.
- They are understood the titration of mixture of halides by emf measurements.