

DEPARTMENT OF
CHEMISTRY
U.G.

DEPARTMENT OF CHEMISTRY

Programme code: K

Programme Name: B.Sc., Chemistry

Programme Outcomes

1. Students aid strong knowledge in fundamentals and applications of organic, inorganic, physical, analytical chemistry and also in inter-disciplinary subjects such as Green, Nano, Environmental, Forensic, Pharmaceutical chemistry etc.,
2. After the completion of the degree, they will be able to work in various fields such as cement industry, petrochemical industry, rubber industry, fertilizer industry, paint industry, food safety, research laboratory, pharma companies, schools, public sectors etc.,
3. Students appreciate the great role of chemistry in day-to-day life.
4. Understands the safe handling of chemicals, environmental issues and key issues that faces society through energy, health and medicine.
5. Motivate them to involve in research and tackle the new challenges.

Program Specific Outcomes

On completion of B.Sc Chemistry Programme, the Students would be able to:

1. Explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions.
2. Perform scientific experiments skillfully by application of procedural knowledge.
3. Enhance the ideas about research in chemistry and develop knowledge of significance in scientific concepts which find applications in industry, medicine and modern research.
4. Gain the knowledge of Chemistry through theory and practical.
5. Identify chemical formulae and solve numerical problems.
6. Understand good laboratory practices and safety.
7. Make aware and handle the sophisticated instruments/equipments.

Course outcomes

SEMESTER- I

Subject Code: 21K11

Course name: INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY –I

Upon completion of the course, the students will be able to

1. State the fundamental concepts of atomic structure, explain the periodic properties and its applications.
2. Explain the formation of chemical bonding, VB theory and MO theory.
3. Understand the concepts of electron displacement effect, reaction intermediate.
4. Write the mechanism of substitution, elimination reactions.
5. Recognize kinetic theory of ideal gases, gas laws, vanderwaal's equation, and Joule Thomson effect and inversion temperature.

Subject. Code: 21SEK11

Course Name: LABORATORY TECHNIQUES

Upon completion of the course, the students will be able to

1. Inculcate the selection and proper use of emergency equipment (e.g., fire extinguishers, eyewash stations, safety showers, spill kits, first aid kits, fire alarms, and fire blankets).
2. Understand the techniques of semi micro qualitative analysis in the removal of interfering anions,
3. Get insight into the applications of solubility product principle, complication reactions.
4. Define concentration systems: molarity, molality, normality
5. Differentiate post precipitation and co-precipitation.
6. Explain recrystallisation of solid, experimental techniques of fractional distillation and distillation under pressure for the purification of liquids.

Subject. Code: 21SEK12

Course Name: INDUSTRIAL CHEMISTRY

Upon completion of the course, the students will be able to

1. Understand the manufacturing process of matches and explain the preparation of TNT, RDX explosives.
2. Enumerate the manufacturing method of Portland cement & glass.
3. Illustrate the manufacturing methods and applications of fertilizer.
4. Explain the isolation of natural rubber, vulcanization, applications of synthetic rubber.
5. Classify plastics, knowing their preparation and applications.

Subject. Code: 21NMK1

Course Name: DAIRY SCIENCE

Upon completion of this course, the student will be able to:

1. Explain the composition, detection of adulteration in milk and milk products.
2. Demonstrate milk processing, milk powder processing methods.
3. Comment on the preparations of butter, cheese, ghee, ice cream.

SEMESTER-II

Subject Code: 21K21

Course name: INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY –II

Upon completion of this course, the student will be able to:

1. Illustrate the mechanism of atom bomb, hydrogen bomb formation.
2. Compare the properties of α, β, γ radiations and mention the applications radioactive isotopes, Carbon dating.
3. Explain acid, base concepts and be familiar with the balancing of redox equations.
4. Outline the methods of preparation in alkanes, alkenes, alkynes, aromatic hydrocarbons and its uses.
5. Give brief account on crystal systems, space lattice, and unit cell, laws of crystallography, Schottky defect, and Frenkel defect.

Subject. Code: 21SEK21

Course Name: MEDICINAL CHEMISTRY

Upon completion of this course, the student will be able to:

1. Understand the terminology in drug chemistry: Pharmacy, Pharmacology, Pharmacodynamics etc.
2. Explain the mode of action, applications of Anaesthetics, Analgesics, and Antipyretics.
3. Outline the need of sulphadiazine, antibiotics, and antiseptics.
4. Mention the applications of barbituric acid, sulphonal, piperadol, hydroxyzine.
5. Reason out the causes for cancer and its treatment.

Subject.Code: 21SEK22

Course Name: FORENSIC CHEMISTRY

Upon completion of this course, the student will be able to:

1. Tell about the basic principles of Forensic Science, identification of physical evidence, Forensic examination of hair, fiber, paints.
2. Know about the examination and identification of drugs, alcohol.
3. Get insight into finger print detection, forensic serology.
4. Understand detecting forgery in bank cheques /draft, detection of gold purity.

Subject.Code: 21NMK2

Course Name: CHEMISTRY IN EVERY DAY LIFE

Upon completion of this course, the student will be able to:

1. Understand the manufacturing techniques of some of the small- scale industrial
2. Trained in preparing sambirani, phenoil, shoe polish, plaster of paris .
3. Start small scale manufacturing unit .

Subject.Code: 21K2P

Course Name: SEMI-MICRO QUALITATIVE ANALYSIS AND ORGANIC PREPARATIONS

Upon completion of this course, the student will be able to:

1. Analyze given inorganic mixture qualitatively and report the two cations and two anions by using semi micro quantity.
2. Identify various anions and cations through flame test.
3. Distinguish interfering radicals and follow the procedure of elimination.
4. Practice group separation to identify the cations and affirm by confirmation test.
5. Acquainted with the apparatus setup, explain the theory of reactions in the preparation of following organic compounds:
 - i. Benzoic acid from methyl benzoate, ii. Salicylic acid from methyl/ethyl salicylate, iii. Osazone from glucose

SEMESTER-III

Subject Code: 17K31

Course Name: ORGANIC AND INORGANIC CHEMISTRY

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

1. Recognize the basic practical skills for the synthesis of alkyl halides, aryl halides and aralkyl halides.
2. Understand the evidences, reactivity and mechanism of various nucleophilic elimination and substitution reactions.
3. Recognize and draw constitutional isomers, stereoisomers, including enantiomers and diastereomers, racemic mixture and meso compounds.
4. State the principle resemblances of elements within each main group in particular alkali metals, alkaline earth metals.
5. Know the fundamentals of the chemistry of the main group elements, and important real world applications of many of these species
6. Compare the Chemical reactivity of elements in the group III to VI

SEMESTER-IV

Subject Code: 17K41

Course Name: ORGANIC AND PHYSICAL CHEMISTRY

Upon completion of the course, the students will be able to

1. Describe different classes of alcohols and able to write down structure of phenol and phenoxide ion.
2. Form the fundamental electronic structure and bonding in carbonyl compounds
3. Explain the reactivity of carbonyl compounds with both hard and soft nucleophiles (aldehydes and ketones)
4. Understand the physical properties and chemical constitution of liquids.
5. Know about the characteristics of adsorption and catalysis
6. Understand the concept of activation energy, steady state, and zero, first and second order rate laws.

Subject Code: 17K4P

Course Name: GRAVIMETRIC AND VOLUMETRIC ANALYSIS

Upon completion of the course, the students will be able to

1. Estimate the quantities of metal cations gravimetrically.
2. Facilitate the learner to make solutions of various molar concentrations.
3. Compute the different types of errors in practical.
4. Calculate titration errors for method evaluation, and perform statistical evaluation of results from classical and instrumental chemical experiments and analyses
5. Know how to engage in safe laboratory practices handling laboratory glassware, equipment, and chemical reagents.

SEMESTER-V

Subject Code: 17K51

Course name: ORGANIC CHEMISTRY

Upon completion of the course, the students will be able to

1. Understand aromatic electrophilic, nucleophilic substitutions and the process of reactions.
2. Identify organic naming reactions and their mechanism.
3. Classify organic nitrogen compounds and compare the basicity of amines.
4. Summarize the preparation, properties of heterocyclic compounds and its uses
5. Define carbohydrates, mutarotation, and epimerization and discuss their structure and configuration.

Subject code: 17K52

Course name: PHYSICAL CHEMISTRY-I

Upon completion of the course, the students will be able to

1. Assess knowledge on importance of thermodynamics, Joule Thomson effect and its applications in real life.
2. Recognize the need for second law of thermodynamics, Nernst heat theorem, and absolute entropy of solid, liquid, gas.
3. Define phase, equilibrium, component, degrees of freedom and Gibbs phase rule and interprets the stability regions in one component, two component, congruent melting, incongruent melting phase diagrams.
4. Describe the effect solute concentration on various properties (vapour pressure, boiling point, freezing point and osmotic pressure)
5. Identify the point group, order of the group in molecules, construct character table for C_{2v} point group

Subject Code: 17KE5A

Course name: INORGANIC AND ANALYTICAL CHEMISTRY

Upon completion of the course, the students will be able to

1. Comment on behavior of halogen compounds, peculiarities of fluorine, inter halogen compounds and their structure.
2. Explain the extraction process of titanium, molybdenum, tungsten and get insight into their compounds.
3. Understand the characteristics of lanthanides and actinides and its applications
4. Know the properties of non-aqueous solvents and inorganic polymers.
5. Develop accuracy and precision in doing experiments, understands the different types of errors and methods for minimizing errors.
6. Describe the principles of thermo gravimetric analysis, differential thermal analysis which is used to find the stability of compounds.

Subject Code: 17SEK51

Course name: CHEMISTRY OF BIOMOLECULES

Upon completion of the course, the students will be able to

1. Discuss the chemistry of biomolecules: Amino acids, proteins, nucleic acids
2. Understand the functions of nucleotide, DNA, RNA and distinguish DNA and RNA Structures.
3. Categorize the functions of hormones and vitamins and hormones.
4. Summarize enzyme activity and its mechanism
5. Determine saponification value, iodine value of oil.

SEMESTER-VI

Subject Code: 17K61

Course name: ORGANIC CHEMISTRY AND SPECTROSCOPY

Upon completion of the course, the students will be able to

1. Outline the preparation, applications of active methylene compounds and dyes.
2. Apprehend the instrumentation of column, thin layer, paper chromatography
3. State Bayer strain theory, and its modification also discuss conformations of ethane, butane, 1, 2-dichloroethane, cyclohexane, methyl cyclohexane
4. Label the various molecular rearrangements by understanding its mechanism.
5. Distinguish tautomerism and resonance.
6. Analyze the extraction method, elucidate the structure of alkaloids and terpenoids.
7. Calculate λ_{\max} values for conjugated dienes and α , β -unsaturated carbonyl compounds.
8. Tell about finger print region, spin-spin coupling, coupling constant, and Pascal's triangle.

Subject Code: 17K62

Course name: PHYSICAL CHEMISTRY –II

Upon completion of the course, the students will be able to

1. Use the Nernst equation to calculate cell potential.
2. Describe the functions of fuelcells and batteries.
3. Understand the laws of photochemistry, quantum yield and differentiate phosphorescence and fluorescence process.
4. Enumerate the postulates of quantum mechanics
5. Apply Schrodinger wave equation to particle in 1D and 3D box.
6. Elaborate on rotational spectroscopy of diatomic molecules, identify modes of vibration of polyatomic molecules in IR spectroscopy and understand the rule of mutual exclusion principle in Raman spectroscopy.

Subject Code: 17KE6A

Course name: INORGANIC AND APPLICATIONS OF COMPUTER IN CHEMISTRY

Upon completion of the course, the students will be able to

1. Understand Nomenclature, EAN rule of coordination complexes and applications of chelated complexes in analytical chemistry.
2. Calculate crystal field splitting energy, magnetic moments of transition elements.
3. Compare VBT and CFT, explain MOT of octahedral complexes.
4. Explain the role of metal ions in biological systems, functions of haemoglobin, myoglobin, and chlorophyll.
5. Solve the chemistry problems with the use of C-language.
6. Represent and manipulate 2D, 3D- molecular structure using cheminformatics.

Subject Code: 17SEK61

Course name: GREEN AND NANO CHEMISTRY

Upon completion of the course, the students will be able to

1. Understand the 12 principles of green chemistry.
2. Design green synthesis using appropriate materials, catalysts & green solvents to improve the sustainability of the product.
3. Brief study on applications of ultrasound and microwave in organic synthesis.
4. Outline the synthesise of nanoparticles, nanosized semiconductors, carbides, and their applications in real world.
5. Create an appreciation of how the practice of nanochemistry enhance competitiveness, innovation and faster time to market.

Subject Code: 17K61P

Course name: ORGANIC ANALYSIS & ESTIMATION

Upon completion of the course, the students will be able to

1. Analyze organic compounds systematically
2. Identify of a compound as to belong to a particular class of compounds and confirm it by preparing a suitable derivative.
2. Distinguish the reactions of various functional groups.
3. Understand the theory behind the reactions of estimation of aniline and phenol

Subject Code: 17K62P

Course name: PHYSICAL CHEMISTRY

Upon completion of the course, the students will be able to

1. Determine molecular weights by transition temperature method, Rast's macro method.
2. Construct phase diagram and determine eutectic composition and eutectic temperature.
3. Determine the miscibility temperature of phenol-water system.
4. Prepare the solutions of desired strength and buffer mixtures.
5. Demonstrate conductometric, potentiometric, colorimetric, and pH titrations.