DEPARTMENT OF CHEMISTRY

PO, PSO and CO analysis 2018-19

B.Sc. Chemistry

Program Outcomes (PO)

PO1. Critical Thinking and analytical reasoning skills

PO2. Problem Solving Skills

PO3. Communication Skills in English and mother tongue

PO4. Modern Tool Usage specifically computers available softwares

PO5. Social and Civic Responsibilities

PO6. Ethics: values and healthy socio-cultural environment

PO7. Environment and Sustainability: Safe handling of chemicals, environmental and health issues

PO8. Self-directed and Life-long Learning and Career Objectives

Program Specific Outcomes (PSO)

The B.Sc. Chemistry Program is successful in imparting the students with the following qualities.

PSO1: Students have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical branches of chemistry.

PSO2: Acquired the knowledge of terms, facts, concepts, processes techniques and principles of the subject.

PSO3: Developed the ability to apply the principles of Chemistry.

PSO4: Are inquisitive towards advanced chemistry and developments therein.

PSO5: Are able to appreciate the achievements in Chemistry and to know the role of Chemistry in nature and in society.

PSO6: Developed problem solving skills.

PSO7: Familiarized with the emerging areas of Chemistry and their applications in various spheres of Chemical sciences and to apprise the students of its relevance in future studies.

PSO8: Developed skills in the proper handling of apparatus and chemicals.

PSO9: Are exposed to the different processes used in industries and their applications.

Course Outcomes (CO)

Course – GENERAL AND ANALYTICAL CHEMISTRY

CO1: Have broad outline of the methodology of science in general and Chemistry in particular

CO2: Understand the important analytical and instrumental tools used for practicing chemistry

CO3: Learn computer based presentation and statistical analysis of data using spreadsheet software

CO4: Apply these skills in the analysis of experimental data in chemistry practical.

Course – THEORETICAL AND INORGANIC CHEMISTRY

CO1: Study the various atom models

CO2: Study the periodic properties of elements

CO3: Explain the formation of different types of bonds, hybridization and geometry of simple molecules

CO4: Understand the molecular orbital theory of diatomic molecules

CO5: Develop interest in various branches of inorganic chemistry.

Course - ORGANIC CHEMISTRY – I

CO1: Classification and nomenclature of organic compounds,

CO2: Understanding organic reactions and their mechanisms

CO3: Fundamentals of aromaticity and stereochemistry

CO4: Have exposure to various emerging new areas of organic chemistry

CO4: Develop skills required for the qualitative analysis of organic compounds

Course: Basic Organic Chemistry-I

CO1: Learn the chemistry of alcohols, phenols, carboxylic acids, derivatives of Carboxylic acids, Sulphonic acids, carbonyl compounds, poly nuclear hydrocarbons, active methylene compounds and Grignard reagents.

CO2: Understand and study Organic reaction mechanisms.

Course: Chemistry of d and f block elements

CO1: Understand the general characteristics of the d and f block elements.

CO2: Study the physical and chemical properties of d and f block elements.

CO3: Study the Werner's theory of coordination compounds.

CO4: Study isomerism in metal complexes.

CO5: Study the bonding in coordination compounds.

CO6: Understand the applications of coordination compounds.

CO7: Understand the classification, properties and applications of organometallic compounds.

CO8: Study the methods of preparation, properties, structure and bonding of metal carbonyls and metal clusters.

CO9: Understand the role of metals in biological systems.

Course: Basic Organic Chemistry-II

CO1: Learn the chemistry of nitro compounds, amines, dyes, organic polymers, soaps, detergents and organic reagents.

CO2: Understand and study mechanism of reactions of nitro compounds and amines.

CO3: Have an elementary idea of chemotherapy, organic spectroscopy and photochemistry

CO4: Identify organic compound using UV, IR and PMR spectroscopic techniques

CO5: Develop basic skills required for crystallization, distillation, solvent extraction, TLC and column chromatography.

Course: States of matter

CO1: Study the intermolecular forces in gases and liquids

CO2: Understand the dynamics of the molecules in the gases and liquids

CO3: Study liquefaction of gases

CO4: Learn the structure of solids

CO5: Study defects in crystals

CO6: Study adsorption.

Course: Quantum Mechanics and Spectroscopy

CO1: Differentiate between classical and quantum mechanics

CO2: Study the postulates of quantum mechanics and the quantum mechanical model of the hydrogen atom

CO3: Study valence bond and molecular orbital theory

CO4: Study the principle and applications of microwave, infra red, Raman, electronic and magnetic resonance spectroscopy.

CO5: Study the fundamentals of mass spectrometry

CO6: Study the fundamentals of photochemistry

Course: Applied Inorganic Chemistry

CO1: Understand the principle of inorganic qualitative analysis

CO2: Understand thermodynamic concepts in the extraction of metals

CO3: Understand the applications of radioactivity and radioisotopes

CO4: Understand the preparation and uses of inorganic polymers

CO5: Understand preparation and application of nanomaterials

CO6: Understand the chemistry of refractory and ceramic materials

CO7: Understand the chemistry of the compounds of p block elements

CO8: Understand thermal and chromatographic techniques

Course: Chemistry of Natural products and Biomolecules

CO1: Learn in detail the chemistry of carbohydrates, heterocyclic compounds, amino acids, proteins and nucleic acids

CO2: Have a thorough idea on the structures of carbohydrates and some heterocyclic compounds.

CO3: Understand the structure and functions of enzymes, proteins and nucleic acids.

CO4: Study the fundamentals of terpenoids, alkaloids, vitamins, lipids and steroids

CO5: Have an elementary idea of supramolecular chemistry and Green Fluorescent Proteins

Course: Equilibrium and Kinetics

CO1: Study the laws of thermodynamics

CO2: Derive Gibbs-Helmholtz, Clausius-Clapeyron, Gibbs-Duhem equations

CO3: Derive the relation between Kp, Kc and Kx

CO4: Derive the phase rule

CO5: Derive the rate equations for zero, first and second order reactions

CO6: Study the phase diagrams of one and two component systems

CO7: Understand the theories of chemical kinetics

CO8: Acquire an elementary idea of catalysis including enzyme catalsis.

Course: Solution Chemistry

CO1: Study the behaviour of binary liquid mixtures, CST, azeotropes, colligative properties

CO2: Study solubility of gases in liquids,

CO3: Study ionic equilibria and electrical properties of ions in solution.

CO4: Study the concepts of acids and bases, pH and buffer solutions

Course: Polymer Chemistry

CO1: Know about the types of polymers and the chemistry of polymerisation.

CO2: Understand the physical properties of polymers, their reactions and degradation.

CO3: Acquire knowledge about the polymerisation techniques and polymer processing.

CO4: Know the chemistry of individual polymers, their preparation and properties

CO5: Have an idea about the recent advances in polymer science

Course: Project

- To familiarize different protocols adopted in research
- To Motivate the students to pursue research as their carrier

- Hands-on experience on sophisticated instruments

M.Sc. Chemistry

Program/ Program Specific Outcomes

PO1: Students have an advanced level understanding in the following areas of chemistry - Analytical, Inorganic, Organic, and Physical Chemistry.

PO2: They have in-depth and detailed functional knowledge of the fundamental theoretical concepts and experimental methods of chemistry.

PO3: Students are able to communicate scientific results in writing and in oral presentation.

PO4: Students acquired the basic tools needed to carry out independent chemical research. Students are proficient in their specialized area of chemistry and successfully completed an advanced research project.

PO5: Students are able to explore new areas of research in both chemistry and allied fields of science and technology.

PO6: Graduates are able to use computers in data acquisition and processing and use available software as a tool in data analysis.

PO7: Graduates are able to use modern library search tools to locate and retrieve scientific information about a topic, chemical, chemical technique, or an issue relating to chemistry.

PO8: Graduates are able to use standard laboratory equipment, modern instrumentation, and classical techniques to carry out experiments.

PO9: Acquired the ability to engage in independent and self-learning as well as to successfully pursue their career objectives in advanced education and in professional courses, in a scientific career in government or industry, in a teaching career in the school systems, or in a related career following graduation.

Course Outcomes

Course: Organometallics and Nuclear Chemistry

- Students learned about various organometallic compounds with linear pi donor ligands, cyclic pi donors etc and also their synthesis, structure and bonding.
- They knew about various reactions of organometallic compounds like nucleophilic ligand substitution, nucleophilic - electrophilic attack, addition-elimination and rearrangement reactions etc
- Students learned different catalysis reactions by organometallic compounds.

- They are familiarized with important organometallic polymers and certain bioinorganic compounds.
- They also learned the various aspects of nuclear chemistry.

Course: Structural and Molecular Organic Chemistry

- Reviewed the basic concepts of organic chemistry- hybridization, aromaticity, MO picture, various effects. nucleophilic and electrophilic reactions etc.

Course: Quantum Chemistry and Group Theory

- To familiarize and understand theoretical field of chemical leading to molecular spectroscopy

Course: Classical and Statistical Thermodynamics

- Thermodynamic formulation of various processes and systems
- To connect the statistical field of chemistry which interlinks macro and micro world

Course: Coordination Chemistry

- To study structure, bonding and properties of coordination complexes.

Course: Organic Reaction Mechanisms

- Review of reaction mechanisms, organic intermediates and their reactions
- Pericyclic reactions in organic synthesis and problems based on it

Course: Chemical Bonding and Computational Chemistry

- Quantum mechanical interpretation of bonding and theoretical calculation of wavefunction and energy
- To understand and apply computational methods to solve problems in chemistry

Course: Molecular Spectroscopy

- Understanding the principle of various spectroscopic techniques
- Correlation of spectroscopy techniques in the structure determination of compounds

Course: Inorganic Chemistry Practical-1

- Anion and cation analysis in mixtures
- Hand-on experience on various analytical instruments such as colorimeter, spectrophotometer

Course: Organic Chemistry Practical-1

- Hand-on experience on separation of organic mixtures using solvent extraction and chromatographic techniques

Course: Physical Chemistry Practical-1

- Experiments based different phase diagrams
- Experiments based on physical properties like viscosity, surface tension, and rate
- Computational methods to study the bonding properties in simple molecules

Course: Structural Inorganic Chemistry

- To get the three dimensional perspective of compounds
- To familiarize different types of inorganic compounds and to study their chemistry

Course: Organic Syntheses

- Various synthetic strategies in organic compounds like coupling reactions, protecting groups, reagents, biosynthesis etc.

Course: Chemical Kinetics, Surface Chemistry and Photochemistry

- To understand and interpret various chemical reactions based on their rates, mechanism and yield
- To understand and interpret various chemical reactions on surfaces

Course: Spectroscopic Methods in Chemistry

- Structural elucidation of compounds using various spectroscopic techniques

Course: Advanced Inorganic Chemistry

- To equip students with latent adaptations in inorganic chemistry

Course: Advanced Physical Chemistry

- To equip students with latent adaptations in physical chemistry

Course: Advanced Organic Chemistry

- To equip students with latent adaptations in organic chemistry
- Research Methodology of Chemistry

Course: Inorganic Chemistry Practical-2

- Quantitative estimation of ions and spectral interpretation of inorganic compounds

Course: Organic Chemistry Practical-2

- Single and multi stage organic preparations, Green strategies in organic synthesis and their spectral data interpretation

Course: Physical Chemistry Practical-2

- Hands-on experience in doing physical chemistry experiments using instruments like conductometer, potentiometer, refractometer, polarimeter etc.

Course: Project

- To familiarize different protocols adopted in research
- To Motivate the students to pursue research as their carrier

Ph.D. in Chemistry

1. Students have an advanced level understanding of Analytical, Inorganic, Organic, and Physical Chemistry. They should master graduate material in their major area(s) of research.

2. The graduate has good knowledge of the topics of the research conducted by the researchers around the world.

3. The graduate has expert knowledge of a well-defined area of research within chemistry.

4. Students broadened their professional foundations through activities such as teaching, internships, fellowships, and grant applications.

5. Students are able to communicate the results of their scientific research in writing and in oral presentation to the scientific community.

6. Students acquired the tools to become fully independent chemical researchers.

7. Students have specific skills in planning and conducting advanced chemical experiments and applying them in modern research. Skilled in examining specific phenomena theoretically and/or experimentally, the graduate is able to contribute to the generation of new scientific insights or to the innovation of new applications of chemical research.

8. To extract new fields in polymer science, nanotechnology, molecular imprinting, metal organic frameworks and sensor technology

PSO-CO analysis of B.Sc Chemistry

Course – THEORETICAL AND INORGANIC CHEMISTRY

PSO → CO ↓	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	2	2	2	2	3	1	0	1
CO2	2	3	1	2	1	1	2	3	3
CO3	3	3	3	2	3	3	3	2	3
CO4	3	3	3	0	0	3	1	1	2
CO5	1	2	2	3	3	1	3	3	3
Average	2.4	2.6	2.2	1.8	2.2	2.2	2	1.8	2.4

CO	Internal	Assignment
CO1	3	
CO2	4	
CO3	5	5
CO4	4	
CO5	4	
Total	**20**	**5**

Sl No:	Name	CO1	CO2	CO3	CO4	CO5	Total	Marks%
1	Aiswarya S	3	4	9.5	3	4	23.5	94
2	Alex George	3	3.5	8.5	3	3	21	84
3	Aleena Tom	3	3.5	10	4	4	24.5	98
4	Anu Varghese	2.5	3.5	9	3	3	21	84
5	Namitha Babu	3	4	10	4	4	25	100
6	Parvathy Dineshan	3	4	9.5	4	4	24.5	98
7	Rahul Anil	2	3	7.5	2	2.5	17	68
8	Renjitha A S	2.5	3.5	9	2.5	3	20.5	82
9	Rohith Anilkumar	2	3	8	2	2	17	68
10	Vishnu K Shaji	2.5	4	9	3	3.5	22	88
Average		2.65	3.6	9	3.05	3.3		

	Exam & Assignment	Total	%
CO1	2.65	3	88.3
CO2	3.6	4	90
CO3	9	10	90
CO4	3.05	4	76.25
CO5	3.3	4	82.5
Average			85.41

Percentage Obtained	Level of Achievement
>80%	Level III
>70%	Level II
>60%	Level I

The average percentage of outcome obtained is 85.41%

Level of Achievement: Level III