# Programme Specific Outcomes (PSOs) and Course Outcomes (COs)

Programme

**BSc Chemistry** 



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Course Code

## Course tittle

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## **PROGRAMME OUTCOMES**

## PO 1. Critical Thinking:

1. Acquire the ability to apply the basic tenets of logic and science to thoughts, actions and interventions.

2. Develop the ability to chart out a progressive direction for actions and interventions by learning to recognize the presence of hegemonic ideology within certain dominant notions.

3. Develop self-critical abilities and also the ability to view positions, problems and social issues from plural perspectives.

## PO 2. Effective Citizenship:

1. Learn to participate in nation building by adhering to the principles of sovereignty of the nation, socialism, secularism, democracy and the values that guide a republic.

2. Develop and practice gender sensitive attitudes, environmental awareness, the ability to understand and resist various kinds of discriminations and empathetic social awareness about various kinds of marginalisation.

3. Internalise certain highlights of the nation's and region's history. Especially of the freedom movement, the renaissance within native societies and the project of modernisation of the post- colonial society.

## PO 3. Effective Communication:

1. Acquire the ability to speak, write, read and listen clearly in person and through electronic media in both English and in one Modern Indian Language

2. Learn to articulate analysis, synthesis, and evaluation of situations and themes in a well- informed manner.

3. Generate hypothesis and articulate assent or dissent by employing both reason and creative thinking.

## PO 4. Interdisciplinarity:

1. Perceive knowledge as an organic comprehensive, interrelated and integrated faculty of the human mind

2. Understand the issues of environmental contexts and sustainable development as a basic interdisciplinary concern of all disciplines.

3. Develop aesthetic, social, humanistic and artistic sensibilities for problem solving and evolving a comprehensive perspective.

# **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

## **Programme Specific Outcomes (PSOs)**

#### After successful completion of three year degree program in Chemistry a student should be able to;

**PSO 1** Understand the fundamental concepts, principles and processes underlying the academic field of chemistry, its different subfields (analytical, inorganic, organic and physical), and its linkages with related disciplinary areas/subjects;

**PSO 2** Demonstrate procedural knowledge that creates different types of professionals in the field of chemistry and related fields such as pharmaceuticals, chemical industry, teaching, research, environmental monitoring, product quality, consumer goods industry, food products, cosmetics industry, etc.;

**PSO 3** mploy critical thinking and the scientific method to design, carry out, record and analyze the results of chemical experiments and get an awareness of the impact of chemistry on the environment and the society.

**PSO 4** Use chemical techniques relevant to academia and industry, generic skills and global competencies, including knowledge and skills that enable students to undertake further studies in the field of chemistry or a related field, and work in the chemical and non-chemical industry sectors.

**PSO5** Undertake hands on lab work and practical activities which develop problem solving abilities required for successful career in pharmaceuticals, chemical industry, teaching, research, environmental monitoring, product quality, consumer goods industry, food products, cosmetics industry, etc.

**PSO** 6Understand safety of chemicals, transfer and measurement of chemical, preparation of solutions, and find out the green route for chemical reaction for sustainable development.

PSO 7 Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.

# **COURSE OUTCOMES (PSOs)**

#### 1B01CHE

**Theoretical and Inorganic Chemistry** 

CO 1: Correlate the structure and behavior of atom

CO2: Differentiate the various chemical interactions in molecules through bonding concepts

CO3: Analyze and interpret the gradation in the properties of elements in the periodic table

CO4:Predict the nuclear transmutations

CO5: identify the role of radioactive materials in different applications

## 2B03CHE

Analytical and Inorganic chemistry-I

CO 1: Determine the error, standard deviation and relative standard deviation of analytical data.

CO 2: Understand statistical treatment of analytical data and the principles underlying volumetric titrations.

CO 3:Understand basic principles behind selective precipitation of cation.

CO 4: Summarize the characteristics of s- and p- block elements CO 5: Compare the various concepts of acids and bases

# 3B04CHE/PCH Organic Chemistry-I

CO:1 ) Explain the types of electron displacement in organic molecules and predict the properties of molecules based on electron displacement effect

CO:2) Distinguish aromatic , anti aromatic and nonaromatic compounds and ions and analyse the mechanistic details of aromatic electrophylic substitution

CO:3) Classify stereo isomers, understand the property of chirality , apply CIP rules to recognize the configuration and explain the stability of conformations drawing energy profile diagram

CO: 4) Explain the mechanism of polymerization, synthesis and application of industrially important Polymers

CO: 5) Explain the classification and the methods of preparation of important dyes

CO: 6) Illustrate the preparative methods and synthetic applications of important synthetic reagents

#### 4B06CHE/PCH Organic Chemistry-II

CO :1) Describe mechanisms for substitution and elimination reactions, and predict theeffect of nucleophile, leaving group, and solvent on the relative rates of SN1 versus SN2 reactions, and E1 versus E2 reactions, as well as on the relative rates of substitution versus elimination.

CO :2) Explain Chugaev and Cope eliminations and E1CB mechanism

CO :3) Illustrate the preparative methods and important properties of Hydro carbons, halogen compounds , Hydroxy compounds and Carbonyl Compounds

CO :4) Explain the mechanism of important name reactions including rearrangements involving hydroxyl and Carbonyl functional groups

## 5B07CHE/PCH Analytical and Inorganic chemistry-II

CO: 1 Understand the qualitative and quantitative aspects of analysis and separation techniques CO: 2 Explain instrumentation and working principle of different analytical techniques –TGA, DTA and radio chemical method of analysis.

CO: 3 Familiarize with the preparation, properties and uses of some inorganic compounds like hydrides of boron, sulphur and silicon based inorganic polymers and understand their importance

CO :4Explain the classification of refractories.

CO :5Knowthe position, electronic configuration and physical properties of noble gases and explain hybridization and geometry of different xenon compounds

CO :6Explain various steps involved in metallurgical operations and power metallurgy and understand Corrosion, theories of Corrosion and factors affecting Corrosion

### 5B08CHE/PCH Inorganic Chemistry

CO:1) Understand the behavior of transition and inner transition elements and explain the separation of lanthanides by ion exchange method and lanthanide contraction

CO: 2) Understand key features of co-ordination compounds and illustrate the theories of coordination complexes, stability of complexesand explain factors affecting crystal field splitting.

CO: 3) Explain biological functions of metal ions.

CO: 4) Familiarize new elements in periodic table and Understand recent developments in inorganicchemistry.CO7: Appreciation of human activities in conservation of useful plants from the past to the present.

#### 5B09CHE/PCH

**Physical Chemistry-I** 

**Physical Chemistry-II** 

CO1) Recognize and relate the properties of ideal and real gases

- CO2) Describe the properties of liquids.
- CO3) Identify and distinguish the types of solutions
- CO4) Explain colligative properties of dilute solution and determine the molecular weight of a solute
- CO5) Identifydifferent crystallographic systems and various types of crystal defects
- CO6) Describe X ray diffraction to explain internal structure of solids

#### 5B10CHE/PCH

- CO 1) Identify the fundamental concepts of thermodynamics
- CO2) Relate and Interpret the various laws of thermodynamics
- CO3) Understand the concept of entropy and how the whole universe is related to it.
- CO 4) Construct phase diagrams and study the equilibrium exists between various states of matter.and apply principles phase diagram to separation processes and for property modification of different type of system.
- CO 5) Understand basic principles of surface chemistry and its application in various fields
- CO 6) Correlate the types of colloids with its properties and to explore the applications in day todaylife.

#### 6B14CHE/PCH Organic Chemistry III

- CO1 Acquaint with the classification, structures and properties of carbohydrates, explain the configuration of glucose and fructose, their inter conversion, illustrate Killiani-Fischer synthesis and Ruff degradation
- CO2 Illustrate the preparative methods and the properties of different classes of organic acids,
- nitrogen containing compounds and heterocyclic compounds .
- CO3Classify amino acids and peptides and explain the synthesisof simple peptides by N- protection (t-butyloxycarbonyl and phthaloyl) &C-activating groups and Merrifield solid- phase synthesis.Explain the methods of determination of primary structure of peptides

CO4 Distinguish the components of nucleic acids and lipids and their roles in biological system and the biological importance of various natural products .Familiarise with important drugs and their therapeutic applications

CO 5 Recognise the types and characteristics of pericyclic reaction and analyse the pericyclic reactions by FMO methods. Understand the photochemistry of carbonyl compounds

CO 6Understand the principles of Green Chemistry and the importance of green synthesis and recognize the impact of green chemistry on human health and the environment

#### 6B15CHE/PCH Physical Chemistry III

CO 1) Understand the mechanism of electrical conductance, theories of electrical conductance, and coductometric titrations

- CO 2) Understand the basic principle of ionic equilibrium and its application in laboratories
- CO 3) Design different types of electro chemical cell and able to calculate its potential.
- CO 4) Familiarise with electro analytical methods
- CO 5) Acquaint with kinetics of simple, complex, enzymatic and surface reactions
- CO6) Understand basic principles of photochemistry and its application in spectrophotometry

### 6B16CHE/PCH Physical Methods in Chemistry

CO 1 i) Explain the important principles of spectroscopy ii) Apply spectroscopic techniques in analyzing the structure of simple organic molecules

CO 2 Acquainting the working principles of various instruments and their functions

CO 3 Understand the basic principles of symmetry and group theory and its applications in chemistry

CO 4 Study the basic principles of nanochemistry and understand the various nanofabrication methods

CO 5 Explain the important principles for quantum chemical and molecular mechanic methods

#### 6B17CHE/PCH Discipline Specific Elective Course

CO1 Know the importance of environmental studies and methods of conservation of natural resources.

CO2 Describe the structure and function of an ecosystem and explain the values and Conservation of bio-diversity.

CO3 Explain the sources, environmental effects and control measures of various types of pollutions.

CO 4: Identify the toxic chemicals in environment and understand the sources, effects and treatment of heavy metal poisoning CO5: Understand the methods of domestic water treatment, Sewage analysis and Sewage treatment

#### 1B02CHE/PCH& 2B02CHE/PCH

- CO 1) Apply the theoretical concepts while performing experiments.
- CO2) Acquire practical skill to estimate acid, base, oxidizing agents etc by volumetric titration method
- CO3) Estimate the metallic ions by complexometric titration method
- CO4) Acknowledge experimental errors and their possible sources.
- CO5) Able to prepare inorganic complexes
- CO 6) Design, carry out, record and analyze the results of chemical experiments

#### 5B11 CHE /PCH& 6B11 CHE/PCH

#### CO1: Make use of standardised procedures for the Gravimetric analysis

- CO2: learn the skills of Precipitation process, digestion, filtration, incineration etc. CO3:Aquire practical Knowledge of co-precipitation
- CO4: Handle sintered glass vessels
- CO5: Acknowledge experimental errors and their possible sources.
- CO6: Able to design, carry out, record and analyze the results of chemical experiments

#### 5B12 CHE/PCH& 6B12 CHE/PCH ORGANIC CHEMISTRY

- CO 1) Apply the theoretical concepts while performing experiments.
- CO2) Acquire practical skill in qualitative analysis of organic compounds
- CO 3) Acquire practical skill in preparing organic compounds and in their purification by crystallisation
- CO4) Separate organic compounds in a mixture -by steam distillation, TLC and Column Chromatography
- CO5) Acquire the habit of working safely with the chemicals and handling of equipments

#### 6B18 CHE/PCH

#### PHYSICAL CHEMISTRY

CO 1)Acquire practical skill in physical chemistry experiments such as Cryoscopy, Transition Experiments ,Phase Rule Experiments, Conductometric titrations ,Potentiometric titrations , colorimetry and Chemical Kinetics

CO2) Learn statistical approach for evaluating data

#### **GRAVIMETRIC ANALYSIS**

Volumetric Analysis

CO3) Able to carry out and record these experiments in a skilful manner CO4) Acquire the habit of working safely with the chemicals and handling of equipments

5B13CHE/PCH& 6B13CHE/PCH

Project & Industrial Visit

CO 1) Able to enhance the skills of managing the resources, time and team work.

CO 2) Students will be able to function as a member of an interdisciplinary problem