

Department of Chemistry

Barbhag College

1. Programme Outcome

B.Sc Regular with Chemistry & Chemistry as Generic Elective

- i) Students will build a firm foundation in current chemical and scientific theories including those in Inorganic, Organic and Physical Chemistry, Polymer Chemistry etc.
- ii) Students will be able to explore new areas of research in both Chemistry and allied fields of science and technology.
- iii) They will have firm knowledge how to build the ability to explain why chemistry is an integral activity for addressing social, economic and environmental problems.
- iv) The Students will build the skill of problem solving, critical thinking and analytical reasoning as applied to chemistry related problems

2. Programme Specific Outcome:

a) B.Sc Honours in Chemistry

- i) Students will develop broad knowledge in Chemistry in addition to understanding of chemical concepts, principles and theories.
- ii) Students will be qualified for admission into post graduate course and other related course in Chemistry.
- iii) They will improve the ability and skill to acquire knowledge for solving of both theoretical and applied Chemistry problems.
- iv) Student can build up their career as Chemists in various chemistry related fields.

3. Course Outcome

a) B.Sc Honours in Chemistry

| Semester | Paper Code/ Name | Course outcome |
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| B.Sc 1 st Semester | CHE-HC-1016: INORGANIC CHEMISTRY-I | On successful completion, students would have clear understanding of the concepts related to atomic and molecular structure, chemical bonding, periodic properties and redox behaviour of chemical species. Students will also have hands on experience of standard solution preparation in different concentration units and learn volumetric estimation through acid-base and redox reactions. |
| | CHE-HC-1026: PHYSICAL CHEMISTRY I | In gaseous state unit the students will learn the kinetic theory of gases, ideal gas and real gases. In liquid state unit, the students are expected to learn the qualitative treatment of |

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| | | the structure of liquid along with the physical properties of liquid, viz, vapour pressure, surface tension and viscosity. In the molecular and crystal symmetry unit they will be introduced to the elementary idea of symmetry which will be useful to understand solid state chemistry and group theory in some higher courses. In solid state unit the students will learn the basic solid state chemistry application of x-ray crystallography for the determination of some very simple crystal structures. The students will also learn another important topic "ionic equilibria" in this course. |
| B.Sc 2 nd Semester | CHE-HC-2016: ORGANIC CHEMISTRY I | Students will be able to identify different classes of organic compounds, describe their reactivity and explain/analyze their chemical and stereo chemical aspects. |
| | CHE-HC-2026: PHYSICAL CHEMISTRY I | In this course the students are expected to learn laws of thermodynamics, thermo chemistry, thermodynamic functions, relations between thermodynamic properties, Gibbs Helmholtz equation, Maxwell relations etc. Moreover the students are expected to learn partial molar quantities, chemical equilibrium, solutions and colligative properties. After completion of this course, the students will be able to understand the chemical systems from thermodynamic point of view |
| B.Sc 3 rd Semester | CHE-HC-3016: INORGANIC CHEMISTRY-II | On successful completion of this course students would be able to apply theoretical principles of redox chemistry in the understanding of metallurgical processes. Students will be able to identify the variety of s and p block compounds and comprehend their preparation, structure, bonding, properties and uses. Experiments in this course will boost their quantitative estimation skills and introduce the students to preparative methods in inorganic chemistry. |
| | CHE-HC-3026: ORGANIC CHEMISTRY-II | Students will be able to describe and classify organic compounds in terms of their functional groups and reactivity. |
| | CHE-HC-3036: PHYSICAL CHEMISTRY-III | The students are expected to learn phase rule and its application in some specific systems. They will also learn rate laws of chemical transformation, experimental methods of rate law determination, steady state approximation etc. in chemical kinetics unit. After attending this course the students will be able to understand different types of surface adsorption processes and basics of catalysis including enzyme catalysis, acid base catalysis and particle size effect on catalysis. |
| | CHE-SE-3034: BASIC ANALYTICAL CHEMISTRY (Optional SEC) | Upon completion of this course, students shall be able to explain the basic principles of chemical analysis, design/implement micro scale and semi micro experiments, record, interpret and analyze data following scientific methodology. |

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| B.Sc 4th Semester | CHE-HC-4016: INORGANIC CHEMISTRY-III | On successful completion, students will be able name coordination compounds according to IUPAC, explain bonding in this class of compounds, understand their various properties in terms of CFSE and predict reactivity. Students will be able to appreciate the general trends in the properties of transition elements in the periodic table and identify differences among the rows. Through the experiments students not only will be able to prepare, estimate or separate metal complexes/compounds but also will be able to design experiments independently which they should be able to apply if and when required. |
| | CHE-HC-4026: ORGANIC CHEMISTRY-III | Students shall demonstrate the ability to identify and classify different types of N-based derivatives, alkaloids and heterocyclic compounds/explain their structure mechanism and reactivity/critically examine their synthesis and reactions mechanism |
| | CHE-HC-4036: PHYSICAL CHEMISTRY-IV | In this course the students will learn theories of conductance and electrochemistry. Students will also understand some very important topics such as solubility and solubility products, ionic products of water, conduct metric titrations etc. The students are also expected to understand the various parts of electrochemical cells along with Faraday's Laws of electrolysis. The students will also gain basic theoretical idea of electrical & magnetic properties of atoms and molecules |
| | CHE-SE-4064: FUEL CHEMISTRY (Optional SEC Paper) | At the end of this course students will learn about the classes of renewable and non-renewable energy sources. Students will learn about the composition of coal and crude petroleum, their classification, isolation of coal and petroleum products and their usage in various industries. They will also learn to determine industrially significant physical parameters for fuels and lubricants. |
| B.Sc 5th Semester | CHE-HC-5016: ORGANIC CHEMISTRY-IV | Students will be able to explain/describe the important features of nucleic acids, amino acids and enzymes and develop their ability to examine their properties and applications. |
| | CHE-HC-5026: PHYSICAL CHEMISTRY V | After completion of this course the students are expected to understand the application of quantum mechanics in some simple chemical systems such as hydrogen atom or hydrogen like ions. The students will also learn chemical bonding in some simple molecular systems. They will be able to understand the basics of various kinds of spectroscopic techniques and photochemistry. |
| | CHE-HE-5026: ANALYTICAL METHODS IN CHEMISTRY (DSE Paper) | On successful completion students will be have theoretical understanding about choice of various analytical techniques used for qualitative and quantitative characterization of samples. At the same time through the experiments students will gain hands on experience of the discussed techniques. This will enable students to take judicious decisions while analyzing different samples |

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| | CHE-HE-5056: POLYMER CHEMISTRY (DSE Paper) | After completion of this course the students will learn the definition and classifications of polymers, kinetics of polymerization, molecular weight of polymers, glass transition temperature, and polymer solutions etc. They also learn the brief introduction of preparation, structure and properties of some industrially important and technologically promising polymers. |
| B.Sc 6th Semester | CHE-HC-6016: INORGANIC CHEMISTRY-IV | By studying this course the students will be expected to learn about how big and substitution and redox reactions take place in coordination complexes. Students will also learn about organo metallic compounds, comprehend their bonding, stability, reactivity and uses. They will be familiar with the variety of catalysts based on transition metals and their application in industry. On successful completion, students in general will be able to appreciate the use of concepts like solubility product, common ion effect, pH etc. in analysis of ions and how a clever design of reactions, it is possible to identify the components in a mixture. With the experiments related to coordination compound synthesis, calculation of $10Dq$, controlling factors etc. will make the students appreciate the concepts of theory in experiments. |
| | CHE-HC-6026: ORGANIC CHEMISTRY-V | Students will be able to explain/describe basic principles of different spectroscopic techniques and their importance in chemical/organic analysis. Students shall be able to classify/identify/critically examine carbohydrates, polymers and dye materials |
| | CHE-HE-6026: INDUSTRIAL CHEMICALS AND ENVIRONMENT (DSE Paper) | After successful completion of the course, students would have learnt about the manufacture, applications and safe ways of storage and handling gaseous and inorganic industrial chemicals. Students will get to know about industrial metallurgy and the energy generation industry. Students will also learn about environmental pollution by various gaseous, liquid wastes and nuclear wastes and their effects on living beings. Finally, the students will learn about industrial waste management, their safe disposal and the importance of environment friendly "green chemistry" in chemical industry. |
| | CHE-HE-6046: RESEARCH METHODOLOGY FOR CHEMISTRY (DSE Paper) or CHE-HE-6056 Dissertation | After completing this course, students should be able to construct a rational research proposal to generate fruitful output in terms of publications and patents in the field of chemical sciences. Or For Dissertation student will be able to complete a project work and then prepare a report on that. |

b) B.Sc Regular with Chemistry& Chemistry as Generic Elective

| Semester | Paper Code/ Name | Course outcome |
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| B.Sc 1 st Semester | CHE-RC/HG-1016: CHEMISTRY1 ATOMIC STRUCTURE, BONDING, GENERAL ORGANICCHEMISTR Y & ALIPHATIC HYDROCARBONS | After completion of this course the students will learn the atomic structure through the basic concepts of quantum mechanics. They will understand the chemical bonding through VB and MO approaches. In organic part, the students are expected to learn basic ideas used in organic chemistry, stereochemistry, functional groups, alkenes, alkenes, alkynes etc. |
| B.Sc 2nd Semester | CHE-RC/HG-2016: CHEMISTRY2 s- AND p-BLOCK ELEMENTS, TRANSITION ELEMENTS, COORDINATION CHEMISTRY STATES OF MATTER & CHEMICAL KINETICS | After completion of this course the students will learn periodic properties in main group elements, transition metals (3d series). They will also learn the crystal field theory in coordination chemistry unit. In physical chemistry part, the students are expected to learn kinetic theory of gases, ideal gas and real gases, surface tension, viscosity, basic solid state chemistry and chemical kinetics. |
| B.Sc 3rd Semester | CHE-RC/HG-3016: CHEMISTRY 3 CHEMICAL ENERGETICS, EQUILIBRIA & FUNCTIONAL ORGANIC CHEMISTRY-I | After completion of this course the students will able to understand the chemical system from thermodynamic points of view. They will also learn two very important topics in chemistry-chemical equilibrium and ionic equilibrium. In organic chemistry part, the students are expected to learn various classes of organic molecules-alkyl halides, aryl halides, alcohols, phenols, ethers, aldehydes and ketones. |
| | CHE-SE-3034: BASIC ANALYTICAL CHEMISTRY (Optional SEC Paper) | Upon completion of this course, students shall be able to explain the basic principles of chemical analysis, design/implement micro scale and semi micro experiments, record, interpret and analyze data following scientific methodology. |
| B.Sc 4th Semester | CHE-RC/HG-4016: CHEMISTRY4 SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE,ELE CTROCHEMISTRY & FUNCTIONAL GROUP ORGANIC CHEMISTRY | After completion of this course the students learn solutions, phase rule and its application in specific cases, basics of conductance and electrochemistry. Students will also learn some important topics of organic and biochemistry-carboxylic acids, amines, amino acids, peptides, proteins and carbohydrates. |
| | CHE-SE-4064: FUEL CHEMISTRY (Optional SEC Paper) | At the end of this course students will learn about the classes of renewable and non-renewable energy sources. Students will learn about the composition of coal and crude petroleum, their classification, isolation of coal and petroleum products and their usage in various industries. They will also learn to determine industrially significant physical parameters for fuels and lubricants. |

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| B.Sc 5th Semester | CHE-RE-5056: POLYMER CHEMISTRY (DSE Paper) | After completion of this course the students will learn the definition and classifications of polymers, kinetics of polymerization, molecular weight of polymers, glass transition temperature, and polymer solutions etc. They also learn the brief introduction of preparation, structure and properties of some industrially important and technologically promising polymers. |
| B.Sc 6th Semester | CHE-RE-6026: INDUSTRIAL CHEMICALS AND ENVIRONMENT (DSE Paper) | After successful completion of the course, students would have learnt about the manufacture, applications and safe ways of storage and handling gaseous and inorganic industrial chemicals. Students will get to know about industrial metallurgy and the energy generation industry. Students will also learn about environmental pollution by various gaseous, liquid wastes and nuclear wastes and their effects on living beings. Finally, the students will learn about industrial waste management, their safe disposal and the importance of environment friendly “green chemistry” in chemical industry. |