Hislop College, Nagpur
PG & Research Department of Chemistry

Program Objectives (POs)

1. Make students employable with the knowledge and competency in various branches of Chemistry

2. Students having good leadership and soft skills with the right attitudes and ethics.

3. Produce Innovative chemists with problem solving skills for sustainability.

4. Chemists who possess interest in research and lifelong learning.

Program Specific Outcome (PSOs)

1. Have sound knowledge about the fundamentals and applications of chemical and Scientific theories

2. Apply appropriate techniques for the qualitative and quantitative analysis of Chemicals in laboratories and in industries.

3. Become familiar with the different branches of chemistry like Analytical, Organic, Inorganic, Physical and Polymer Chemistry

4. Develop analytical skills and problem solving skills requiring application of chemical principles.

5. Acquire the ability to synthesise, separate and characterize compounds using laboratory and instrumentation techniques.

Course outcomes (Cos)

Organic Chemistry

On completion of the course, the student should be able to:

1. Predict the major and minor products of a variety of organic reactions with appropriate stereochemistry and regiochemistry.
2. Understand and reproduce accepted mechanisms of organic reactions including all intermediates, arrows, charges, and resonance structures.
3. Understand and interpret spectra (IR, 1H NMR, 13C NMR, Mass Spec., and UV-VIS) of organic molecules.
4. Name or draw the structure of an organic molecule using substitutive and/or functional class IUPAC nomenclature.
5. Devise reasonable high-yield synthesis of a target molecule from given organic starting material and to Understand physical properties of organic molecules.

6. Perform a laboratory experiment using conventional equipment, instrumentation, and techniques and understand the principles well enough to interpret the data collected.

Physical Chemistry:

On completion of the course, the student should be able to:

1. Acquire a good knowledge on the chemical kinetics, unimolecular and bimolecular reactions, fast reactions, Catalysis, Surface chemical reactions and Photochemistry of atoms and molecules.

2. Explain statistical physics and thermodynamics as logical consequences of the postulates of statistical mechanics;

3. Understand postulates and general principles of quantum mechanics. Approximations based on variational method and time independent perturbation theory. Application to harmonic oscillator, rigid rotor, one-electron and many-electron atoms, and homo-and hetero-nuclear diatomic molecules

4. Know the importance of nuclear chemistry and its applications. Students will measure the rate of nuclear decay of a short-lived isotope to determine a number of statistical and physical properties.

Inorganic Chemistry:

On completion of the course, the student should be able to:

1. Understand the background of bonding forces
2. Appreciates the importance of various theories in bonding
3. Learns the chemistry basis of solid state
4. Gains the imagination of 3D structures of silicates and caged compounds
5. Estimates the importance of extractive metallurgy

Analytical Chemistry:

On completion of the course, the student should be able to:

1. Describe and compare a range of analytical chemistry methods and explain the underlying theoretical principles.

2. Explain the broad role of chemists in quality control and assessment of experimental measurements and analytical tasks.

3. Employ a variety of analytical and instrumental methods to prepare, separate and quantify samples from various matrices.

4. Apply the scientific process, including statistical treatment of data, in the conduct and reporting of chemical analysis.

5. Work safely and competently in an analytical laboratory setting.

6. Contribute to team and group work for scientific investigation and reporting.

Polymer Chemistry:

On completion of the course, the student should be able to:

1. Isolate the key design features of a product which relate directly to the material(s) used in its construction
2. indicate how the properties of polymeric materials can be exploited by a product designer
3. describe the role of rubber-toughening in improving the mechanical properties of polymers
4. identify the repeat units of particular polymers and specify the isomeric structures which can exist for those repeat units
5. estimate the number- and weight-average molecular masses of polymer samples given the degree of polymerisation and mass fraction of chains present.

Molecular Spectroscopy:

On completion of the course, the student should be able to:

- have achieved advanced knowledge about the interactions of electromagnetic radiation and matter and their applications in spectroscopy.
- be able to apply formalisms based on molecular symmetry to predict spectroscopic properties.
- be able to analyse and interpret spectroscopic data collected by the methods discussed in the course.
- be able to solve problems related to the structure, purity and concentration of chemicals and to study molecular interactions by choosing suitable spectroscopic methods and interpreting corresponding data.