



## DEPARTMENT OF CHEMISTRY INDAS MAHAVIDYALAYA

**Students passing with B.Sc. General Degree should be able to acquire:**

- PO 1:** Capability of demonstrating comprehensive knowledge of B.Sc. programme.
- PO 2:** Ability to employ critical thinking in understanding the concept in every area of B.Sc. programme.
- PO 3:** Able to plan and execute experiments or investigations, analyse and interpret data information collected using appropriate methods.
- PO4:** Ability to analyse the results and apply them in various problems.
- PO5:** Develop a sense of research to predict cause-and-effect relationships.
- PO 6:** Create, select and apply appropriate techniques, resources and modern science.
- PO 7:** Ability to communicate various concepts of B.Sc. programme effectively using examples.
- PO 8:** Ability to think, acquire knowledge and skills through logical reasoning and to inculcate the habit of self-learning.
- PO 9:** Ability to identify unethical behavior and adopting objective, unbiased and fruitful actions in all aspects of their programme.
- PO 10:** This programme will also help students to enhance their employability for jobs in different sectors.

### Course Outcomes

#### Semester 1

**Students will be able to:**

- CO 1:** Associate different bond types of carbon and its hybrid orbitals.
- CO2:** Understand nucleophile and electrophile groups and their properties.
- CO3:** Interpret the concept of aromaticity and main properties of aromatic compounds.
- CO4:** Derive mechanism of a reaction.

- CO5:** Evaluate effects of atomic properties on acidity and basicity.
- CO6:** Interpret reactivity of alkane, alkene and alkyne.
- CO7:** Design reactions of aliphatic hydrocarbons.
- CO8:** Prepare alkane, alkene and alkyne using different methods.
- CO9:** Describe the structure of an atom as a nucleus containing protons and neutrons surrounded by electrons in shells (energy levels).
- CO10:** Able to calculate energy of an electron in an orbital of a given atom.
- CO11:** Demonstrate an understanding that the existence of an isotope results in some relative atomic masses not being whole numbers.
- CO12:** Describe the Arrhenius model for acids and bases.
- CO13:** Describe HSAB process.
- CO14:** Describe the strength of an acid or base.
- CO15:** Calculate pH of a solution.
- CO16:** Identify a redox reaction based on change in oxidation number across the chemical change.
- CO17:** Identify oxidizing and reducing agents in chemical reaction.
- CO18:** Balance a net redox reaction using the half reaction in acidic or basic solution.

## **Semester: 2**

### **Students will be able to:**

- CO1:** Explain the octet rule and its limitations; draw Lewis structure of simple molecules.
- CO2:** Explain the formation of different types of bonds.
- CO3:** Describe the VSEPR theory and predict the geometry of simple molecules.
- CO4:** Explain the valence bond approach for the formation of covalent bonds.
- CO5:** Explain the different types of hybridizations and draw the shapes of simple covalent molecules.
- CO6:** Describe the molecular orbital theory of molecules.
- CO7:** Explain the concept of hydrogen bonding.
- CO8:** Predict the directional properties of covalent bonds.
- CO9:** Learn the rate laws of chemical transformations.
- CO10:** Learn experimental methods of determining the rate of a reaction.
- CO11:** Understand different types of adsorption processes and basics of catalysis.

## Semester: 3

### Students will be able to:

**CO1:** Explain the basic concepts of thermodynamics like system, properties, equilibrium, pressure, specific volume, temperature etc.

**CO2:** Explain the concept of thermodynamic work, calculate and compare work in case of a closed system executing different thermodynamic process or different thermodynamic cycles.

**CO3:** State and apply the first law of thermodynamics for closed and open systems undergoing different process.

**CO4:** Describe the difference between completion for irreversible chemical reaction and for reversible chemical reactions.

**CO5:** Describe the position of equilibrium.

**CO6:** Write an equilibrium constant expression for a reversible reaction.

**CO7:** Describe what information is provided by the value of equilibrium constant for a chemical reaction.

**CO8:** Calculate the value of  $K_p$ ,  $K_c$  and reaction quotient  $Q$ .

**CO9:** Describe Le chanticleer's principle.

**CO10:** Learn cell constant, specific conductance, molar conductance.

**CO11:** Describe how conductance varies with dilution for strong electrolyte and weak electrolyte

**CO12:** Calculate the value of equivalent conductance at infinite dilution for weak electrolyte using Kohlrausch's law of independent migration of ions

**CO13:** Describe transport number

**CO14:** Describe the application of conductance measurement.

**CO15:** Understand the difference between aliphatic and aromatic compounds.

**CO16:** Understand the hybridisation in Benzene

**CO17:** Recognise the general properties of aromatic compound, the criteria of aromaticity and Huckel's rule.

**CO 18:** Know the types of electrophonic aromatic substitution reaction.

**CO19:** Understand the reactivity of aromatic compound and orientation of monosubstituted benzene's reaction.

**CO20:** Know how chemical properties affected by metals and ligands.

**CO21:** Use knowledge and bonding issues to understand the stability of simple organometallic complexes.

**CO22:** Describe the preparation reaction of carbonyl compound.

**CO23:** Explain the mechanism of nucleophilic addition reaction of carbonyl compound.

### **Semester: 4**

**Students will be able to:**

**CO1:** Identify properties of carboxylic acids and their derivatives.

**CO2:** Illustrate methodologies for the synthesis of carboxylic acids.

**CO3:** Illustrate the reactions of carboxylic acids and its derivatives.

**CO4:** Explain the strength of carboxylic acid.

**CO5:** Predict the reactivity of anion as bases and nucleophiles.

**CO6:** Recognise the basic property structure, physical and chemical properties of anion.

**CO7:** Know the difficult methods of preparation and reaction of anion.

**CO8:** Identify several major functions of carbohydrates.

**CO9:** Learn difficult reaction of carbohydrates

**CO10:** Explain why the transition metals are a distinct group of elements in the periodic table.

**CO11:** Understand why all valence electrons occupy the d sub shells in transition metal cations.

**CO12:** Know the transition metals have many oxidation states.

**CO13:** Predict coordination geometry from coordination

**CO14:** Explain the production of cement.

**CO15:** Describe raw materials of cement.

**CO16:** Interpret hydration reaction.

**CO17:** Recognize the aggregation which used in production of cement.

### **Semester: 5**

**Students will be able to:**

**CO1:** Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the faces of chemistry, public policy law, business, and environmental health science that can be integrated to promote green chemistry and the redesign of chemicals, industrial process and products.

**CO2:** Understand the basic principle of toxicology including hazards, exposure , and risk as they are applied to assessing the impact of chemical an humans and the environmental ,

settings priorities in public health decision making and identifying opportunities for informing chemical design.

**CO3:** Understand and identify structure /function relationships with respect to chemical properties, biological activity and product performance.

**CO4:** Understanding the role of law and economics in shaping, industrial activity, to identify different legal approach to chemical regulation.

**CO5:** Critically assess methods for identifying and evaluating the environmental , social and health impacts of a chemical product over the life cycle of the product from ' cradle to grave' .

**CO6:** Understanding the use of alternative assessments that combine chemical environmental health regularity and business consideration to develop safer products.

### **Semester: 6**

#### **Students will be able to:**

**CO1:** Use essential description about polymer chemistry.

**CO2:** Summarize historical evolution of the polymers.

**CO3:** Recognize monomers and polymers.

**CO4:** Evaluate the structure of polymers

**CO5:** Interpret stereochemistry of polymers.

**CO6:** Solve the problems about polymer chemistry.

**CO7:** Categorize polymers.

**CO8:** Categorize polymerisation reaction with respect to mechanism and distinguish differences of this reaction.

**CO9:** Explain polymers production processes.