(University of Delhi)
Shyam Lal College

Programme Specific Outcomes and Course Outcomes

B.Sc. (P) Chemistry

Shyam Lal College (University of Delhi)

Department of Chemistry

Programme Outcomes and Course Outcomes

Programme Outcomes

Programme	Programme Outcomes
B.Sc. (Physical Sciences) with Chemistry	**PO-1:** An integral part of chemistry curriculum is problem solving. The student will be equipped to solve problems of numerical, synthetic and analytical nature that are best approached with critical thinking. **PO-2:** The student will be able to draw logical conclusions based on a group of observations, facts and rules. **PO-3:** The student is inquisitive about processes and phenomena happening during experiments in laboratories and seeks answers through the research path. **PO-4:** Students are aware of the importance of working with safety and consciousness in laboratory and actively seeks information about health and environmental safety of chemicals that are used in the laboratories and follows protocols for their safe disposal.

Course Outcomes

Semester 1

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
Basic Concepts of Organic Chemistry	**CO-1:** Understand and explain the differential behavior of organic compounds based on fundamental concepts learnt. **CO-2:** Understand the fundamental concepts of stereochemistry. **CO-3:** Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved. **CO-4:** Learn and identify many organic reactions and their mechanisms including electrophilic addition, nucleophilic addition, nucleophilic substitution, electrophilic substitution and rearrangement reactions.	1. Use of 3D models to visualize the organic molecules in a three dimensional space. 2. Blended mode of teaching with flip classroom approach along with traditional chalk and blackboard method. 3. Video lectures from SWAYAM and NPTEL. 4. Use of Virtual Labs. 5. Correlation of concepts with demonstration and experiments in Laboratory. 6. Assessment based upon continuous evaluation including quizzes , assignments projects, presentations, and class test. 7. In practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Semester 2

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
Periodic Properties and Chemical Bonding	**CO-1:** Understand periodicity in ionization enthalpy, electron gain enthalpy, electronegativity and enthalpy of atomization. **CO-2:** Understand variability in oxidation state, colour, metallic character, magnetic and catalytic properties and ability to form complexes. **CO-3:** Understand the concept of lattice energy using Born-Landé expression. **CO-4:** Draw Born Haber Cycle and analyse reaction energies. **CO-5:** Draw the plausible structures and geometries of molecules using VSEPR theory. **CO-6:** Understand and draw MO diagrams (homo- & hetero-nuclear diatomic molecules). Understand the importance and applications of hydrogen and van der Wall bonding.	1. Use of Periodic table charts and models to better understand the chemistry of elements of periodic table. 2. Blended mode of teaching with flip classroom approach along with traditional chalk and black board method. 3. Video lecture from SWAYAYAM and NPTEL. 4. Use of virtual labs. 5. Correlation of concepts with demonstration and experiments in laboratory. 6. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. 7. In practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Semester 3

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
Solutions, Phase Equilibrium, Conductance, Electrochemistry and Functional Group Organic Chemistry-II	**CO-1:** Explain the concepts of different types of binary solutions-miscible, partially miscible and immiscible along with their applications. **CO-2:** Explain the thermodynamic aspects of equilibria between phases and draw phase diagrams of simple one component and two component systems. **CO-3:** Explain the factors that affect conductance, migration of ions and application of conductance measurement. **CO-4:** Understand different types of galvanic cells, their Nernst equations, and measurement of emf, calculations of thermodynamic properties and other parameters from the emf measurements. **CO-5:** Understand and demonstrate how the structure of biomolecules determines their chemical properties, reactivity and biological uses. **CO-6:** Design newer synthetic routes for various organic compounds.	1. Use of 3D models to visualize the organic molecules in a three dimensional space. 2. Blended mode of teaching with flip classroom approach along with traditional chalk and black board method. 3. Video lectures from SWAYAM and NPTEL. 4. Use of Virtual Labs. 5. Correlation of concepts with demonstration and experiments in Laboratory. 6. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. 7. In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Semester 4

Course Name	Course outcomes	Methodology to Achieve the Specific Outcomes
Chemistry of s- and p-Block Elements, States of Matter and Chemical Kinetics	**CO-1:** Understand the chemistry and applications of s- and p-block elements. **CO-2:** Derive ideal gas law from kinetic theory of gases and explain why the real gases deviate from ideal behavior. **CO-3:** Explain Maxwell-Boltzmann distribution, critical constants and viscosity of gases. **CO-4:** Explain the properties of liquids especially surface tension and viscosity. **CO-5:** Explain symmetry elements, crystal structure specially NaCl, KCl and CsCl **CO-6:** Define rate of reactions and the factors that affect the rates of reaction. **CO-7:** Understand the concept of rate laws e.g., order, molecularity, half-life and their determination **CO-8:** Learn about various theories of reaction rates and how these account for experimental observations.	1. Use of 3D models to visualize the organic molecules in a three dimensional space. 2. Blended mode of teaching with flip classroom approach along with traditional chalk and black board method. 3. Video lectures from SWAYAM and NPTEL 4. Use of Virtual Labs. 5. Correlation of concepts with demonstration and experiments in Laboratory. 6. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. 7. In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Semester 5

Course Name	Course Outcomes	Methodology to Achieve the Specific Outcomes
DSE-1: Chemistry of d-Block Elements, Quantum Chemistry and Spectroscopy	**CO-1:** Understand chemistry of d and f block elements, Latimer diagrams, properties of coordination compounds and VBT and CFT for bonding in coordination compounds. **CO-2:** Understand basic principles of quantum mechanics: operators, eigen values, averages, probability distributions. **CO-3:** Understand and use basic concepts of microwave, IR and UV-VIS spectroscopy for interpretation of spectra. **CO-4:** Explain Lambert-Beer's law, quantum efficiency and photochemical processes.	1. Use of 3D models to visualize the organic molecules in a three dimensional space. Blended mode of teaching with flip classroom approach along with traditional chalk and black board method. 3. Video lectures from SWAYAM and NPTEL. 4. Use of Virtual Labs. 5. Correlation of concepts with demonstration and experiments in Laboratory. 6. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. 7. In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Semester 6

Course Name	Course outcomes	Methodology to Achieve the Specific Outcomes
DSE-2: Organometallics, Bioinorganic Chemistry, Polynuclear Hydrocarbons and UV, IR Spectroscopy	**CO-1:** Understand the chemistry and applications of 3d elements including their oxidation states and important properties of the familiar compounds potassium dichromate, potassium permanganate and potassium ferrocyanide. **CO-2:** Use IR data to explain the extent of back bonding in carbonyl complexes. **CO-3:** Get a general idea of toxicity of metal ions through the study of Hg2+ and Cd2+ in the physiological system. **CO-4:** Understand the fundamentals of functional group chemistry, polynuclear hydrocarbons and heterocyclic compounds through the study of methods of preparation, properties and chemical reactions with underlying mechanism. **CO-5:** Gain insight into the basic fundamental principles of IR and UV-Vis spectroscopic techniques. **CO-6:** Use basic theoretical principles underlying UV-visible and IR spectroscopy as a tool for functional group identification in organic molecules.	1. Use of 3D models to visualize the organic molecules in a three dimensional space. 2. Blended mode of teaching with flip classroom approach along with traditional chalk and black board method. 3. Video lectures from SWAYAM and NPTEL. 4. Use of Virtual Labs. 5. Correlation of concepts with demonstration and experiments in Laboratory. 6. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. 7. In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce.

Skill Enhancement Course

Course Name	Course outcomes	Methodology to Achieve the Specific Outcomes
Green Methods in Chemistry	**CO-1:** Get idea of toxicology, environmental law, energy and the environment **CO-2:** Think to design and develop materials and processes that reduce the use and generation of hazardous substances in industry. **CO-3:** Think of chemical methods for recovering metals from used electronics materials. **CO-4:** Get ideas of innovative approaches to environmental and societal challenges. **CO-5:** Know how chemicals can have an adverse/potentially damaging effect on human and vegetation. **CO-6:** Critically analyse the existing traditional chemical pathways and processes and creatively think about bringing environmentally benign reformations in these protocols. **CO-7:** Convert biomass into valuable chemicals through green technologies.	1. Some motivating short movies in green chemistry especially in bio mimicry. 2. Blended mode of teaching with flip classroom approach along with traditional chalk and black board method. 3. Video lectures from SWAYAM and NPTEL. 4. Use of Virtual Labs. 5. Correlation of concepts with demonstration and experiments in Laboratory. 6. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test. 7. In Practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of Examination and viva voce. 8. Visit to a green chemistry lab.