# B.L.D.E.ASSOCIATION'S
# SB ARTS AND K.C.P. SCIENCE COLLEGE, VIJAYAPUR
# RE-ACCREDITED AT THE 'B++' LEVEL
# Bachelor of Science

## Department of Chemistry

## PROGRAM OUTCOMES (2023-2024)

| POs | DESCRIPTIONS |
|---|---|
| PO1: | **Knowledge: Width and depth:** Students acquire theoretical knowledge and understanding of the fundamental concepts, principles and processes in main branches of chemistry, namely, organic, inorganic, physical, spectroscopy, analytical and biochemistry. In depth understanding is the outcome of transactional effectiveness and treatment of specialized course contents. Width results from the choice of electives that students are offered. |
| PO2: | **Laboratory Skills: Quantitative, analytical and instrument based:** A much valued learning outcome of this programme is the laboratory skills that students develop during the course. Quantitative techniques gained through hands on methods opens choice of joining the industrial laboratory work force early on. The programme also provides ample training in handling basic chemical laboratory instruments and their use in analytical and biochemical determinations. Undergraduates on completion of this programme can cross branches to join analytical, pharmaceutical, material testing and biochemical labs besides standard chemical laboratories. |
| PO3: | **Communication:** Communication is a highly desirable attribute to possess. Opportunities to enhance students' ability to write methodical, logical and precise reports are inherent to the structure of the programme. Techniques that effectively communicate scientific chemical content to large audiences are acquired through oral and poster presentations and regular laboratory report writing. |
| PO4: | **Capacity Enhancement:** Modern day scientific environment requires students to possess ability to think independently as well as be able to work productively in groups. This requires some degree of balancing. The chemistry honours programme course is designed to take care of this important aspect of student development through effective teaching learning process. |
| PO5: | **Portable Skills:** Besides communication skills, the programme develops a range of portable or transferable skills in students that they can carry with them to their new work environment after completion of chemistry honours programme. These are problem solving, numeracy and mathematical skills- error analysis, units and conversions, information retrieval skills, IT skills and organizational skills. These are valued across work environments. |

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**Course outcomes**

| CLASS | PAPER | COURSE OUTCOMES | DESCREPTIONS |
|---|---|---|---|
| B. SC. I SEM (DSC) | Chemistry-I | | This course will enable the students to |
| | | CO1 | Describe the dual nature of radiation and matter; dual behaviour of matter and radiation, de Broglie's equations, Heisenberg Uncertainty principle and their related problems. |
| | | CO2 | Able to understand Electronic configurations of the atoms. |
| | | CO3 | To Understand principles of different type's titrations. Titration curves for all types of acids – base titrations. |
| | | CO4 | Explain bond properties, electron displacement effects (inductive effect, electrometric effect, resonance effect and Hyper conjugation effect). Steric effect and their applications in explaining acidic strength of carboxylic acids, basicity of amines. |
| | | CO5 | Explain the existence of different states of matter in terms of balance between intermolecular forces and thermal energy of the particles. |
| | | CO6 | Explain properties of liquids in terms of intermolecular attractions. |
| B. SC. I SEM (Practical) | Chemistry Lab (Inorganic and Organic Analyses) | CO1 | Understand and practice the calibration of glasswares (burette, pipette, volumetric flask). |
| | | CO2 | Basic concepts involved in titrimetric analysis, primary standard substances, preparation of standard solutions. |
| B. SC. II SEM (DSC2) | Chemistry-II | CO1 | To Understand the principals of ionic bonding, polarization power, covalent bonding and molecular orbital theory |
| | | CO2 | The study of concept of mechanism and its importance Stereoisomersim: Geometrical isomerism, Optical isomerism and Understand the concept Molecular forces and general properties of liquids. |
| | | CO3 | Describe the significance of surface tension, surface energy, effect of temperature on surface tension, shapes of liquid drops and soap bubbles, capillary action, |
| | | CO4 | Understanding the concept of Gravimetric Analysis |
| | | CO5 | Basic Explanation, classification with examples- Smectic, nematic, cholesteric, disc shaped and polymeric |
| | | CO6 | Able to solve Laws of Crystallography: Law of constancy of interfacial angles, Law of rational indices, |

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| **B. SC. II SEM (DSC2)** | **Practical** | **CO1** | Estimation of inorganic and organic compounds |
| **B. SC. III SEM (DSC)** | **Chemistry-III** | **CO1** | Study of Electromagnetic spectrum, absorption of electromagnetic radiation Beer's law, Beer-Lambert law derivation, deviations from Beer's law. |
| | | **CO2** | Instrumentation: single beam and double beam Spectrophotometers, quantitative applications of colorimetry. |
| | | **CO3** | To study of Structures of ionic solids, Radius ratio rules, Calculation of some limiting radius ratio values, Coordination number 3. |
| | | **CO4** | To study of Carbon-carbon pi bonds, Formation of alkenes and alkynes by elimination reaction. Mechanism of SN1 and SN2 reactions with suitable examples. |
| | | **CO5** | To study of Thermodynamic Processes, Reversible and Irreversible Processes, Nature of Heat and Work, Internal Energy, First Law of Thermodynamics. |
| | | **CO6** | To study of Freundlich adsorption isotherm (only equation), its limitations. |
| **B. SC. III SEM (DSC)** | **Practical** | **CO1** | Part A: Physical chemistry, calorimetry, and determination of Rf value. |
| | | **CO2** | Part B: Qualitative analysis of organic compounds. |
| **B. SC. IV SEM (DSC)** | **Chemistry-IV** | **CO1** | To study of Fundamentals of chromatography, Thin layer chromatography (TLC) and ion exchange chromatography. |
| | | **CO2** | To study of Concept of resonance, resonance energy, hybridisation, types of hybridization, Molecular Orbital theory-II and General properties of metals. |
| | | **CO3** | Reaction Intermediates: Generation, Stability and Reactions of, carbocation, carboanaion and free radicals. |
| | | **CO4** | Carbenes and Nitrenes: Singlet and Triplet states, their relative stability and Reactions. |
| | | **CO5** | To study of temperature dependence of reaction rates, Arrhenius equation, activation energy, Numerical problems on Arrhenius equation in calculating energy of activation and rate constants. |
| | | **CO6** | To study of Important Applications of conductance measurement. |
| **B. SC. IV SEM (DSC4)** | **Practical** | **CO1** | Part A- Inorganic Chemistry Practicals-Qualitative semi-microanalysis of mixtures containing 2 anions and 2 cations. |

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| | | CO2 | Part B- Physical Chemistry Practicals-Determination of velocity constant, equivalent conductance and dissociation constant. |
| B. SC. V SEM (DSC) P-I (Theory) | Chemistry-V P-I (Theory) | CO1 | To study of Transition Elements (3d series): General group trends with special reference to electronic Configuration and Valence bond theory. |
| | | CO2 | Classification, molecular orbital picture and Aromatic character of furan, thiophene, pyrrole and pyridine, synthesis of the following compounds. |
| | | CO3 | Definition, source, classification and general characteristics, Hofmann exhaustive methylation with pyridine as an example. |
| | | CO4 | Electromagnetic radiation, regions of the spectrum, Born-Oppenheimer approximation, degrees of freedom |
| | | CO5 | Classification of molecules, rotational spectra of rigid diatomic molecules, criteria for showing the spectra, energy levels of rigid rotator, selection rules |
| | | CO6 | Physical, thermal, Flow & Mechanical Properties, Brief introduction to preparation, structure, properties and application of the following polymers: |
| | Chemistry-V P-I (Practical) | CO1: | Part A: Preparation and quantitative analysis of inorganic complexes.<br>Part B: Physical chemistry practical's, Colorimetry and potentiometry. |
| | Chemistry-V P-II (Theory) | CO1 | Alloys-Significance, types of alloys (ferrous and non-ferrous alloys), preparation (fusion and electro-deposition) and their applications. |
| | | CO2 | Cement: Raw materials, composition of Portland cement, manufacture by rotary kiln method, mechanism of setting. |
| | | CO3 | Preparation, mechanism of action and applications DCC (Amide formation), LiAlH4 (reduction of aldehyde, carboxylic acid and ester), |
| | | CO4 | Electrochemistry – EMF, Application of EMF measurements. |
| | | CO5 | Batteries and Fuel Cells, applications of batteries and fuel cells. |
| | | CO6 | Introduction to infrared spectroscopy. |
| | | CO7 | Types of electronic transitions, chromophores and auxochromes, bathochromic shift and hypochromic shift, intensity of absorption, Woodward- Fieser rules |
| | Chemistry-V P-II (Practical) | CO1 | Part A: Preparation of organic compounds.<br>Part B: Quantitative analysis. |
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| B. SC. VI SEM (DSC) | Chemistry-VI P-I (Theory) | CO1 | Coordination Chemistry – II, study of Crystal field theory (CFT) and Stability of metal complexes. |
| | | CO2 | Haworth and conformational formulae of glucose and fructose, mutarotation and its mechanism, osazone formation, Killani's synthesis, Ruff's degradation. |
| | | CO3 | Classification, structure and stereochemistry (D and L) of amino acids, acid-base behaviour, iso-electric point and electrophoresis, peptides-nomenclature. |
| | | CO4 | Concept of phases, components and degrees of freedom, derivation of Gibbs Phase Rule for nonreactive and reactive systems. |
| | | CO5 | Photochemistry, Absorbance, transmittance, Beer-Lambert's law and its limitations. |
| | | CO6 | Photophysical process - definition, fluorescence, phosphorescence, Chemiluminescence and bioluminescence with examples. |
| | | CO7 | Introduction - liquid-liquid mixtures (miscible, immiscible and partially miscible), Raoult's law-definition, equation. Duhem – Margules equation (no derivation) and its applications. |
| | Chemistry-VI P-I (Practical) | CO1 | Part A: Gravimetric analysis.<br>Part B: Conductometric titration, pH meter and potentiometric titrations. |
| | Chemistry-VI P-II (Theory) | CO1 | Study of Nuclear Chemistry and Applications of radioisotopes in tracer technique, neutron activation analysis and carbon dating. |
| | | CO2 | Introduction, classification of terpenes, Ingold's isoprene rule, constitution of citral with synthesis, synthesis of α and β ionones, synthesis of α-terpeniol |
| | | CO3 | Black body radiation, Plank's theory, photoelectric effect, Einstein's photoelectric equation,<br>Compton effect, wave nature of electron, Schrödinger's wave equation. |
| | | CO4 | Derivation of rate constants of unimolecular (Lindemann hypothesis) and bimolecular reaction rates, limitations of collision theory. |
| | | CO5 | Emulsions, micro emulsions or micellar emulsions, and its stability, properties of micro emulsions. |
| | | CO6 | Introduction, requirement of an ideal synthetic drug, classification, synthesis. |
| | Chemistry-VI P-II Chemistry-VI (Practical) | CO1 | Preparation of organic compounds. |
| | | CO2 | To study of quantitative analysis. |

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