

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 (2022-2023)

| POs | DESCRIPTIONS |
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| 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. |

Course outcomes

| CLASS | PAPER | COURSE OUTCOMES | DESCREPTIONS |
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| B. SC. I SEM (DSC) | Atomic structure & Periodicity of elements | | 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 | Define periodicity, explain the cause of periodicity in properties, and classify the elements into four categories according to their electronic configuration. |
| | | CO4 | Define atomic radii, ionisation energy, electron affinity and electronegativity, discuss the factors affecting atomic radii, describe the relationship of atomic radii with ionization energy and electron affinity, describe the periodicity in atomic radii, ionization energy, electron affinity and electronegativity. |
| | Analytical chemistry | CO1 | Understand principles of titrimetric analysis. |
| | | CO2 | Understand principles of different type's titrations. Titration curves for all types of acids – base titrations. |
| | | CO3 | Gain knowledge about balancing redox equations, titration curves, theory of redox indicators and applications. |
| | | CO4 | Understand titration curves, indicators for precipitation titrations involving silver nitrate- Volhard's and Mohr's methods and their differences. |
| | | CO5 | Indicators for EDTA titrations - theory of metal ion indicators. Determination of hardness of water. |
| | Bonding in Organic Molecules and Mechanism of Organic reactions | CO1 | 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. |
| | | CO2 | Understand basic concept of organic reaction mechanism, types of organic reactions, structure, stability and reactivity of reactive intermediates. |
| | | CO3 | Describe important characteristics of configurationally and conformational isomers. Practice and write conformational isomers of ethane, butane and cyclohexane. |
| | | CO4 | Understand the various concepts of geometrical isomerism and optical isomerism. Describe CIP rules to |

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| | | | assign E,Z notations and R & S notations. Explain D and L configuration and threo and erythro nomenclature. |
| | | C05 | Explain racemic mixture and racemisation, resolution of racemic mixture through mechanical separation, formation of diastereomers, and biochemical methods, biological significance of chirality. |
| | | C06 | Learn to trace some standard curves. |
| | Gaseous State & Distribution Law | C01 | Explain the existence of different states of matter in terms of balance between intermolecular forces and thermal energy of the particles. |
| | | C02 | Explain the laws governing behavior of ideal gases and real gases. |
| | | C03 | Understand cooling effect of gas on adiabatic expansion. |
| | | C04 | Describe the conditions required for liquefaction of gases. Realise that there is continuity in gaseous and liquid state. |
| | | C05 | Explain properties of liquids in terms of intermolecular attractions. |
| B. SC. I SEM (Practical) | CHEMISTRY LAB (Inorganic and Organic Analyses) | C01 | Understand and practice the calibration of glasswares (burette, pipette, volumetric flask). |
| | | C02 | Basic concepts involved in titrimetric analysis, primary standard substances, preparation of standard solutions. |
| | | C03 | Explain the principles of acid-base, redox and iodometric titrations. |
| | | C04 | Work out the stoichiometric relations based on the reactions involved in the titrimetric analysis. |
| | | C05 | Based on principles of titrimetric analysis student can perform |
| | | C06 | Describe the significance of organic quantitative analysis. |
| | | C07 | Determine the amount of phenol, aniline, amide, ester and formaldehyde in a given solution by performing blank titration and main titrations |
| | | C08 | Determine aspirin in the tablet by hydrolysis method. |
| B. SC. I SEM (OEC) | CHEMISTRY IN DAILY LIFE | C01 | Understand the chemical constituents in various day today materials using by a common man. |
| | | C02 | Understand the chemical constituents in fertilizers, insecticides and pesticides, chemical explosives etc. |
| | | C03 | Understand the chemical constituents in polymers, surface coatings etc. |
| B. SC. II SEM (DSC2) | Chemical bonding, molecular | C01 | Understand the principals of ionic bonding, polarization power. |
| | | C02 | Explain the principles of covalent bonding |


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| | structure Acidic Strengths of Organic compounds and Stereochemi stry | C03 | Explain the principles of molecular orbital theory |
| | | C01 | The concept of mechanism and its importance Stereoisomersim: |
| | | C02 | The concept of mechanism and its importance Geometrical isomerism |
| | | C03 | The concept of mechanism and its importance Optical isomerism |
| | | C04 | Definition, Resolution of racemic mixture by: i) Mechanical separation ii) Formation of diastereomers iii) Biochemical methods |
| | | C05 | Review of reaction rates, order and molecularity. Factors affecting rates of reaction: concentration pressure, |
| | | C06 | Understand the concept Molecular forces and general properties of liquids |
| | Chemical Kinetics I, Liquid state & Gravimetric Analysis | C01 | Describe the significance of surface tension, surface energy, effect of temperature on surface tension, shapes of liquid drops and soap bubbles, capillary action, |
| | | C02 | Describe the significance of determination of surface tension by capillary rise method, drop weight and drop number methods using stalagmometer |
| | | C03 | determination of surface tension by capillary rise method, drop weight and drop number methods using stalagmometer |
| | | C04 | Definition, Specific and molar refraction |
| | | C05 | Understanding the concept of Gravimetric Analysis |
| | Solids &Liquid crystals | C01 | Basic Explanation, classification with examples- Smectic, nematic, cholesteric, disc shaped and polymeric |
| | | C02 | Basic Explanation, classification with examples- Smectic, nematic, cholesteric, disc shaped and polymeric |
| | | C03 | Able to solve Laws of Crystallography: Law of constancy of interfacial angles, Law of rational indices, |
| B. SC. II SEM (DSC2) | Practical | C01 | Determine the amount carbonate and hydroxide present in a mixture. |
| | | C02 | Determine the amount potassium permanganate solution and determination of nitrite in a water sample |
| | | C03 | Determine the amount chlorine in bleaching powder using iodometric method. |
| | | C04 | chlorine in bleaching powder using iodometric method. |
| | | C05 | Determination of Cu ²⁺ as CuSCN |
| B. SC. II SEM (OEC) | OEC | C01 | Acquire knowledge about different types of sugars and their chemical structures. |
| | | C02 | Identify different types of amino acids and determine the structure of peptides. |
| | | C03 | Explain the actions of enzymes in our body and interpret enzyme inhibition |
| | | C04 | Predict action of drugs. Depict the biological importance of oils and fats. Importance of lipids in the metabolism Differentiate RNA and DNA and their replication. |


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| B. SC. III SEM (CBSC) | Solutions and Liquids | CO1 | Explain production of energy in our body Understand the importance of fundamental ideal solutions: Ideal solutions and Raoult's law |
| | | CO2 | Explain the deviations from Raoult's law – non-ideal solutions. Vapour pressure-composition and temperature-composition curves of ideal and non-ideal solutions. Distillation of solutions |
| | | CO3 | Understand the Critical solution temperature; effect of impurity on partial miscibility of liquids. Immiscibility of liquids |
| | Electrochem istry and Phase Equilibrium | CO1 | Explain Electrochemistry, Concept of EMF, thermodynamics & PH of hydrogen electrode |
| | | CO2 | Write the Phase Equilibrium of water and sulphur. |
| | | CO3 | Explain the congruent and incongruent melting point |
| | Orientation, Alcohols and Phenols | CO1 | Explain mechanism for a given reaction |
| | | CO2 | Predict the probable mechanism for a reaction. explain the importance of reaction intermediates, its role and techniques of generating such intermediates |
| | Spectroscop y and Aromatic Hydrocarbo ns | CO1 | Explain the importance Infrared spectroscopy. |
| | | CO2 | Principle, instrumentation, definitions of parent peak and base peak, McLafferty rearrangement with respect to butyraldehyde |
| | | CO3 | Explain the Aromatic Hydrocarbons. |
| | | CO4 | Explain the poly nuclear hydrocarbon. |
| B. SC. III SEM (CBSC) | Practical | CO1 | Understand the effect of acid base strength |
| | | CO2 | Understand the rate constant for second order, Adsorption and degree of dissociation. |
| | | CO3 | Explains the surface tension, viscosity and degree of dissociation |
| | | CO4 | Study of Inorganic volumetric analysis. |
| B. SC. IV SEM (CBSC) | Transition elements & Coordination Chemistry | CO1 | Organizing general trends in electronic configuration, valency, color, magnetic and catalytic properties. |
| | | CO2 | Interpreting the electronic spectra, oxidation state, valency, color, magnetic of lanthanoids & actinides |
| | | CO3 | Giving description of VBT. |
| | Chemistry of d-block and f-block elements | CO1 | Interpreting trends in electronic configuration, valency, color, magnetic and catalytic properties etc of d & f block elements. |
| | | CO2 | Understanding the chelate, Characteristics, factor affecting & important of chelates. |
| | | CO3 | Categorizing the Air pollution, Water pollution, COD & BOD |
| | Kinetics of Gases & Conductance | CO1 | Deduce the derivation of the kinetic gas equation, real gas & Van der waals equation of state. |
| | | CO2 | Manipulate Maxwell Boltzmann distribution law & Collision theory etc |
| | | CO3 | Understand the conductance of acid & bases |

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| | Theory of Solids & Chemical Kinetics | C01 | Organizing solid, symmetry, Crystal lattice, law of Crystallography, X-rays & structures of Solids |
| | | C02 | Understanding the concept of chemical kinetics, order & molecularity, half life of reactions etc. |
| | | C03 | Focus collision, activated complex & qualitative treatment etc |
| B. SC. IV SEM (DSC4) | Practical | C01 | Differentiating the basic principles involved in classification of ions into groups in semi-micro qualitative analysis of salt mixture of inorganic salts |
| B. SC. V SEM (CBSC) | P-I (Theory) | C01 | Nomenclature, isomerisation & theories of coordination chemistry. |
| | | C02 | Theoretical study of gravimetric analysis. |
| | | C03 | Types, structure, & application of inorganic polymers. |
| | | C04 | Understanding the concept of green chemistry |
| | | C05 | Understanding classification and aromaticity of heterocyclic compounds.. |
| | | C06 | Giving description of synthetic applications & reaction mechanism. Of enolates. |
| | | C07 | Isolation, synthesis constitution of alkaloids. |
| | | C08 | Determination of properties of bonds rotational, vibrational spectra. |
| | | C09 | Application of phase rule to different component systems |
| | P-I (Practical) | C01: | Preparation of organic compound |
| | P-II (Theory) | C01 | Synthesis, significance, types, & applications of alloys, abrasives, and glass.. |
| | | C02 | Manufacture, composition characteristic of fuels, cement and pigment. |
| | | C03 | Preparation mechanism of action and application of oxidizing and reducing agents. |
| | | C04 | Principle and instrumentation of mass spectroscopy |
| | | C05 | colour & constitution, synthesis of different dyes. ns. |
| | | C06 | Study of theories of absorption & industrial application of catalyst. |
| | | C07 | Study of general aspects of chemical equilibrium & kinetics of chain reaction |
| | P-II (Practical) | C01 | Volumetric analysis of iron, copper, zinc & calcium. |
| | | C02 | Experimental study of conductometric titrations. |
| B. SC. VI SEM (CBSC) | P-I (Theory) | C01 | Study of CFT, with respect to complexes of $C.N\ 4$ and 6 . CFSE calculation and properties of complexes. |
| | | C02 | Formation and stability constants of metal-ligand equilibria factors influencing stability of metal complexes and chelates. |
| | | C03 | 18 electron rule with respect to OMC structure, bonding in ferrocene, ziegler salt |

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| | | C04 | Howorth and conformational formulae of glucose and fructose there synthesis and inter combination. |
| | | C05 | Classification and importance of vit A,B6 , B12 C, D & E & synthesis of amino acids, peptides, proteins, and terpinoids. |
| | | C06 | PE curve for BMO& ABMO & electronic transitions, dipole moment and its application. |
| | | C07 | Determination and classification of molar masses of polymers by using different methods. |
| | | C08 | Study of different photoelectric methods. |
| | P-I (Practical) | C01 | Organic estimation & determination of saponification & iodine value of oils. |
| | P-II (Theory) | C01 | Brief account of paper & coloumn chromatography. |
| | | C02 | Principle, instrumentation & application of different analytical methods. |
| | | C03 | Study of nutrients and determination of various parameters of soil nutrients. |
| | | C04 | Electronic spectrum study of metal complexes |
| | | C05 | Synthesis and classification & uses of chemotherapatic drugs. |
| | | C06 | Manufacture & cleaning action of soaps and detergents. |
| | | C07 | Study of reaction mechanism of various named reactions |
| | | C08 | Basics of NMR spectroscopy in the study of some simple organic compounds. |
| | | C09 | Types of electrochemical cells & electrodes& emf measurements.. |
| | | C010 | Computing photochemical laws quantum efficiency & photochemical process |
| | P-I (Practical) | C01 | Gravimetric analysis of ores. |
| | | C02 | Experimental study of potentiometric titrations & colorimetric methods. By using Beers lamberts law. |


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