

Department of Chemistry
Dr. Harisingh Gour Vishwavidyalaya, Sagar
 Scheme of B.Sc. Program in Chemistry under CBCS system
Objectives and Learning Outcomes of B.Sc. Chemistry

Department of Chemistry						
Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	First	CHE-CC-111	Inorganic & Organic Chemistry	Mid Sem: 40 End Sem = 60	04
Course Objectives: Students will be empowered with basic to advance knowledge of organic and inorganic chemistry. Course Learning Outcomes: Upon successful completion of the course, students will be able to: Unit 1 -To understand the all basic facts and concepts of inorganic and organic chemistry students will learn the atomic structure and basic concepts of organic chemistry like hybridisation conjugation field effects aroma city and reactive intermediates. Unit II -Students will learn the atomic structure through the basic Concept of quantum mechanics. Unit III - They will understand the chemical bonding through VBT, MOT and CFT. Unit IV - This organic chemistry part contains preparation and properties of aliphatic hydrocarbons. Unit V - The unit has been designed to give an insight into almost all aspects of stereochemistry and to build a solid platform in this specific field.						

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	First	CHE-CC-112	Chemistry Laboratory	Mid Sem: 40 End Sem = 60	02
Course Objectives: Students will be empowered with basic to advance knowledge of organic and inorganic chemistry. Course Learning Outcomes: Upon successful completion of the course, students will be able to: • Prepare standard solutions; they'll have knowledge about normality equivalent weight of simple and double titrations.						

- Knowledge on technique of organic quality details analysis of element detection.

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Second	CHE-CC- 211,	Physical & Organic Chemistry	Mid Sem: 40 End Sem = 60	04
Course Objectives: Students will learn of basic concepts of organic and physical chemistry. Course Learning Outcomes: Upon successful completion of the course, students will be able to: Unit I - Know the thermodynamics and its application in all feasible systems students will also learn of all specific features of carbon and compounds. Unit II - To learn chemical energetics they will learn about the principle of equilibrium. Unit III - Able to understand electrolytic behaviour of electrolytes and the role of solubility product and pH in solutions. Unit IV - Understand the possible modifications of aromatic compounds and alkyl halides, they will learn about different kinds of electrophilic and nucleophilic substitution reactions and their mechanism. Unit V - Impart knowledge to the students about organic compounds containing oxygen. Students will know the chemical reaction involved in preparation and properties of these compounds.						

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	First	CHE-CC-212	Chemistry Laboratory	Mid Sem: 40 End Sem = 60	02
Course Objectives: Students will be empowered with basic to advance knowledge of organic and inorganic chemistry. Course Learning Outcomes: Upon successful completion of the course, students will be able to: • Analyse organic compounds and gain knowledge about the method of organic compound preparations.						

- They will understand pH and thermodynamics factors of solutions.

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Third	CHE-SEC-311	Basic Analytical Chemistry	Midsem -40 Endsem – 60	02
Course Objectives: To inculcate the basic understanding of Analytical chemistry and its interdisciplinary applications among the students. Course learning outcomes: Upon successful learning, students will be able to Unit I-Gather knowledge of basic and applied areas of Analytical Chemistry as well as how to present experimental data. Unit-II- Understand the composition of soil and measurement of important parameters of soil. Unit-III- Measurement of important water quality parameters and adulterants in food items. Unit IV- To understand the basic concept of different types of two-dimensional chromatography and its application. UnitV-To develop concept about analysis of cosmetics and metal ions in various samples using classical and instrumental method of quantitative analysis.						

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Third	CHE-CC-311	Physical and organic Chemistry	Mid Sem: 40 End Sem = 60	04
Course Objectives: • To elaborate chemistry of dilute solutions, processes involved in equilibrium states and their electrochemical properties and • To explore the chemistry of acids and amines Course Learning Outcomes: Upon successful learning, students will be able to Unit I: elaborate chemistry of ideal and non-ideal solutions and apply the concept of phase equilibrium in various systems Unit II: explore electrochemical aspects of dilute solution Unit III: understand qualitative treatment of acid – base and redox processes and to explore basic chemistry of carboxylic acids and their derivatives Unit IV: explore chemistry of amines and amino acids						

Unit V: evaluate structural aspects of protein and to explore chemistry of carbohydrates.

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Third	CHE-CC-312	Chemistry Laboratory	Mid Sem: 40 End Sem = 60	04
Course Objectives: - To impart practical knowledge of equilibrium and electrochemical aspects of dilute solutions and - To apply chromatographic method of separation and qualitative analysis functional groups in organic compounds Course Learning Outcomes: Upon successful learning, students will be able to - Evaluate distribution co-efficient of a compounds between two immiscible solvents - Construct phase diagram of a binary system - Do conductance measurement of dilute solutions - Perform potentiometric titrations - Separate the organic mixture using chromatographic technique and identify presence of various functional groups in a given organic compounds						

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Fourth	CHE-SEC-411	Green Methods in chemistry	Mid Sem: 40 End Sem = 60	02
Course Objectives: To provide knowledge on green and sustainable chemistry, and introduces the learners to various tools and principle of green chemistry, Real-world Cases in green chemistry, some examples of replacement of toxic chemicals with environment friendly green compounds and benefits of utilizing concept of green chemistry for designing chemicals and processes for manufacturing chemicals.						
Course Learning Outcomes: Upon successful completion of the course, students will be able to understand:						
Unit I: The basic concept, background and significance of green chemistry, various tools and twelve principles of green chemistry.						
Unit II: How to design and develop green synthetic methods for drugs by using principles of green chemistry that reduces the generation of waste and hazardous substances, the						

developments of some real world cases in green chemistry.

Unit III: The fundamental concept of catalyst, catalytic reaction and use of catalyst to improve the bleaching activity of hydrogen peroxide.

Unit IV: The concept of green chemistry for production of environmentally advanced preservative.

Unit V: How to design safer chemicals by replacing toxic chemicals, such as environmentally benign pigments, recyclable carpet.

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Fourth	CHE-CC-411	Inorganic and Physical Chemistry	Mid Sem: 40 End Sem = 60	04
Course Objectives: - To explore the chemistry of main group elements and the metallurgical processes and - To explore the chemistry of the three phases (solid, liquid and gases) of material and kinetic aspects of chemical reactions Course Learning Outcomes: Upon successful learning, students will be able to Unit I: see applications of periodicity in properties and of various metallurgical processes Unit II: explore basic chemistry of s- and p- block elements Unit III: explore chemistry of hydrides, oxides, oxoacids, halides and oxoacids of non-metals and to understand various aspects of liquid states Unit IV: impart knowledge of kinetic theory of gases Unit V: investigate lattice structure of solids and rate of chemical reactions.						

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Fourth	CHE-CC-412	Chemistry Laboratory	Mid Sem: 40 End Sem = 60	04
Course Objectives: - To impart practical knowledge of semimicro qualitative analysis of soluble inorganic salts - To identify properties of liquids and kinetic of chemical reactions Course Learning Outcomes: Upon successful learning, students will be able to - Identify soluble ions in a given mixture - Determine surface tension of any liquid - Evaluate parameter of viscosity of a liquid - Identify rate of a chemical reaction						

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Fifth	CHE-SEC-511	Pharmaceutical Chemistry	Mid Sem: 40 End Sem = 60	02
Course Objectives: To provide knowledge on drugs discovery, design, developments. The course will provide basic concept of retrosynthesis and synthesis of important drugs including analgesics, antipyretic, anti-inflammatories, antibacterial and antifungal, antiviral, central nervous system, cardiovascular agents and drugs for HIV-AIDS. To impart knowledge on certain dietary supplements such as amino acids, vitamins, their pharmaceutical uses and overview of fermentation process. Course Learning Outcomes: Upon successful completion of the course, students will be able to understand: Unit I: The basic concept of drugs discovery, design, and developments, and retrosynthesis. Unit II: How to synthesize important drugs including analgesics, antipyretic, anti-inflammatory agents by using retrosynthetic approach. Unit III: The synthetic approach to access some representative drugs including antibacterial and antifungal drugs and their pharmaceutical applications. Unit IV: The synthetic aspects of some representative drugs including antiviral, central nervous system, cardiovascular agents and drugs for HIV-AIDS and their pharmaceutical applications. Unit V: The chemistry and importance of aerobic and anaerobic fermentation, the pharmaceutical applications of penicillin antibiotics, Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.						

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Fifth	CHE-DSE-511	Chemistry of <i>d</i> – Block Elements, Quantum Chemistry and Spectroscopy	Mid Sem: 40 End Sem = 60	04
Course Objectives: Develop knowledge of periodic elements, and fundamental properties of quantum chemistry and spectroscopy. Course Learning Outcomes: Upon successful learning, students will be able to Unit I: To comprehend the qualities of the elements in the periodic table, including their physical, chemical, periodic, magnetic, and catalytic properties, with the help of the Valence bond theory, which incorporates notions of hybridization and predicts the geometry of molecules.						

Unit II: To understand how the electronic structure and colours of metal complexes are explained by crystal field theory.

Unit III: Being able to distinguish between classical and quantum mechanics requires an understanding of quantum chemistry and its application to microscopic entities.

Unit IV: Understand the different regions of spectroscopy, electronic transition through electronic spectroscopy, interpret and apply the basic concepts of spectroscopy.

Unit V: To know about photochemistry, laws of photochemistry, quantum yield and its measurement and understand the difference between thermal and photochemical reactions.

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Fifth	CHE-DSE-512	Chemistry Laboratory	Mid Sem: 40 End Sem = 60	02
Course Objectives: To understanding of various analytical methods of analysis, complexometric titration, various concentration and basic concepts of UV/Visible Spectroscopy. Course Learning Outcomes: Upon successful learning, students will be able Inorganic Chemistry 1. To understand the amount of nickel present in a given solution as bis(dimethylglyoximate) nickel(II) or aluminium as oxinate in a given solution gravimetrically. 2. To understand the complexometric titrations using EDTA. 3. To understand the complexometric titration. 4. To understand the draw calibration curve and concentration of the solution. 5. To determine the Job's method by different complexes. 6. To determination of concentration of Na⁺ and K⁺ using Flame Photometry. Physical Chemistry: 1. To Study the λ_{max} values and calculation energies of the two transitions states 2. To Study the pH-dependence of the UV-Vis spectrum 3. To understand the UV spectra of organic compounds. Colourimetry: 1. To understand Lambert-Beer's law and determine the concentration of solutions 2. To understand the given vibration-rotation spectrums						

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Sixth	CHE-SEC-611	Pesticide Chemistry	Mid Sem: 40 End Sem = 60	02
Course Objectives: To investigate chemical, environmental and toxicological aspects of						

pesticides

Course Learning Outcomes: Upon successful learning, students will be able to

Unit I: get general idea about pesticides, their benefits and harms of use

Unit II: understand quantitative structure activity relationship

Unit III: explore organochlorine pesticides, their applications and limitations of use

Unit IV: explore organophosphate pesticides and carbamate pesticides, their applications and limitations of use

Unit V: investigate quinones and anilide pesticides, their applications and limitations of use.

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Sixth	CHE-DSE-611	Organometallics, Bioinorganic chemistry, Polynuclear hydrocarbons and UV, IR Spectroscopy	Mid Sem: 40 End Sem = 60	04
Course Objectives: To introduces the knowledge of organic and inorganic chemistry, properties and preparation of polynuclear hydrocarbons and spectroscopic applications towards the organic compounds. Course Learning Outcomes: Upon successful learning, students will be able to Unit I: Access the knowledge of oxidation states and preparations of some inorganic compounds. Unit II: Understand the structure and properties of important organometallic compounds like methyl lithium, Zeiss salt, ferrocene and metal carbonyls, applications of EAN rule and back bonding in metal carbonyls Unit III: Learn how metal ions function in biological systems, paying special attention to the functioning of the sodium-potassium pump in organisms, the creation of energy by Mg^{2+} ions, the clotting of blood by Ca^{2+} ions, the stability of protein structures, and the structural role of metal ions (bones). Unit IV: Understand the properties and reaction mechanism of some selected polynuclear hydrocarbons Unit V: Understand the important concepts of UV-visible and IR spectroscopy and its role in structure elucidation of organic compounds.						

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Class	Subject	Semester	Course Code	Course Title	Marks	Credit
B.Sc.	Chemistry	Sixth	CHE-DSE-612	Chemistry Laboratory	Mid Sem: 40 End Sem = 60	02
Course Objectives: To develop the qualitative technique, separation of mixtures, skills in students including preparation of the metal complexes, study and conductance of inorganic						

complexes by conductometer.

Course Learning Outcomes: Upon successful learning, students will be able to

Inorganic Chemistry

1. To Analysis the separation technique of mixtures of complexes by chromatography.
2. To understand the Preparation of complexes.
3. To understand the conductance of the complexes.

Organic Chemistry

1. To understand the qualitative analysis of Organic compounds.
2. To Identify the monofunctional groups and preparation of one derivative.