DEPARTMENT OF CHEMISTRY
H.N.B. G.P.G. COLLEGE KHATIMA

Program specification outcome and Course Outcome are assessed by focusing on the outcome of internal as well as external examination. The marks obtained by the students in the semester/year examination, assignments, practical examination, etc. are reflective/ indicative of Programme/ Course outcomes. This offers information about the achievements of the students to the respective course teachers. Besides this, each department organizes Presentations, Quizzes, Chart/ Poster competitions to motivate the students to exert a little bit of extra effort for improving their performance. The POS is evaluated by the number of students getting selected in various institutions for higher or specialization studies and getting placement after thecourse.

Graduation:

Program outcome: The U.G. program provides the understanding of fundamental chemistry from core to their basic application in daily life. At the end of this program student have acquired the knowledge of chemistry of system, surrounding and their positive and negative impact in our daily life and environment.

Course outcome: The students will be able to know

Inorganic chemistry: This course includes the fundamental study of atomic structure, periodic properties, Nature of chemical bonding, related theories and chemistry of all the elements of periodic table. Metallurgical processes, chemistry of transition elements, oxidation and reduction, coordination chemistry, hard and soft acid-base theory, metal-ligand bonding in transition metal complexes, magnetic properties of transition metal complexes, electronic spectra of transition metal complexes, thermodynamic and kinetic aspects of coordination compounds, organometallic chemistry, bioinorganic chemistry, inorganic polymers of silicon and phosphorus.

Organic chemistry: This course gives the understanding of structure and bonding,mechanism of organic reactions, stereochemistry of organic compounds and the study of different functional groups in organic molecules. Study of electromagnetic spectrum; absorption spectroscopy, spectroscopy, organo-metallic compounds, organo-sulphur compounds, heterocyclic compounds. Also it involves the study of biomolecular like carbohydrates, amino acids, peptides, proteins and nucleic acids which constitutes of body and monitor the functioning of life. Study of fats, oils and detergents, synthetic polymers, synthetic dyes, natural products.

Physical Chemistry:-This course links physical state with the chemical changes occurs in our surroundings and nature. The chemistry of different states i.e. Solid, liquid and gaseous state and colloidal state and branch of science that deals with the quantitative relationship between heat and other forms of energy called thermodynamics and the chemistry related to electrolytes called electrochemistry. Study of Elementary Quantum Mechanics, Spectroscopy, Photochemistry, Physical Properties and Molecular Structure, Solutions and Colligative Properties, Thermodynamics.

POST-GRADUATION

Program outcome: The P.G program offer the understanding of detail, advanced and fine knowledge of chemistry. This program explores and covers the remaining concept of U.G program and links the text book chemistry to the daily life activities and their application. Importantly this program includes the course that deals with the study of interaction of light with matter called spectroscopy which helps in the real analysis.

COURSE OUTCOME:
INORGANIC CHEMISTRY

This Course encompasses the theories and bonding concepts in coordination compound and acids-bases in detail. The interesting chemistry of organometallic compounds.

The students will be able to know

1. The chemistry of main group elements, synthesis and properties of few main group compounds.
2. General properties and separation of lanthanides and actinides.
3. Basics of nuclear chemistry and radio analytical techniques.
4. Stability of organometallic compounds and clusters, and their applications as industrial catalysts.
5. Explain the formation, reaction mechanism and stability of coordination complexes.
6. Interpret the electronic and magnetic properties of inorganic compounds.

ORGANIC CHEMISTRY

This advance organic chemistry course includes the mechanism, energy consideration, stereochemistry and different types of organic reactions in detail.

The students will be able to explain

1. Mechanistic aspects in nucleophilic and electrophilic substitution.
2. Reaction conditions, products formation and mechanisms of some named reactions.
3. Mechanisms of addition reactions of C=C and C=O bonds and elimination reactions.
4. Assess chromatographic separation and identification of organic compounds.
5. Distinguish purification, crystallization, and different distillation processes.
6. Recognize synthesis, purification and characterization of aspirin, Schiff's base, Diels-Alder adduct.

PHYSICAL CHEMISTRY

This course includes the thermodynamic and kinetic behavior of reaction and various theories for reaction kinetics. The students will be able to:

1. Comprehend the redox processes in electrochemical systems.
2. Explain Debye-Huckel theory and determination of activity and activity coefficient.
3. Correlate and differentiate Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics, theories of specific heat for solids.
4. Interpret mechanism for chemical reactions for optimizing the experimental conditions.
5. Familiar with application of homogeneous and heterogeneous catalysis in chemical synthesis.
6. Explain the importance of adsorption process and catalytic activity at the solid surfaces.
7. Classify the colloidal material and their stability for many practical uses.

GROUP THEORY AND INSTRUMENTATION CHEMISTRY: Group Theory is the mathematical application to determine the symmetry of molecule and molecular operation and to obtain knowledge of its physical properties and binding nature. Instrumentation techniques involve the understanding about the instruments and techniques used in analysis.
The students will be able to explain

1. The concepts of symmetry and group theory in solving chemical structural problems.
2. Molecular structure by the use of character tables and projection operator techniques.
3. The importance of symmetry and group theory in spectroscopic applications.

Spectroscopic Techniques: This course deals with the study of interaction of light with matter. The light of different energy cause different type of changes like electronic, vibration, rotational, nuclear etc. interaction with different frequency light in molecule. Organic

spectroscopy includes NMR, ESR, Mossbauer, IR, UV-visible spectroscopy.

The students will be able to

1. Identify functional groups using IR, λmax for polyenes and α, β-unsaturated carbonyl compounds.
2. Interpret Cotton effect curves for obtaining absolute configuration of chiral molecules with chromophores.
3. Determine chemical structure by UV-Vis, IR, 1HNMR, 13CNMR and mass spectral data.
4. Interpret microwave, vibration-rotation Raman and infra-red spectra for chemical analysis
5. Analyze electronic spectra of different elements and simple molecules.

4. Comprehend Nuclear Magnetic and Electron Spin Resonance spectroscopic techniques for organic compounds analysis and medical diagnostics.

Solid State Chemistry: The students will be able to

1. Correlate the physicochemical properties, defects in solid, diffraction techniques, electrical andmagnetic properties of materials.

Chemistry for Biological System: The students will be able to

1. Assess molecular structure and interactions present in proteins, nucleic acids, carbohydrates and lipids.
2. Be familiar with organization and working principles of various components present in living cell.
3. Evaluate kinetics, thermodynamics, and mechanism of protein folding.

1. Assess the structure and biological functions of proteins and the role of metals inbiology.

Inter Disciplinary Topics in Chemistry: The students will be able to

1. Comprehend experimental techniques for different catalytic reactions.
2. Interpret physical and chemical characterization of catalysts and catalytic reaction.
3. Be familiar with various reagents and their applications in industry.
4. Various optical methods like AES, AAS, plasma and electric discharge spectroscopy, spectrofluorimetry, nephelometry and turbidimetry.
5. Potentiometric, coulometric, and voltametric methods of analysis.
6. Chromatographic techniques and applications.

Photo Chemistry and Allied Chemistry: Various reactions takes place by the effect of temperature change called thermal reaction. The reactions which takes place by the effect of light of different frequency and wavelength is called photochemical reaction and mechanism of such reactions studied under photochemistry.

The student will be able to

1. Conformational analysis of cycloalkanes, reactivity, chirality, interconversion, resolution and asymmetric synthesis.
2. Aromaticity, no aromaticity and antiaromaticity in carbocyclic and heterocyclic compounds.
3. Molecular orbital symmetry and possibility of thermally and photochemically pericyclic reactions.
4. Basics of photochemical reactions of alkenes, carbonyl and aromatic compounds.
5. Assess photochemistry and photophysical principles.
6. Identify and characterize of transient intermediates by ultrafast modern techniques.
7. know the theory and application of photochemistry and photophysical principles of macromolecules.

organic Synthesis: The synthesis of organic molecules involve various approached and mechanism, new molecules synthesized by mimicking the existing route amd concept. Retrosynthetic or disconnection approach also used to design various drug molecule and biologically active molecule.

The students will be able to interpret

1. Mechanistic pathway of organic reactions.
2. Retro-synthetic approach to planning organic syntheses.
3. Conversion of different functional group *via* rearrangement reaction.

Medicinal Chemistry: The students will be able to

1. Comprehend drug designing and development, their SAR and QSAR.
2. Explain the mode of action of different drugs.
3. Describe the role of drugs to inhibit the particular enzymes and treatment of disease.

Program Specific Outcomes:

Chemistry is a broad area, its important branch of science as everything we do is chemistry! All matter is made up of chemical, even our body is made of chemicals and chemical reactionoccur when we eat, breath etc, so it's the study of everything. From starting (like extractionof elements, compounds) to their final state (like polymers, cosmetics, drugs and medicine etc.) Ready for application involve various chemical processes and purification techniques which were studied under the program. The advantage of leaning chemistry and acquiring knowledge about the process and techniques involves have great career opportunities in academic as well as industries. As this subject covers broad area, one can pursue a job as a pharmacologist, biochemist, lab technicians, analytical chemist, environmentalist, synthetic chemist, material scientist, geochemist, chemical engineer in industry.

विभागाध्यक्ष
रसायन विज्ञान विभाग
हे०न०ब०रा०स्नातकोत्तर महाविद्यालय
खटीमा (ऊधम सिंह नगर)