



**Govt. Shivalik College Naya Nangal**  
**Department Of Chemistry**

**Session 2022-23**

**SUBMITTED BY 1) Dr. SUMAN KUMARI**  
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## Department Of Chemistry

Sr.No	Course Name & Course Code	Outcomes
1.	B.SC– I (First Semester)  Inorganic chemistry(SCIB1208T)	<p><b>Upon the completion of the course the learner will be able to:</b></p> <p>CO-1: To understand the atomic structure of an atom and various shapes of <i>s,p,d</i> orbital's .</p> <p>CO-2:To understand the position of elements in the periodic tables, application and chemical behaviour.</p> <p>CO-3:To study the .chemical properties of noble gases structure and bonding in xenon compounds.</p> <p>CO-4: Understand chemical bonding shapes inorganic molecules and ions ,VSEPR theory, BT theory &amp; its limitation, various types of hybridization.</p>
2	B.SC – I (First Semester)  1.Organic chemistry(SCIB1209T)	<p>After completion of this course, students will be able to:</p> <p>CO-1:Understandstructure and chemical bonds Vander waals interaction inductive effect and hydrogen bonding ..</p> <p>CO-2:To understand mechanism of varous organic reactions ,reactive intermediates–carbocation,carbanionfree radicals.</p> <p>CO-3: To understand alkanes and cycloalkanes ,Isomerism ,method of formation, physical and chemical properties, and various mechanisms involve them.</p> <p>CO-4: To study the nomenclature of alkenes ,preparation ,mechanism, chemical reactions.</p> <p>CO-5To study Cycloalkanes, dienes and alkynes.</p>

3.	B.SC – I (FIRST Semester) Physical chemistry(SCIB1210T)	After completion of this course, students will be able to:  CO-1: Understand the various mathematical concept linear graphs calculation of slops factorial,probability.  CO-2:Evaluation of analytical data least square curve fitting ,confidence limit.  CO-3:To Understand intermolecular forces and structure in liquid state& liquid crystals..  CO-4:To understand the gases states ,physical properties and their molecular structure..
4.	B.SC – I (First Semester) Chemistry Practical(SCIB1211L)	Upon the completion of the course the learner will be able to  CO-1:To understand semi –micro analysis cation & anions analysis,sepration and identification of ions from groups I,II,III,IV,V & VI.
5.	B.SC – I (Second Semester) 1.Inorganic Chemistry(SCIB2308)	After completion of this course, students will be able to:  CO-1: To understand S& P blocks elements ,comparative study, diagonal relationships ,silent features, basic properties of halogens ,interhalogens and polyamides.  CO-2:Study about ionic solids their structures ,lattice defects ,polarisabilityof ions valance bond theory, weak interactions-hydrogen bonding, Vander waals forces .  CO-3: Implement various objects oriented concepts to solve practical problems.
6.	B.SC – I (Second Semester) organic Chemistry (SCIB2309)	After completion of this course, students will be able to:  CO-1:To study the stereochemistry of various organic compounds and difference between configuration and conformation.  CO-2 understand arenas and aromaticity,nomenclature structure ,stability, carbon-carbon bond length of benzene, Huckels rule, aromatic ions , method , formation and chemical reaction of alkyl benzenes, biphenyl.  CO-3: study of alkyl and aryl halides their nomenclature preparation chemical reactions and mechanisms.

7	B.SC – I (Second Semester) Physical Chemistry (SCIB2310)	After completion of this course, students will be able to:  CO-1: To understand solution ,dilute solution,and colligative properties of solution.  CO-2: To understand the colloidal states classification preparation properties ,inhibition ,general application of colloids.  CO-3: to study chemical kinetics and its scope collision theory, equilibrium constant and thermodynamic aspects ,catalysis and general characteristics of catalytic reactions and its mechanism
8	B.SC – I (Second Semester) Chemistry Practical(SCIB2311)	After completion of this course, students will be able to:  CO-1: To determine the melting point and boiling point of various substances like benaphthalene,asprin,ethanol,toluene and benzene.  CO-2: To study crystallization eg.phthalic acid from hot water, naphthalene from ethanol, benzoic acid from water.  CO-3:To study the hydrolysis of an ester, viscosity and surface tension of pure liquids.  CO-4: To study the molecular weight by Rast method.

9	B.SC– II (Third Semester) Inorganic chemistry(SCIB2408)	To understand chemistry of Transition and Lanthanide elements. To understand chemistry of actinide elements.
10	B.SC– II (Third Semester) organic chemistry(SCIB2109)	To understand the methods of formation and chemical properties of alcohols, glycerol's.  <b>2.</b> To discuss the acidic strength of alcohols and phenols.  <b>3.</b> Able to understand the Gatterman synthesis, HaubenHostch and Reimer-Tiemann reactions.  <b>4.</b> To understand the concept of acetals as protecting groups. <b>5.</b> To understand the concept and importance of $\alpha,\beta$ -unsaturated aldehydes and ketones

11	B.SC– II (Third Semester) Physical chemistry(SCIB2410)	.To study the concepts of enthalpy, entropy and second law of thermodynamic.  2. To describe the Carnot theorem and problems based on efficiency of Carnot cycle.  3. To understand the concept of entropy and its change in mixture of ideal gases.  4. To understand the third law of thermodynamics and natural phenomenon related to third law of thermodynamics.  5.To write the expressions for equilibrium constants.
12	B.SC– II (Third Semester) Practical chemistry(SCIB2411)	<b>Volumetric Analysis :</b>  1. Determination of acetic acid in a commercial vinegar using NaOH.  2. Determination of alkaline content in antacid tablet.  3. Estimation of hardness of water by EDTA.  4. Estimation of ferrous and ferric by dichromate method.  5. Estimation of copper using sodium thiosulphate.  <b>Thin Layer Chromatography :</b> Determination of $R_f$ Value of different components.
13	B.SC– 2 (Fourth Semester) inorganic chemistry(SCIB3508)	1. To understand the chemistry of coordination compounds, Werner's theory, Nomenclature, VBT theory of transition metal complexes.  To understand redox potential data, redox stability, study of acids and bases as well as study of non- aqueous solvent such as liquid ammonia and liquid sulphur dioxide.

14	B.SC– 2 (Fourth Semester) organic chemistry(SCIB3509)	<ol style="list-style-type: none"> <li>1. To study nomenclature, physical and chemical properties as well as effect of substituent's on acidity of carboxylic acids.</li> <li>2. To study the properties and chemical reaction of unsaturated mono and di carboxylic acids.</li> <li>3. To study the preparation, properties, nomenclature of carboxylic acid derivatives.</li> <li>4. To study the nomenclature and properties of ether and peroxides.</li> <li>5. To study the structure, properties, analysis of fats, oils and detergents.</li> </ol> <p>To understand the organic compounds of nitrogen i.e. nitro and amine compounds</p>
15	B.SC– 2 (Fourth Semester) Physical chemistry(SCIB3510)	<ol style="list-style-type: none"> <li>1. To understand the concept of phase rule and degree of freedom.</li> <li>2. To study the properties of immiscible liquids and partially miscible liquids.</li> <li>3. To understand Kohlrausch's law and explain its application.</li> <li>4. Discuss the Arrhenius theory of electrolyte dissociation and its limitation.</li> <li>5. To Explain the construction and working of glass electrode.</li> <li>6. To know the salt bridge. Explain its function.</li> </ol>
16	B.SC– 2 (Fourth Semester) Practical chemistry(SCIB3511)	<p><b>Qualitative analysis :</b></p> <p>Detection of elements and functional groups in simple organic compounds.</p> <p><b>Physical Chemistry :</b></p> <ol style="list-style-type: none"> <li>1. To determine the solubility of benzoic acid at different temperature and determine enthalpy change of dissolution process.</li> <li>2. To determine enthalpy of neutralization of weak acid/weak base vs strong acid / strong base.</li> <li>3. To determine enthalpy of solution of solid calcium carbonate.</li> </ol>

17	B.SC– 3 (Fifth Semester) Inorganic chemistry(SCIB3608)	<ol style="list-style-type: none"> <li>1. To understand Crystal field theory for coordination compounds and their electronic spectrum.</li> <li>2. To understand thermodynamic and kinetic aspects of metal complexes</li> </ol> <p>To understand the magnetic properties as well as electronic spectra of transition metal complexes.</p>
18	B.SC– 3 (Fifth Semester) organic chemistry(SCIB3609)	<ol style="list-style-type: none"> <li>1. Spectroscopy <ul style="list-style-type: none"> <li>• NMR, UV, IR – Applications and their properties</li> </ul> </li> <li>2. To study the structure, properties and applications of organo metallic compounds as well as organo sulphur compounds.</li> </ol>
19	B.SC– 3 (Fifth Semester) Physical chemistry(SCIB3610)	<ol style="list-style-type: none"> <li>1. To understand elementary quantum mechanics.</li> <li>2. Spectroscopy <ul style="list-style-type: none"> <li>• Rotational and vibrational of various diatomic molecules, selection rules, determination of bond length, qualitative description of non rigid rotator.</li> </ul> </li> </ol>
20	B.SC– 3 (Fifth Semester) Practical chemistry(SCIB36)11	<ol style="list-style-type: none"> <li>1. Synthesis and Analysis of inorganic compounds e. g. Preparation of sodium trioxalatoferrate (III) , and determination of it's composition , Preparation of copper tetraamine complex, preparation of Nickel- DMG complex.</li> </ol> <p>Study and synthesis of Organic compounds</p>
21	B.SC– 3 (Six Semester) Inorganic chemistry(SCIB1108T)	<ol style="list-style-type: none"> <li>1. Study of concepts of hard and soft acids and base</li> <li>2. Study of Bio – Inorganic chemistry, nucleic acid, role of metal in biological systems</li> <li>3. Silicones and phosphazenes</li> <li>4. Organo metallic chemistry – Nomenclature , Classification, properties and applications., Study of nature of bonding in metal carbonyl.</li> </ol>

22	B.SC– 3 (Six Semester) organic chemistry(SCIB1109T)	<ol style="list-style-type: none"> <li>1. To understand the chemistry of heterocyclic compounds like indole, quinoline, isoquinoline.</li> <li>2. To study the preparation, properties and applications of synthetic polymers.</li> <li>3. To study the organic synthesis via enolates.</li> <li>4. Study of chemistry of carbohydrates with special reference to structure and configuration of glucose and fructose.</li> </ol> <p>Gain knowledge about amino acids, peptides and proteins</p>
23	B.SC– 3 (Six Semester) Physical chemistry(SCIB1110T)	To understand Raman, electronic spectra, understand photochemistry and solid state
24	B.SC– 3 (Six Semester) Practical chemistry(SCIB3511L)	<ol style="list-style-type: none"> <li>1. Study of column chromatography as well as stereo chemical study of organic compounds via models.</li> <li>2. To determine the strength of given acid, conductometry.</li> <li>3. To determine the strength of given acid solution via pH metrically by using standard alkali solution.</li> <li>4. To determine the molar refraction of given liquid I.e. methanol, ethanol and propanol by using Abbe's refract meter.</li> <li>5. To study the distribution of iodine between water and ccl4.</li> </ol> <p>To study the distribution of benzoic acid between benzene and water</p>

## PROGRAMME OUTCOME

A three year program which enables the students to appreciate the achievements in chemistry to know the role of chemistry in nature and in society. Candidates who have passed +2 science from any recognised institution. The student graduating with the degree B.Sc chemistry should be able to acquire.

**Core Competency:** students will acquire core competency in the subject. Chemistry ,and in allied subject areas.

- i) Systematic and coherent understanding of the fundamental concepts in physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry and all other related allied chemistry subjects.
- ii) Students will be able to use the evidence based comparative chemistry approach to explain the chemical synthesis and analysis.



- iii) The student will be able to understand the characterization of materials.
- iv) Students will be able to understand the basic principle of equipments, instruments in the chemistry laboratory.
- v) Students will be able to demonstrate the experimental techniques and methods.
- vi) **Disciplinary knowledge and skill:** a graduate student is expected to be capable of demonstrating comprehensive knowledge and understanding of both theoretical and experimental/applied chemistry knowledge in various fields of interest like Analytical chemistry, Physical chemistry, Inorganic chemistry, organic chemistry, Material chemistry, etc. Further the students will be capable of using advanced instruments and related software for in-depth characterization of materials/chemical analysis and separation technology.
- vii) **Skilled communicator:** the course curriculum incorporates basics and advanced training in order to make a graduate student capable of expressing the subject through technical writing as well as through oral representation.
- viii) **Critical thinker and problem solver:** the course curriculum also includes components that can be helpful to graduate students to develop critical thinking ability by way of solving problems/numerical using basic chemistry knowledge and concepts .
- ix) **Sense of enquiry:** it is expected that the course curriculum will develop an inquisitive characteristics among the students through appropriate questions planning and reporting experimental investigation.
- x) **Team Player:** The course curriculum has been designed to provide opportunity to act as team player by contributing in laboratory ,field based situation and industry.
- xi) **Skilled project Manager:** The course curriculum has been designed in such a manner as to enable a graduate student to become a skilled project manager by acquiring knowledge about chemistry project management ,writing ,planning, study of ethical standards and rules and regulations pertaining to scientific project operation.
- xii) **Digitally literate:** The course curriculum has been designed to impart a good working knowledge in understanding and carrying out data analysis, use of library search tools and use of chemical simulation software and related computational work .
- xiii) **Ethical awareness/reasoning:** A graduate student requires to understand and develop ethical awareness/reasoning which the course curriculum adequately provides.
- xiv) **Lifelong learner:** The course curriculum is designed to inculcate a habit of learning .continuously through use of advanced ICT technique and other available techniques/books /journals for personal academic growth as well as for increasing employability opportunity.