



DEPARTMENT OF CHEMISTRY
SYLLABUS 2023-24

DEPARTMENT OF CHEMISTRY SRIY.N.COLLEGE (A)-NARSAPUR
B.Sc.(Hon), I B.Sc. SEMESTER– I For 2023-2024 Batch [w.e.f. 2023-2024] (Revised in
May 2023)]

Course – I Essentials and Applications of Mathematical, Physical and Chemical Sciences
SYLLABUS (Maths Stream)

UNIT I: ESSENTIALS OF MATHEMATICS: 9hrs

Complex Numbers: Introduction of the new symbol i – General form of a complex number – Modulus- Amplitude form and conversions Trigonometric Ratios: Trigonometric Ratios and their relations – Problems on calculation of angles Vectors: Definition of vector addition – Cartesian form – Scalar and vector product and problems Statistical Measures: Mean, Median, Mode of a data and problems

UNIT II: ESSENTIALS OF PHYSICS: 9hrs

Definition and Scope of Physics- Measurements and Units - Motion of objects: Newtonian Mechanics and relativistic mechanics perspective - Laws of Thermodynamics and Significance- Acoustic waves and electromagnetic waves- Electric and Magnetic fields and their interactions- Behaviour of atomic and nuclear particles- Wave-particle duality, the uncertainty principle- Theories and understanding of universe

UNIT III: ESSENTIALS OF CHEMISTRY: 9hrs

Definition and Scope of Chemistry - Importance of Chemistry in daily life - Branches of chemistry and significance – PERIODIC TABLE:- Significance, Electronic Configuration, Periodic properties like Atomic size and Ionization potential and their trend. Types of chemical changes - Classification of matter. BIOMOLECULES:- Classification & Functions of Carbohydrates, Proteins, Fats & Vitamins.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY: 9hrs

Applications of Mathematics in Physics & Chemistry: Calculus , Differential Equations & Complex Analysis

Application of Physics in Industry and Technology: Electronics and Semiconductor Industry, Robotics and Automation, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies.

Application of Chemistry in Industry and Technology: Chemical Manufacturing, Pharmaceuticals and Drug Discovery, Materials Science, Food and Beverage Industry.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE: 9hrs

Milestones of computer evolution - Internet, history, Internet Service Providers, Types of Networks, IP, Domain Name Services, applications.

Ethical and social implications: Network and security concepts- Information Assurance Fundamentals, Cryptography-Symmetric and Asymmetric, Malware, Firewalls, Fraud Techniques- Privacy and Data Protection

DEPARTMENT OF CHEMISTRY SRIY.N.COLLEGE (AUTONOMOUS)-NARSAPUR
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(Revised in May 2023)]

Course – I Essentials and Applications of Mathematical, Physical and Chemical Sciences
MODEL PAPER (Maths Stream)

Time: 3Hrs.

Max. Marks: 60 M

SECTION – A

Answer any **FIVE** questions.

5 x 4 = 20 M

1. Express $1 + i\sqrt{3}$ in Modulus- Amplitude form.
2. If $3 \sin a + 5 \cos a = 5$, then show that $5 \sin a - 3 \cos a = \pm 3$.
3. Write the applications of Physics in automotive industries?
4. What are fundamental and derived units?
5. What are the differences between simple and complex carbohydrates?
6. Explain any two chemical changes.
7. Write the applications of Internet.
8. Explain briefly Information assurance.

Answer any **FIVE** questions from sections B and choosing at least **TWO** questions from each section. Each question carries 8 marks.

5 x 8 = 40 M

SECTION–B

9. Consider the following distribution of daily wages of 50 workers of a factory

Daily wages in Rs.	200-250	250-300	300-350	350-400	400-450
No. of workers	12	14	8	6	10

Find the mean wages of the workers of the factory by using an appropriate method.

10. Explain Newton's Laws of Motion.
11. Write an essay on importance of chemistry in everyday life?
12. What are the applications of Physics in Robotics and automation?
13. What is a Network? Explain various types of Networks.

SECTION–C

14. If $x + iy = \frac{3}{2 + \cos\theta + i\sin\theta}$, then show that $x^2 + y^2 = 4x - 3$.
15. What is First law of thermodynamics and give its significance.
16. What is the significance of Periodic table and explain the periodicity of Atomic size and ionization energy
17. Given Applications of complex analysis in Mathematics.
18. Explain various malwares.

Blue Print

Semester-I

Course – I: Essentials and Applications of Mathematical, Physical and Chemical Sciences

Chapter/Unit	Section A 4 marks	Section-B 8 marks	Section-C 8 marks
Unit-I: Essentials of Mathematics	2	1	1
Unit-II: Essentials of Physics	2	1	1
Unit –III: Essentials of Chemistry	2	1	1
Unit-IV: Applications of Maths, Physics and Chemistry	1	1	1
Unit-V: Essentials of Computer Science	1	1	1

SRI Y.N.COLLEGE (AUTONOMOUS)-NARSAPUR
B.Sc.(HONOURS) I B.Sc. SEMESTER – I For 2023-2024 Batch
[w.e.f. 2023-2024] (Revised in May 2023)]

COURSE2: Advances of Mathematical, Physical and Chemical Sciences
Syllabus (Maths stream)

UNIT I: ADVANCES IN BASICS MATHEMATICS

9hrs

Straight Lines: Different forms – Reduction of general equation into various forms –Point of intersection of two straight lines

Limits and Differentiation: Standard limits – Derivative of a function –Problems on product rule and quotient rule

Integration: Integration as a reverse process of differentiation – Basic methods of integration

Matrices: Types of matrices – Scalar multiple of a matrix – Multiplication of matrices – Transpose of a matrix and determinants

UNIT II: ADVANCES IN PHYSICS:

9hrs

Renewable energy: Generation, energy storage, and energy-efficient materials and devices.Recent advances in the field of nanotechnology: Quantum dots, Quantum Communication- recent advances in biophysics- recent advances in medical physics- Shape Memory Materials.

UNIT III: ADVANCES IN CHEMISTRY:

9hrs

Computer aided drug design and delivery, nano sensors, Chemical Biology, impact of chemical pollutants on ecosystems and human health, Dye removal - Catalysis method

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY 9hrs

Mathematical Modelling applications in physics and chemistry Application of Renewableenergy: Grid Integration and Smart Grids, Application of nanotechnology: Nanomedicine,

Application of biophysics: Biophysical Imaging, Biomechanics, Neurophysics,Application of medical physics: Radiation Therapy, Nuclear medicine

Solid waste management, Environmental remediation- Green Technology, Water treatment.

UNIT V: Advanced Applications of computer Science

9hrs

Number System-Binary, Octal, decimal, and Hexadecimal, Signals-Analog, Digital, Modem, Codec, Multiplexing, Transmission media, error detection and correction- Parity check and CRC, Networking devices- Repeater, hub, bridge, switch, router, gateway.

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COURSE2: Advances of Mathematical, Physical and Chemical Sciences

MODEL PAPER

Time: 3 Hrs.

Max. Marks: 60 M

SECTION – A

Answer any FIVE questions.

5 x 4 = 20 M

01. Find $\lim_{x \rightarrow \infty} \frac{\sin x}{x}$.

02. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is a symmetric matrix, then find x .

03. What are the advantages of Renewable Energy?

04. What are the applications of Nanotechnology in nanomedicine?

05. What are the applications of Nanosensors?

06. What is the impact of chemical pollutants on human health?

07. Explain about Modem.

08. Explain about Error detection and correction

Answer any FIVE questions from sections B and C choosing atleast TWO questions from each section.
Each question carries 8 marks.

5 x 8 = 40 M

SECTION –B

09. Solve $\int e^{2x} \cos(3x + 4) dx$.

10. Explain energy efficient devices for energy storage.

11. What is computer aided drug design and delivery?

12. Explain dye-removal by using catalysis method.

13. Convert the following Decimal numbers into binary numbers.

i) $(23)_{10}$ ii) $(36)_{10}$ iii) $(347)_{10}$ iv) $(416)_{10}$

SECTION –C

14. Show that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a - b)(b - c)(c - a)$.

15. What are the recent advances in Biophysics of nanotechnology?

16. What are the recent advances in medical physics of nanotechnology?

17. Explain waste water treatment

18. Explain various Network Devices.

**Blue Print
Semester-I**

Course – 2: ADVANCES OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Chapter/Unit	Section A 4 marks	Section-B 8 marks	Section-C 8 marks
Unit-I: ADVANCES IN LBASIC MATHEMATICS	2	1	1
Unit-II: ADVANCES IN PHYSICS	2	1	1
Unit –III: ADVANCES IN CHEMISTRY	2	1	1
Unit-IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS AND CHEMISTRY	1	1	1
Unit-V:ADVANCED APPLICATIONS OF COMPUTER SCIENCE	1	1	1

B.Sc., (Hon) I B.Sc., SEMESTER-I (2023-24)
COURSE 1: (Biology stream): INTRODUCTION TO CLASSICAL BIOLOGY

SYLLABUS

Unit 1: Introduction to systematics, taxonomy and ecology.

- 1.1. Systematics – Definition and concept, Taxonomy – Definition and hierarchy.
- 1.2. Nomenclature – ICBN and ICZN, Binomial and trinomial nomenclature.
- 1.3. Ecology – Concept of ecosystem, Biodiversity and conservation.
- 1.4. Pollution and climate change.

Unit 2: Essentials of Botany.

- 2.1. The classification of plant kingdom.
- 2.2. Plant physiological processes (Photosynthesis, Respiration, Transpiration, phytohormones).
- 2.3. Structure of flower – Micro and macro sporogenesis, pollination, fertilization and structure of mono and dicot embryos.
- 2.4 Mushroom cultivation, floriculture and landscaping.

Unit 3: Essentials of Zoology

- 3.1. The classification of Kingdom Animalia and Chordata.
- 3.2 Animal Physiology – Basics of Organ Systems & their functions, Hormones and Disorders
- 3.3 Developmental Biology – Basic process of development (Gametogenesis, Fertilization, Cleavage and Organogenesis)
- 3.4 Economic Zoology – Sericulture, Apiculture, Aquaculture

Unit 4: Cell biology, Genetics and Evolution

- 4.1. Cell theory, Ultrastructure of prokaryotic and eukaryotic cell, cell cycle.
- 4.2. Chromosomes and heredity – Structure of chromosomes, concept of gene.
- 4.3. Central Dogma of Molecular Biology.
- 4.4. Origin of life

Unit 5: Essentials of chemistry

- 5.1. Definition and scope of chemistry, Importance of chemistry in daily life.
- 5.2. Branches of chemistry and significance
- 5.3. Chemical bonds –Covalent, Non-covalent: – Ionic, Hydrogen, Vander Waals, Hydrophobic.
- 5.4. Green chemistry: Definition and significance, 12 principles of Green Chemistry.

SRI Y.N. COLLEGE (A) I B.Sc SEMESTER – I (2023-2024)
Course – I (Biological stream): INTRODUCTION TO CLASSICAL BIOLOGY
MODEL PAPER

Time: 3hrs

Max marks: 60

PART – I

Answer any five of the following questions. Each question carries 4 marks.

5 X 4 = 20 M

1. Binomial nomenclature
2. Food chain and food web
3. Photosynthesis
4. T.S of anther
5. Chordate
6. Concept of gene
7. Write the branches of chemistry
8. Explain covalent and ionic bonds

PART- II

SECTION-A

Answer any five questions. Choosing at least two questions from each section

5 X 8 = 40M

9. Write an essay on international code of botanical nomenclature.
10. What is biodiversity? Explain the types of biodiversity.
11. Describe the microsporogenesis.
12. Define photophosphorylation. Explain the non-cyclic photophosphorylation.
13. Write an essay on basis of organ systems and their functions.

SECTION-B

14. Write in brief about sericulture and apiculture.
15. Write the structure and functions of chromosomes.
16. Write the process of transcription and translation.
17. What is the importance of chemistry in daily life?
18. What is the definition and 12 principles of green chemistry.

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S.NO	UNIT	SHORTS	ESSAYS
1.	I	2	2
2.	II	2	2
3.	III	1	2
4.	IV	1	2
5.	V	2	2
Total		08	10

B.Sc., (Hon). I B.Sc., SEMESTER-I 2023-24
COURSE 2: (Biology stream) INTRODUCTION TO APPLIED BIOLOGY

SYLLABUS

Unit 1: Essentials of Microbiology and Immunology

1. History and Major Milestones of Microbiology; Contributions of Edward Jenner, Louis Pasteur, Robert Koch and Joseph Lister.
2. Groups of Microorganisms – Structure and characteristics of Bacteria, Fungi, Archaea and Virus.
3. Applications of microorganisms in – Food, Agriculture, Environment, and Industry.
4. Immune system – Immunity, types of immunity, cells and organs of immune system.

Unit 2: Essentials of Biochemistry

1. Biomolecules I – Carbohydrates: sources, classification and functions. Lipids: Types, properties.
2. Biomolecules II – Amino acids: Essential & Non essential amino acids, Zwitter ion, Isoelectric point. Proteins: Classification & functions
3. Biomolecules III – Nucleic acids – Functions of DNA and RNA, Structure of DNA
4. Basics of Metabolism – Anabolism and catabolism.

Unit 3: Essentials of Biotechnology

1. History, scope, and significance of biotechnology. Applications of biotechnology in Plant, Animal, Industrial and Pharmaceutical sciences.
2. Environmental Biotechnology – Bioremediation and Biofuels, Biofertilizers and Biopesticides.
3. Genetic engineering – Gene manipulation using restriction enzymes and cloning vectors; Physical, chemical, and biological methods of gene transfer.
4. Transgenic plants – Stress tolerant plants (biotic stress – BT cotton, abiotic stress – salt tolerance). Transgenic animals – Animal and disease models.

Unit 4: Analytical Tools and techniques in biology – Applications

1. Applications in forensics – PCR and DNA fingerprinting
2. Immunological techniques – Immunoblotting and ELISA.
3. Monoclonal antibodies – Applications in diagnosis and therapy.
4. Eugenics and Gene therapy

Unit 5: Biostatistics and Bioinformatics

1. Data collection and sampling. Measures of central tendency – Mean, Median, Mode.
2. Measures of dispersion – range, standard deviation and variance. Probability and tests of significance.
3. Introduction, Genomics, Proteomics, types of Biological data, biological databases- NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment
4. Accessing Nucleic Acid and Protein databases, NCBI Genome Workbench

SRI Y.N. COLLEGE (A) I BSc– SEMESTER – I (2023-2024)
Course – II (Biological stream): INTRODUCTION TO APPLIED BIOLOGY
MODEL PAPER

TIME: 3hrs

Max marks: 60

PART-I

Answer any five of the following questions. Each question carries 4 marks

5 x 4 = 20M

1. Structure of bacteria
2. Draw the structure of DNA
3. What is anabolism and catabolism
4. Applications of biotechnology in plants
5. BT- Cotton
6. DNA finger printing
7. Mean
8. NCBI

PART-II

SECTION-A

Answer any five questions choosing at least two questions from each section.

5 x 8 = 40M

9. Write about contribution of the following scientists
a) Louis Pasteur b) Edward Jenner.
10. What are the applications of microorganisms in food, agriculture and industry?
11. Write the sources classification and functions of carbohydrates.
12. What are essential and non essential amino acids? What is zwitter ion?
13. Write an essay on environmental biotechnology.

SECTION –B

14. What is biotechnology? Scope and significance of biotechnology
15. Explain the production and application of antibodies (MAB)
16. Write an essay on PCR?
17. Calculate the standard deviation from the following data. Hemoglobin percent of frog was recorded as 23,22,20,24,16,17,18,19 and 21.
18. Explain the biological databases with a detailed explanation.

Blue print:

S.N	Unit	Shorts	Essays
1.	I	1	2
2.	II	2	2
3.	III	2	2
4.	IV	1	2
5.	V	2	2

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COURSE 3: GENERAL & INORGANIC CHEMISTRY
SYLLABUS (2023-2024 batch)

Unit I: Atomic Structure and Periodic table

(9h)

Electronic configuration: Bohr theory, dual nature of electrons, Heisenberg uncertainty principle, the Schrodinger equation, significance of wave functions, normalization of wave function, radial and angular wave functions, Pauli's exclusion principle, Hund's rule, sequence of energy levels (Aufbau principle).

Periodicity: periodic law and arrangement of elements in the periodic table, IUPAC nomenclature and group number, horizontal, vertical, and diagonal relationships in the periodic table. General properties of atoms: size of atoms and ions-atomic radii, ionic radii, covalent radii; trend in ionic radii, ionization potential, electron affinity; electronegativity - Pauling, Mulliken-Jaffe, Allred-Rochow definitions; oxidation states and variable valency; isoelectronic relationship; inert-pair effect;

UNIT 2: Ionic bond

(9h)

Properties of ionic compounds, factors favouring the formation of ionic compounds- ionization potential, electron affinity, and electronegativity. Lattice energy: definition, factors affecting lattice energy, Born-Haber cycle-enthalpy of formation of ionic compound and stability. Stability of ionic compounds in terms of ΔH_f and U_o . Solubility and thermal stability of ionic compounds. Covalent character in ionic compounds-polarization and Fajan's rules; effects of polarization-solubility, melting points, and thermal stability of typical ionic compounds.

UNIT 3: Acids and Bases

(9h)

Theories of acids and bases: Arrhenius theory, Bronsted-Lowry theory, Lewis theory, the solvent system, Nonaqueous solvents: classification-protonic and aprotic solvents, liquid ammonia as solvent-solutions of alkali and alkaline earth metals in ammonia.

Types of chemical reactions: acid-base, oxidation-reduction, calculation of oxidation number. Definition of pH, pKa, pKb. Types of salts, Salt hydrolysis. Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard and Soft-Soft combinations.

UNIT 4: The Covalent Bond

(9h)

Valence Bond theory-arrangement of electrons in molecules, hybridization of atomic orbitals and geometry of molecules-BeCl₂, BF₃, CH₄, PCl₅, SF₆ –VSEPR model-effect of bonding and nonbonding electrons on the structure of molecules, effect of electronegativity, isoelectronic principle, illustration of structures by VSEPR model-NH₃, H₂O, SF₄, ICl⁻⁴, ICl⁻², XeF₄, XeF₆

Molecular orbital theory- LCAO method, construction of M.O. diagrams for Homo-nuclear and Hetero-nuclear diatomic molecules (N₂, O₂, CO and NO)

UNIT 5: Metallic and Weak Bonds

(9h)

The Metallic bond: metallic properties, free electron theory, Valence Bond Theory, band theory of metals. Explanation of conductors, semiconductors and insulators.

Weak bonds: hydrogen bonding-intra- and intermolecular hydrogen bonding, influence on the physical properties of molecules, comparison of hydrogen bond strength and properties of hydrogen bonded N, O and F compounds; associated molecules-ethanol and acetic acid; Vanderwaals forces, ion dipole-dipole interactions.

List of Reference Books:

1. J. D. Lee, Concise Inorganic Chemistry, 5th ed., Blackwell Science, London, 1996.
2. . B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., 1996.
3. D. F. Shriver and P. W. Atkins, Inorganic Chemistry, 3rd ed., W. H. Freeman and Co, London,

II. Laboratory course syllabus:

Analysis of SIMPLE SALT

Analysis of simple salt containing ONE anion and ONE cation from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate. Cations: Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Magnesium and Ammonium.

SRI YN COLLEGE (AUTONOMOUS) – NARSAPUR, W.G.DIST
B.Sc. (HONOURS) CHEMISTRY MAJOR
For 2023-2024 Batch [w.e.f. 2023-2024]
I B.Sc. SEMESTER – II, At the end of SECOND SEMESTER
COURSE 3: GENERAL & INORGANIC CHEMISTRY
MODEL QUESTION PAPER (2023-2024 batch)

Time: 3 Hrs

Max. Marks: 60M

PART – A

5 X 8M = 40M

Answer any **FIVE** questions choosing atleast **TWO** questions from each **SECTION - I & II.**

SECTION – I

1. What are the main postulates of Bohr's model of hydrogen atom? Discuss the importance of this model to explain various series of line spectra in hydrogen atom?
2. What is a periodic property? How the following properties vary in a group and in a period? Explain? (a) Atomic Radius and (b) Ionization Energy.
3. What are ionic compounds? Explain the factors favourable for the formation of ionic compounds?
4. What is Lattice energy? Explain the factors affecting lattice energy?
5. Explain the Pearson's concept of HSAB principle?

SECTION – II

6. Explain the shapes and bond angles in BeCl_2 and PCl_5 molecules by Valence Bond theory?
7. Explain the structures of the following molecules by VESPER theory (a) ICl^-2 and (b) XeF_4
8. Draw the molecular orbital energy diagrams of O_2 & CO and explain its bond order & magnetic properties?
9. Discuss Band Theory of bonding in metals? How does Band theory explain the conductivity of semi conductors?
10. What is hydrogen bonding? Explain intra and intermolecular hydrogen bonding with examples?

PART – B

Answer any **FIVE** of the following questions.

5 X 4M = 20M

11. Write short notes on diagonal relationship.
12. Write the general Properties of ionic compounds.
13. What are protonic and aprotic solvents? Give examples.
14. Write short notes on acid-base titrations with one example?
15. Nitrogen in NH_3 is in SP^3 hybridization, but the bond angle is deviates from $109^\circ 28'$. Explain?
16. What are bonding and anti-bonding molecular orbitals?
17. Explain conductors based on band theory?
18. What is metallic bond? Write the properties of metals?

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B.Sc. (HONOURS) CHEMISTRY MAJOR
COURSE 3: GENERAL & INORGANIC CHEMISTRY
At the end of II semester

S.No	Name of the chapter	8M	4M
SECTION - I			
1	Unit-1: Atomic Structure and Periodic table	2	1
2	Unit-II: Ionic bond	2	1
3	Unit-III: Acids and Bases	1	2
SECTION - II			
1	Unit-IV: The Covalent Bond	3	2
2	Unit-V: Metallic and Weak Bonds	2	2
	TOTAL	10	08

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COURSE 3: GENERAL & INORGANIC CHEMISTRY

QUESTION BANK

PART-A

ESSAY QUESTIONS: (8 Marks)

SECTION -I

Unit – I: Atomic Structure and Periodic table

1. What are the main postulates of Bohr's model of hydrogen atom? Discuss the importance of this model to explain various series of line spectra in hydrogen atom?
2. Write short notes on (a) Heisenberg uncertainty principle and (b) Hund's rule.
3. Define electro negativity? Explain its Pauling and Mulliken scales
4. What is a periodic property? How the following properties vary in a group and in a period? Explain? (a) Atomic Radius and (b) Ionization Energy.

Unit-II: Ionic Bond

1. What are ionic compounds? Explain the factors favourable for the formation of ionic compounds?
2. What is Lattice energy? Explain the factors affecting lattice energy?
3. Explain the effects of solubility, melting points, and thermal stability of typical ionic compounds?
4. Explain the Solubility and thermal stability of ionic compounds?

Unit – III: Acids and Bases

1. Explain the Pearson's concept of HSAB principle?
2. Explain Lewis acid-base theory with suitable examples?
3. What are ammono acids and ammono bases? Explain with suitable examples?

SECTION -II

UNIT-IV: The Covalent Bond

1. Explain the shapes and bond angles in BeCl_2 and PCl_5 molecules by Valence Bond theory?
2. Explain the structures of the following molecules by VESPER theory (a) SF_4 and (b) ICl^{-4}
3. Write the main postulates of M.O Theory? Draw the molecular orbital energy diagram of N_2 and explain its bond order & magnetic properties?
4. Draw the molecular orbital energy diagrams of O_2 & CO and explain its bond order & magnetic properties?
5. Explain the structures of the following molecules by VESPER theory (a) ICl^{-2} and (b) XeF_4

Unit-V: Metallic and Weak Bonds

1. Discuss Band Theory of bonding in metals? How does Band theory explain the conductivity of semi conductors?
2. Explain the free electron theory and valence bond theory for bonding in metals?
3. What is hydrogen bonding? Explain intra and intermolecular hydrogen bonding with examples?
4. Write short notes on (a) Vanderwaals forces and (b) Ion dipole-dipole interactions.

PART – B

SHORT QUESTIONS (4 Marks)

Unit – I: Atomic Structure and Periodic table

1. Derive Schrodinger wave equation
2. Write a note on diagonal relationship.
3. Write a note on inert-pair effect

Unit - II: Ionic Bond

1. Explain Covalent character in ionic compounds with one example?
2. State Fajan's rules and give suitable examples?
3. Write the general Properties of ionic compounds?

UNIT - III: Acids and Bases

1. What are protonic and aprotic solvents? Give examples
2. Write short notes on Redox titrations with one example?
3. Explain with examples Hard-Hard and Soft-Soft combinations?
4. Write short notes on acid-base titrations with one example?

Unit - IV: The Covalent Bond

1. Nitrogen in NH_3 is in SP^3 hybridization, but the bond angle is deviates from $109^\circ 28'$. Explain?
2. Explain the hybridization involved in SF_6 molecule?
3. What are bonding and anti-bonding molecular orbitals?
4. Explain the effect of bonding and nonbonding electrons on the structure of molecules with one example?

Unit – V: Metallic and Weak Bonds

1. What is metallic bond? Write the properties of metals?
2. What are associated molecules? Explain with two examples?
3. How hydrogen bonding, influence on the physical properties of molecules? Explain?
4. Explain conductors based on band theory?

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COURSE 4: INORGANIC CHEMISTRY - I
SYLLABUS (2023-2024 Batch)

UNIT –I Chemistry of p-block elements–I **(9h)**

Group 13: Preparation & structure of Diborane, Borazine and $(BN)_x$

Group 14: Preparation, classification and uses of silicones and Silanes.

Group 15: Preparation & structure of Phosphonitrilic Chloride $P_3N_3Cl_6$

Unit II Chemistry of p-block elements–II **(9h)**

Group 16: Classification of Oxides, structures of oxides and Oxoacids of Sulphur

Group 17: Preparation and Structures of Interhalogen compounds. Pseudohalogens,

Unit – III Radioactivity **(9h)**

Definition, Isotopes, n/p ratio, binding energy, types of radioactivity, Soddy-Fajan's displacement law, Law of Radioactivity, Radioactive decay series, Nuclear Reactions-fission and fusion, Applications of radioactivity.

UNIT-IV Chemistry of d-block elements **(9h)**

Characteristics of d-block elements with special reference to electronic configuration, variable valence, colour, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states of 3d series-Latimer diagrams.

UNIT-V Chemistry of f-block elements **(9h)**

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction, consequences of lanthanide contraction, colour, magnetic properties. Separation of lanthanides by ion exchange method. Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

Reference Books

1. Basic Inorganic Chemistry by Cotton and Wilkinson

2. Advance Inorganic chemistry vol-I by Satya Prakash
3. Inorganic chemistry by Puri and Sharma
4. Concise Inorganic Chemistry by J D Lee
5. Nuclear Chemistry by Maheshwar Sharon, 2009

Laboratory course syllabus:

Preparation of Inorganic compounds:

1. Crystallization of compounds and determination of melting point.
2. Preparation of Cuprous chloride.
3. Preparation of Potash Alum.
4. Preparation of Chrome Alum.
5. Preparation of Ferrous oxalate
6. Preparation of Ferrous ammonium sulphate.

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B.Sc. (HONOURS) CHEMISTRY MAJOR
For 2023-2024 Batch [w.e.f. 2023-2024]
I B.Sc. SEMESTER – II, At the end of SECOND SEMESTER
COURSE 4: INORGANIC CHEMISTRY - I
MODEL QUESTION PAPER (2023-2024 Batch)

Time: 3 Hrs

Max. Marks: 60M

PART – A

5 X 8M = 40M

Answer any **FIVE** questions choosing atleast **TWO questions** from each **SECTION - I & II.**

SECTION – I

11. Write any two preparations of Diborane. Explain the structure of Diborane.
12. What are silicones? Write their classification and one preparation for each.
13. Explain the classification of oxides based on chemical behavior?
14. What are inter halogen Compounds? Explain the structures of AX₃ and AX₅ type of inter halogen Compounds with examples.
15. What is radioactivity? Write the types of radioactivity and explain Radioactive decay series.

SECTION – II

6. Explain the following properties of d-block elements. (a) Oxidation states (b) Colour
7. Explain the magnetic and catalytic properties of d- block elements.
8. What are d-block elements? Explain the complex forming nature of d-block elements with suitable examples?
9. What is Lanthanide contraction? Explain its consequences.
10. What are inner transition elements? Write short notes on magnetic properties of f-block elements.

PART – B

Answer any **FIVE** of the following questions.

5 X 4M = 20M

11. Explain the structure of Borazole
12. What are pseudo halogens? Write one preparation and one chemical property of pseudo halogens.
13. Write short notes on Nuclear fission.
14. State and explain the group displacement law?
15. Write the electronic configuration of 3d-series elements.
16. Explain the Stability of various oxidation states of d-block elements
17. How Lanthanides are separated by Ion exchange method
18. Write any four differences between Lanthanides and Actinides.

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B.Sc. (HONOURS) CHEMISTRY MAJOR
COURSE 4: INORGANIC CHEMISTRY - I
At the end of II semester

S.No	Name of the chapter	8M	4M
SECTION - I			
1	Unit-1: Chemistry of p-block elements-I	2	1
2	Unit-II: Chemistry of p-block elements-II	2	1
3	Unit-III: Radioactivity	1	2
SECTION - II			
1	Unit-IV: Chemistry of d-block elements	3	2
2	Unit-V: Chemistry of f-block elements	2	2
	TOTAL	10	08

SRI YN COLLEGE (AUTONOMOUS) – NARSAPUR, W.G.DIST
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I B.Sc. SEMESTER – II, At the end of SECOND SEMESTER
COURSE 4: INORGANIC CHEMISTRY - I

QUESTION BANK

Part-A

ESSAY QUESTIONS: (8Marks)

SECTION -I

Unit – I: UNIT –I Chemistry of p-block elements–I

1. Write any two preparations of Diborane. Explain the structure of Diborane.
2. What are silicones? Give their classification and write one preparation for each.
3. Write any two preparations & structure of Phosphonitrilic Chloride $P_3N_3Cl_6$

Unit-II: UNIT –I Chemistry of p-block elements–II

1. Explain the classification of oxides based on oxygen content?
2. Explain the classification of oxides based on chemical behaviour?
3. What are inter halogen Compounds? Explain the structures of AX_3 and AX_5 type of inter halogen Compounds with examples.
4. What are inter halogen Compounds? Write their classification with suitable examples.

Unit – III: Radioactivity

1. What is radioactivity? Write the types of radioactivity and explain Radioactive decay series.
2. Write short notes on Nuclear fission and Nuclear Fusion

SECTION -II

UNIT-IV: Chemistry of d-block elements

1. Explain the magnetic and catalytic properties of d- block elements.
2. Explain the following properties of d-block elements. (a) Oxidation states (b) Colour
 3. What are d-block elements? Explain the Stability of various oxidation states of d-block elements?
 4. What are d-block elements? Explain the complex forming nature of d-block elements with suitable examples?

Unit-V: Chemistry of f-block elements:

1. What is Lanthanide contraction? Explain its consequences.
2. What are inner transition elements? Write short notes on magnetic properties of f-block elements. 3.

Explain (a) actinide contraction and (b) oxidation states of actinides.

PART – B
SHORT QUESTIONS (4 Marks)

Unit – I: Chemistry of p-block elements – I

1. Explain the structure of Borazole
2. Write any four uses of silicones.
3. What are silanes? Write any two preparations of silanes?

Unit-II: Chemistry of p-block elements – II

1. What are pseudo halogens? Give two examples. Write one property of pseudo halogens.
2. What are interhalogen compounds? Explain the AX₇ type of interhalogen compounds with example?
3. Write any two structures of oxoacids of sulphur?
4. Write any two structures of oxides of sulphur?

UNIT-III: Radioactivity

1. State and explain the group displacement law?
2. Write any four application of radioactivity.
3. Write the types of radioactivity.

Unit-IV: Chemistry of d-block elements

1. Write the Electronic configuration of 3d- series elements?
2. Explain the magnetic properties of d-block elements?
3. Explain the variable valence of d-block elements.
4. Write short notes on Latimer diagrams.

Unit – V: Chemistry of f-block elements

1. Write any four differences between Lanthanides and Actinides.
2. How Lanthanides are separated by Ion exchange method
3. Write any four comparisons between lanthanides and actinides.
4. Write short notes on oxidation states of actinides.

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I B.Sc. SEMESTER – II, At the end of SECOND SEMESTER
COURSE 3: GENERAL & INORGANIC CHEMISTRY
SYLLABUS (2023-2024 batch)

Unit I: Atomic Structure and Periodic table

(9h)

Electronic configuration: Bohr theory, dual nature of electrons, Heisenberg uncertainty principle, the Schrodinger equation, significance of wave functions, normalization of wave function, radial and angular wave functions, Pauli's exclusion principle, Hund's rule, sequence of energy levels (Aufbau principle).

Periodicity: periodic law and arrangement of elements in the periodic table, IUPAC nomenclature and group number, horizontal, vertical, and diagonal relationships in the periodic table. General properties of atoms: size of atoms and ions-atomic radii, ionic radii, covalent radii; trend in ionic radii, ionization potential, electron affinity; electronegativity - Pauling, Mulliken-Jaffe, Allred-Rochow definitions; oxidation states and variable valency; isoelectronic relationship; inert-pair effect;

UNIT 2: Ionic bond

(9h)

Properties of ionic compounds, factors favouring the formation of ionic compounds- ionization potential, electron affinity, and electronegativity. Lattice energy: definition, factors affecting lattice energy, Born-Haber cycle-enthalpy of formation of ionic compound and stability. Stability of ionic compounds in terms of ΔH_f and U_o . Solubility and thermal stability of ionic compounds. Covalent character in ionic compounds-polarization and Fajan's rules; effects of polarization-solubility, melting points, and thermal stability of typical ionic compounds.

UNIT 3: Acids and Bases

(9h)

Theories of acids and bases: Arrhenius theory, Bronsted-Lowry theory, Lewis theory, the solvent system, Nonaqueous solvents: classification-protonic and aprotic solvents, liquid ammonia as solvent-solutions of alkali and alkaline earth metals in ammonia.

Types of chemical reactions: acid-base, oxidation-reduction, calculation of oxidation number. Definition of pH, pKa, pKb. Types of salts, Salt hydrolysis. Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard and Soft-Soft combinations.

UNIT 4: The Covalent Bond

(9h)

Valence Bond theory-arrangement of electrons in molecules, hybridization of atomic orbitals and geometry of molecules-BeCl₂, BF₃, CH₄, PCl₅, SF₆ –VSEPR model-effect of bonding and nonbonding electrons on the structure of molecules, effect of electronegativity, isoelectronic principle, illustration of structures by VESPR model-NH₃, H₂O, SF₄, ICl⁻⁴, ICl⁻², XeF₄, XeF₆

Molecular orbital theory- LCAO method, construction of M.O. diagrams for Homo-nuclear and Hetero-nuclear diatomic molecules (N₂, O₂, CO and NO)

UNIT 5: Metallic and Weak Bonds

(9h)

The Metallic bond: metallic properties, free electron theory, Valence Bond Theory, band theory of metals. Explanation of conductors, semiconductors and insulators.

Weak bonds: hydrogen bonding-intra- and intermolecular hydrogen bonding, influence on the physical properties of molecules, comparison of hydrogen bond strength and properties of hydrogen bonded N, O and F compounds; associated molecules-ethanol and acetic acid; Vanderwaals forces, ion dipole-dipole interactions.

List of Reference Books:

1. J. D. Lee, Concise Inorganic Chemistry, 5th ed., Blackwell Science, London, 1996.
2. . B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., 1996.
3. D. F. Shriver and P. W. Atkins, Inorganic Chemistry, 3rd ed., W. H. Freeman and Co, London,

II. Laboratory course syllabus:

Analysis of SIMPLE SALT

Analysis of simple salt containing ONE anion and ONE cation from the following:

Anions: Carbonate, Sulphate, Chloride, Bromide, Acetate, Nitrate, Borate, Phosphate. Cations: Lead, Copper, Iron, Aluminium, Zinc, Nickel, Manganese, Calcium, Strontium, Barium, Magnesium and Ammonium.

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For 2023-2024 Batch [w.e.f. 2023-2024]
I B.Sc. SEMESTER – II, At the end of SECOND SEMESTER
COURSE 3: GENERAL & INORGANIC CHEMISTRY
MODEL QUESTION PAPER (2023-2024 batch)

Time: 3 Hrs

Max. Marks: 60M

PART – A

5 X 8M = 40M

Answer any **FIVE** questions choosing atleast **TWO** questions from each **SECTION - I & II.**

SECTION – I

16. What are the main postulates of Bohr's model of hydrogen atom? Discuss the importance of this model to explain various series of line spectra in hydrogen atom?
17. What is a periodic property? How the following properties vary in a group and in a period? Explain? (a) Atomic Radius and (b) Ionization Energy.
18. What are ionic compounds? Explain the factors favourable for the formation of ionic compounds?
19. What is Lattice energy? Explain the factors affecting lattice energy?
20. Explain the Pearson's concept of HSAB principle?

SECTION – II

21. Explain the shapes and bond angles in BeCl_2 and PCl_5 molecules by Valence Bond theory?
22. Explain the structures of the following molecules by VESPER theory (a) ICl^{-2} and (b) XeF_4
23. Draw the molecular orbital energy diagrams of O_2 & CO and explain its bond order & magnetic properties?
24. Discuss Band Theory of bonding in metals? How does Band theory explain the conductivity of semi conductors?
25. What is hydrogen bonding? Explain intra and intermolecular hydrogen bonding with examples?

PART – B

Answer any **FIVE** of the following questions.

5 X 4M = 20M

11. Write short notes on diagonal relationship.
12. Write the general Properties of ionic compounds.
13. What are protonic and aprotic solvents? Give examples.
14. Write short notes on acid-base titrations with one example?
15. Nitrogen in NH_3 is in SP^3 hybridization, but the bond angle is deviates from $109^\circ 28'$. Explain?
16. What are bonding and anti-bonding molecular orbitals?
17. Explain conductors based on band theory?
18. What is metallic bond? Write the properties of metals?

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B.Sc. (HONOURS) CHEMISTRY MAJOR
COURSE 3: GENERAL & INORGANIC CHEMISTRY
At the end of II semester

S.No	Name of the chapter	8M	4M
SECTION - I			
1	Unit-1: Atomic Structure and Periodic table	2	1
2	Unit-II: Ionic bond	2	1
3	Unit-III: Acids and Bases	1	2
SECTION - II			
1	Unit-IV: The Covalent Bond	3	2
2	Unit-V: Metallic and Weak Bonds	2	2
	TOTAL	10	08

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I B.Sc. SEMESTER – II, At the end of SECOND SEMESTER
COURSE 3: GENERAL & INORGANIC CHEMISTRY

QUESTION BANK

PART-A

ESSAY QUESTIONS: (8 Marks)

SECTION -I

Unit – I: Atomic Structure and Periodic table

5. What are the main postulates of Bohr's model of hydrogen atom? Discuss the importance of this model to explain various series of line spectra in hydrogen atom?
6. Write short notes on (a) Heisenberg uncertainty principle and (b) Hund's rule.
7. Define electro negativity? Explain its Pauling and Mulliken scales
8. What is a periodic property? How the following properties vary in a group and in a period? Explain? (a) Atomic Radius and (b) Ionization Energy.

Unit-II: Ionic Bond

2. What are ionic compounds? Explain the factors favourable for the formation of ionic compounds?
2. What is Lattice energy? Explain the factors affecting lattice energy?
3. Explain the effects of solubility, melting points, and thermal stability of typical ionic compounds?
4. Explain the Solubility and thermal stability of ionic compounds?

Unit – III: Acids and Bases

1. Explain the Pearson's concept of HSAB principle?
2. Explain Lewis acid-base theory with suitable examples?
3. What are ammono acids and ammono bases? Explain with suitable examples?

SECTION -II

UNIT-IV: The Covalent Bond

1. Explain the shapes and bond angles in BeCl_2 and PCl_5 molecules by Valence Bond theory?
2. Explain the structures of the following molecules by VESPER theory (a) SF_4 and (b) ICl^{-4}
3. Write the main postulates of M.O Theory? Draw the molecular orbital energy diagram of N_2 and explain its bond order & magnetic properties?
4. Draw the molecular orbital energy diagrams of O_2 & CO and explain its bond order & magnetic properties?
5. Explain the structures of the following molecules by VESPER theory (a) ICl^{-2} and (b) XeF_4

Unit-V: Metallic and Weak Bonds

1. Discuss Band Theory of bonding in metals? How does Band theory explain the conductivity of semi conductors?
2. Explain the free electron theory and valence bond theory for bonding in metals?
3. What is hydrogen bonding? Explain intra and intermolecular hydrogen bonding with examples?
4. Write short notes on (a) Vanderwaals forces and (b) Ion dipole-dipole interactions.

PART – B

SHORT QUESTIONS (4 Marks)

Unit – I: Atomic Structure and Periodic table

1. Derive Schrodinger wave equation
2. Write a note on diagonal relationship.
3. Write a note on inert-pair effect

Unit - II: Ionic Bond

1. Explain Covalent character in ionic compounds with one example?
2. State Fajan's rules and give suitable examples?
3. Write the general Properties of ionic compounds?

UNIT - III: Acids and Bases

1. What are protonic and aprotic solvents? Give examples
2. Write short notes on Redox titrations with one example?
3. Explain with examples Hard-Hard and Soft-Soft combinations?
4. Write short notes on acid-base titrations with one example?

Unit - IV: The Covalent Bond

1. Nitrogen in NH_3 is in SP^3 hybridization, but the bond angle is deviates from $109^{\circ}28'$. Explain?
2. Explain the hybridization involved in SF_6 molecule?
3. What are bonding and anti-bonding molecular orbitals?
4. Explain the effect of bonding and nonbonding electrons on the structure of molecules with one example?

Unit – V: Metallic and Weak Bonds

1. What is metallic bond? Write the properties of metals?
2. What are associated molecules? Explain with two examples?
3. How hydrogen bonding, influence on the physical properties of molecules? Explain?
4. Explain conductors based on band theory?

SRI Y N COLLEGE (AUTONOMOUS) - NARSAPUR
(Affiliated to Adikavi Nannaya University)
Accredited by NAAC with “A” Grade with a CGPA 3.41
II B.Sc. Chemistry Paper-III (Organic Chemistry & Spectroscopy)
(At the end of III semester) w.e.f 2021-2022 (2021-2024 batch)

SYLLABUS (2023-24)

(Organic Chemistry)

Chemistry of Halogenated Hydrocarbons: Alkyl Halides: Methods of preparation and properties, nucleophilic substitution reactions– SN₁ and SN₂ mechanisms with stereo chemical aspects. Aryl Halides: Preparation and properties, nucleophilic aromatic substitution; Relative reactivity of alkyl, allyl, benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Alcohols & Phenols

Alcohols: preparation and properties, Bouvet Blanc Reduction; Oxidation Of Diols by Per iodic acid and lead Tetraacetate, Pinacol- Pinacolone Rearrangement;

Phenols: Preparation And Properties; Acidity of phenols, Reimer–Tiemann and Kolbe’s–Schmidt Reactions, Fries and Claisen Rearrangement with mechanism;

Carbonyl Compounds: Structure, reactivity, preparation and properties; Nucleophilic Addition, Nucleophilic Addition-elimination reactions with ammonia derivatives Mechanisms of Aldol and Benzoin Condensation, Claisan-Schmidt, Perkin, Cannizzaro and Wittig reaction, Beckmann Haloform Reaction And Baeyer Villiger oxidation, oxidations and reductions (Clemmensen, wolf –kishner, with LiAlH₄ & NaBH₄).

Active Methylene Compounds:

Ethyl acetoacetate: keto-enol tautomerism, preparation by Claisen condensation,

Synthetic applications: Preparation of a) monocarboxylic acids. b) Dicarboxylic acids.

c) Reaction with urea

Diethyl malonate: preparation from acetic acid.

Synthetic applications: Preparation of a) monocarboxylic acids (propionic acid and n-butyric acid). b) Dicarboxylic acids (succinic acid and adipic acid) c) α,β -unsaturated carboxylic acids (crotonic acid). d) Reaction with urea.

Carboxylic Acids and their Derivatives : General methods of preparation, physical properties and reactions of monocarboxylic acids, effect of substituent acidic strength. Preparation And Reactions Of Acid Chlorides, anhydrides, esters and amides; Claisen Condensation, Reformatsky reactions and Curtius Rearrangement Reactions involving H, OH and COOH groups- salt formation, anhydride formation, acid

chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt- Eistert synthesis, halogenation by Hell- Volhard- Zelinsky reaction.

(SPECTROSCOPY)

Spectrophotometry: General features of absorption - Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert law for quantitative analysis of 1. Chromium in $K_2Cr_2O_7$ 2. Manganese in Manganous sulphate

Vibrational Spectroscopy: Classical Equation of Vibration, computation of force constant, Harmonic and anharmonic oscillator, Morse Potential curve, vibrational degrees of freedom for polyatomic molecules, Modes of vibrations in diatomic and polyatomic molecules. Selection rules for vibrational transitions, Fundamental Frequencies, overtones and hot bands. functional group and fingerprint region.

Electronic spectroscopy: Interaction of electromagnetic radiation with molecules and types of molecular spectra. Energy levels of molecular orbitals (σ , π , n). Selection rules for electronic spectra. Types of electronic transitions in molecules, effect of conjugation. Concept of chromophore and auxochrome. bathochromic and hypsochromic shifts.

Nuclear Magnetic Resonance (NMR) spectroscopy: Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals - spin-spin coupling, coupling constants. Applications of NMR with suitable examples - ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

Application of Spectroscopy to Simple Organic Molecules

Application of visible, ultraviolet and Infrared spectroscopy in organic molecules. Application of electronic spectroscopy and Woodward rules for calculating λ_{max} of conjugated dienes and α,β - unsaturated compounds.

Infrared radiation and types of molecular vibrations, IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on $>C=O$ stretching absorptions).

REFERENCE BOOKS:

1. A TextBook of Organic Chemistry by Bahl and Arunbahl
2. A Textbook of Organic chemistry by I L Finar Vol I
3. Organic chemistry by Bruice
4. Organic chemistry by Clayden
5. Spectroscopy by William Kemp

6. Spectroscopy by Pavia
7. Organic Spectroscopy by J. R. Dyer

8. Elementary organic spectroscopy by Y.R. Sharma
9. Spectroscopy by P.S.Kalsi
10. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
11. Spectrometric Identification of Organic Compounds by Robert M Silverstein, Francis X Webster. 12. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. & Tatchell, A.R. Practical Organic Chemistry, 5th Ed. Pearson (2012)
13. Ahluwalia, V.K. & Aggarwal, R. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press (2000)

LABORATORY COURSE -III

Organic preparations: 40M

i. Acetylation of one of the following compounds:

amines (aniline, o-, m-, p- toluidine and o-, m-, p-anisidine) and phenols (β -naphthol, vanillin, salicylic acid) by any one method:

- a. Using conventional method.
- b. Using green approach

ii. Benzoylation of one of the following amines

(aniline, o-, m-, p- toluidine and o-, m-, p-anisidine)

- a. Nitration of any one of the following: Acetanilide/nitrobenzene by conventional method
- b. Salicylic acid by green approach (using ceric ammonium nitrate).

IR Spectral Analysis 10M

IR Spectral Analysis of the following functional groups with examples

- a) Hydroxyl groups
- b) Carbonyl groups
- c) Amino groups
- d) Aromatic groups

SRI Y N COLLEGE (AUTONOMOUS) - NARSAPUR
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Accredited by NAAC with "A" Grade with a CGPA 3.41
II B.Sc. Chemistry Paper-III (Organic Chemistry & Spectroscopy)
(At the end of III semester) w.e.f 2021-2022 (2021-2024 batch)

Time: 3 Hrs

Max. Marks: 75M

MODEL PAPER

PART – A

Answer any **FIVE** questions choosing at least **TWO questions** from each **SECTION - I & II**.
5X 10M = 50M

SECTION – I (ORGANIC CHEMISTRY)

1. Discuss the mechanism of SN^1 and SN^2 reactions in Alkyl Halides.
2. Explain the following reactions with mechanism.
 - a) Kolbe – Schmidt reaction
 - b) Riemer -Tiemann reaction
3. Discuss the mechanism for following reactions.
 - (i) Perkin reaction
 - (ii) Benzoin condensation
4. (a) Write any two methods of preparation for carboxylic acids.
(b) Explain hydrolysis of ester with mechanism?
5. (a) Explain any method of preparation of Diethyl malonate.
(b) How the following are prepared from malonic ester?
 - (i) Succinic acid
 - (ii) Crotonic acid

SECTION – II (SPECTROSCOPY)

6. State and explain Beer Lamberts law? Write any one application of it?
7. Discuss various types of electronic transitions with relation to their order of energy
8. Discuss various types of stretching and bending vibrations in IR spectroscopy
9. Explain the following properties
 - (a) Chemical Shift
 - (b) Spin-Spin coupling
10. Write Woodward-Fieser rules for calculating λ_{max} for conjugated dienes and α,β – unsaturated carbonyl compounds , With one example each.

PART – B

Answer any **FIVE** of the following questions.

5 X 5M = 25M

11. Write any two methods for preparation of aryl halides?
12. Explain the mechanism for Pinacol-Pinacolone rearrangement
13. Explain the mechanism for Baeyer-villiger oxidation reaction.
14. Trichloro acetic acid is more acidic than acetic acid. Explain. Why?
15. Write about single beam and double beam spectrophotometers?
16. What are Chromophores and Auxochromes? Give examples

17. What is Finger print region? What is its significance?
 18. What are equivalent and non-equivalent protons in a molecule?

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II B.Sc. Chemistry Paper-III (Organic Chemistry & Spectroscopy)
(At the end of III semester) w.e.f 2021-2022 (2021-2024 batch)

S.No		10M	5M
Organic Chemistry			
1.	Chemistry of Halogenated Hydrocarbons	1	1
2.	Alcohols & phenols	1	1
3.	Carbonyl compounds	1	1
4.	Active methylene compounds	1	---
5.	Carboxylic acids and derivatives	1	1
Spectroscopy			
1.	Spectrophotometry	1	1
2.	Electronic spectroscopy	1	1
3.	Vibrational Spectroscopy	1	1
4.	Proton magnetic resonance spectroscopy (¹ H-NMR)	1	1
5.	Application of Spectroscopy to Simple Organic Molecules	1	---
Total questions		10	8

SRI Y N COLLEGE (AUTONOMOUS) - NARSAPUR
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Accredited by NAAC with "A" Grade with a CGPA 3.41
II B.Sc. Chemistry Paper-IV (Inorganic, Organic & Physical Chemistry)
(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)
SYLLABUS (2023-24)

(INORGANIC & ORGANIC CHEMISTRY)

Organ metallic Compounds: Definition and classification of organometallic compounds on the basis of bond type, Metal Carbonyls:18-electron rule, General methods of preparation of mono and binuclear carbonyls of 3d series. P-acceptor behaviour of carbon monoxide.

Carbohydrates: Classification and their biological importance, Monosaccharides: Constitution and absolute configuration glucose and fructose (open chain and cyclic structure), epimers and anomers, mutarotation, osazone formation from glucose and fructose Interconversions of Aldohexose to Ketohexose [(+) Glucose to (-) Fructose] and Ketohexose to Aldohexose (Fructose to Glucose) Kiliani-Fischer synthesis and Ruff degradation;

Amino acids and proteins: Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Essential and Non-essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Gabriel Phthalimide synthesis c) strecker's synthesis.

Physical properties: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point.

Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating- peptide bond (amide linkage).

Heterocyclic Compounds: Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole - Aromatic character – Preparation from 1, 4, -dicarbonyl compounds, Paul-Knorr synthesis. Properties: Acidic character of pyrrole - electrophilic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan. Pyridine – Structure - Basicity - Aromaticity- Comparison with pyrrole- one method of preparation and properties - Reactivity towards Nucleophilic substitution reaction.

(ORGANIC & PHYSICAL CHEMISTRY)

Nitro hydrocarbons

Nomenclature and classification-nitro hydrocarbons, structure -Tautomerism of nitroalkanes leading to aci and keto form, Preparation of Nitroalkanes, reactivity -halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Micheal addition and reduction.

Amines:

Introduction, classification, chirality in amines (pyramidal inversion), importance and general methods of preparation.

Properties : Physical properties, Basicity of amines: Effect of substituent, solvent and steric effects. Distinction between Primary, secondary and tertiary amines using Hinsberg's Method And Nitrous Acid. Discussion of the following reactions with emphasis on the mechanistic pathway: Gabriel Phthalimide synthesis, Hoffmann- Bromamide Reaction, Carbylamine Reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction and Cope elimination.

Photochemistry: Difference between thermal and photochemical processes, Laws of photochemistry- Grothus- Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield- Photochemical reaction mechanism- hydrogen- chlorine and hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Photosensitized reactions.

Thermodynamics: The first law of thermodynamics-statement, definition of internal energy and enthalpy, Heat capacities and their relationship, Joule-Thomson effect- coefficient, Calculation of work for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes, State function. Temperature dependence of enthalpy of formation- Kirchoffs equation, Second law of thermodynamics Different Statements of the law, Carnot cycle and its efficiency, Carnot theorem, Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes. Third law of thermodynamics, Nernst heat theorem, Spontaneous and non- spontaneous processes, Helmholtz and Gibbs energies-Criteria for spontaneity.

REFERENCE BOOKS:

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G.Mareloudan, Purdue Univ
4. Text book of physical chemistry by S Glasstone
6. Concise Inorganic Chemistry by J.D.Lee
7. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
8. A Text Book of Organic Chemistry by Bahl and Arunbahl

9. A Text Book of Organic chemistry by I L Finar Vol I
10. A Text Book of Organic chemistry by I L Finar Vol II
11. Advanced physical chemistry by Gurudeep Raj

LABORATORY COURSE -IV

Organic Qualitative analysis 50 M

Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives.

Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic primary amines, amides and simple sugars

SRI Y N COLLEGE (AUTONOMOUS) - NARSAPUR
(Affiliated to Adikavi Nannaya University)
Accredited by NAAC with "A" Grade with a CGPA 3.41
II B.Sc. Chemistry Paper-IV (Inorganic, Organic & Physical Chemistry)
(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)
MODEL PAPER

Time: 3 Hrs

Max. Marks: 75M

PART – A

Answer any **FIVE** questions choosing at least **TWO questions** from each **SECTION - I & II.** 5X 10M = 50M

SECTION – I (INORGANIC & ORGANIC CHEMISTRY)

1. What are organometallic compounds? Discuss their Classification on the basis of type of bonds with examples.
2. Give an account of open chain structure of glucose.
3. Write about the formation of osazone in glucose? How do you convert an aldohexose to Ketohexose
4. Write any two methods of preparation and any three chemical properties for amino acids
5. How do you prepare pyrrole from Paul Knorr synthesis? Write any three chemical properties of pyrrole.

SECTION – II (ORGANIC & PHYSICAL CHEMISTRY)

6. Write the mechanism for the following. (i)Nef reaction (ii) Mannich reaction
7. Explain Hinsberg method for the separation of a mixture of 1^o, 2^o and 3^o amines
8. What is meant by Quantum yield? Quantum yield for the reaction $H_2 + Br_2 \rightarrow 2HBr$ is very low. Explain.
9. Explain Carnot cycle? Derive an expression for the efficiency of an engine working between two temperatures.
10. State and explain the first law of thermodynamics. Derive an expression for the work done in reversible isothermal expansion of an ideal gas.

PART – B

Answer any **FIVE** of the following questions.

5 X 5M = 25M

11. Write any two methods of preparations of mono nuclear carbonyls of 3d series
12. What are epimers and anomers. Give examples.
13. Explain the classification of amino acids based on their nature?
14. Explain the basicity of pyridine.
15. Explain the Tautomerism of Nitro alkanes.
16. Write any two preparations of primary amines?
17. Write short notes on Einstein's law of Photo chemical equivalence
18. Define heat capacities and derive $C_p - C_v = R$

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II B.Sc. Chemistry Paper-IV (Inorganic, Organic & Physical Chemistry)
(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)

S.No		10M	5M
Inorganic & Organic Chemistry			
1	Organ metallic Compounds	1	1
2	Carbohydrates	2	1
3	Amino acids	1	1
4	Heterocyclic compounds	1	1
Organic & Physical Chemistry			
1	Nitro hydrocarbons	1	1
2	Amines	1	1
3	Photo Chemistry	1	1
4	Thermodynamics	2	1
	TOTAL	10	08

SRI Y N COLLEGE (AUTONOMOUS) - NARSAPUR
(Affiliated to Adikavi Nannaya University)
Accredited by NAAC with "A" Grade with a CGPA 3.41
II B.Sc. Chemistry Paper-V (Inorganic & Physical Chemistry)
(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)
SYLLABUS (2023-24)

(INORGANIC CHEMISTRY)

Coordination Chemistry: IUPAC nomenclature of coordination compounds, Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Valence Bond Theory (VBT): Inner and outer orbital complexes. Limitations of VBT, Crystal Field Theory:- Splitting of d-orbitals in Octahedral, Tetrahedral and Square-planar complexes, Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Factors affecting the magnitude of crystal field splitting energy, Spectrochemical series, Comparison of CFSE for Octahedral and Tetrahedral complexes, Jahn-Teller distortion,

Inorganic Reaction Mechanism: Introduction to inorganic reaction mechanisms. Concept of reaction pathways, transition state, intermediate and activated complex. Labile and inert complexes, ligand substitution reactions -SN₁ and SN₂, Substitution reactions in square planar complexes, Trans-effect, theories of trans effect and its applications

Stability of metal complexes: Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job's method and mole ratio method.

Bioinorganic Chemistry: Metal ions present in biological systems, classification of elements according to their action in biological system. biological significance of Na, K, Mg, Ca, Fe and Cl⁻. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cis-platin as an anti-cancer drug. Metalloporphyrins – Structure and functions of hemoglobin and Chlorophyll.

(PHYSICAL CHEMISTRY)

Phase rule: Concept of phase, components, degrees of freedom. Thermodynamic derivation of Gibbs phase rule. Phase diagram of one component system - water system, Study of Phase diagrams of Simple eutectic systems i) Pb-Ag system, desilverisation of lead ii) NaCl-Water system, Congruent and incongruent melting point- Definition and examples for systems having congruent and incongruent melting point , freezing mixtures.

Electrochemistry: Specific conductance, equivalent conductance and molar conductance- Definition and effect of dilution. Cell constant. Strong and weak electrolytes, Kohlrausch's law and its applications,

Definition of transport number, determination of transport number by Hittorf's method. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only), Application of conductivity measurements- conduct metric titrations. Electrochemical Cells- Single electrode. potential, Types of electrodes with examples: Metal- metal ion, Gas electrode, Inert electrode, Redox electrode, Metal-metal insoluble salt- salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements - Potentiometric titrations. Fuel cells- Basic concepts, examples and applications

Chemical Kinetics: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction, Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only). Enzyme catalysis- Specificity, factors affecting enzyme catalysis,

List of Reference Books

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G.Mare loudan, Purdue Univ
4. Advanced Physical Chemistry by
5. Text book of physical chemistry by S Glasstone
6. Concise Inorganic Chemistry by J.D.Lee
7. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
8. A Text Book of Organic Chemistry by Bahl and Arun bahl
9. A Text Book of Organic chemistry by I L Finar Vol I
10. Advanced physical chemistry by Gurudeep Raj

LABORATORY COURSE -V

Conductometric and Potentiometric Titrimetry 50 M

1. Conductometric titration- Determination of concentration of HCl solution using standard NaOH solution.
2. Conductometric titration- Determination of concentration of CH₃COOH Solution using standard NaOH solution.
3. Conductometric titration- Determination of concentration of CH₃COOH and HCl in a mixture using standard NaOH solution.
4. Potentiometric titration- Determination of Fe (II) using standard K₂Cr₂O₇ solution.
5. Determination of rate constant for acid catalyzed ester hydrolysis.

SRI Y N COLLEGE (AUTONOMOUS) - NARSAPUR

(Affiliated to Adikavi Nannaya University)

Accredited by NAAC with "A" Grade with a CGPA 3.41

II B.Sc. Chemistry Paper-V (Inorganic & Physical Chemistry)

(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)

MODEL PAPER

Time: 3 Hrs

Max. Marks: 75M

PART – A

Answer any **FIVE** questions choosing at least **TWO questions** from each **SECTION - I & II.** 5X 10M = 50M

SECTION – I (INORGANIC & ORGANIC CHEMISTRY)

1. Write the salient features of Crystal field theory. Explain the splitting of d-orbitals in Octahedral complexes.
2. Write the salient features of Valency Bond Theory and explain the formation of $[\text{Fe}(\text{CN})_6]^{4-}$ ion.
3. What are labile and inert complexes? Explain SN_1 and SN_2 substitution reactions in square planar
4. Explain the factors that affect the stability of complexes.
5. Write the importance of Sodium, Potassium and Chloride ions in biological systems.

SECTION – II (ORGANIC & PHYSICAL CHEMISTRY)

6. What is condensed phase rule? Explain the phase diagram of silver-lead system?
7. What is Transport number? How is transport number of an ion determined by Hittorf's method?
8. State and explain Kohlrausch's law? What are its applications?
9. What is EMF of a cell? How it is determined?
10. Define order and Molecularity of a reaction. Drive an expression for the rate constant of a first order reaction

PART – B

Answer any **FIVE** of the following questions.

5 X 5M = 25M

11. Write note on Jahn-Teller distortion
12. What is trans effect? Give one example. Write any two applications of trans effect.
13. Explain job's method for the determination of composition of complexes.
14. Explain biological significance of Sodium and Potassium
15. Explain the following terms with one example each? (1) Phase (2) Component.
16. Explain the construction and working of calomel electrode
17. Explain the collision theory of bi molecular reaction
18. Write any two methods for the determination of order of a reaction.

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II B.Sc. Chemistry Paper-V (Inorganic & Physical Chemistry)
(At the end of IV semester) (w.e.f. 2021-2022) (2021-2024 batch)

S.No		10M	5M
Inorganic Chemistry			
1	Coordination Chemistry	2	1
2	Inorganic Reaction Mechanism	1	1
3	Stability of metal complexes	1	1
4	Bioinorganic Chemistry	1	1
Physical Chemistry			
1	Phase rule	1	1
2	Electrochemistry	3	1
3	Chemical Kinetics	1	2
TOTAL		10	08

SRI Y.N.COLLEGE (AUTONOMOUS) – NARSAPUR, W.G.Dt.

(Affiliated to Aadikavi Nannayya University)

Four year B.Sc. (Hons) Domain Subject: **CHEMISTRY**

III B.Sc–Semester –V, Paper VI: Environmental Chemistry (Course code: 6D)

w.e.f 2022-23 (2021-24 batch)

SYLLABUS (2023-24)

I. Learning Outcomes:

Students after successful completion of the course will be able to:

1. Understand the environment functions and how it is affected by human activities.
2. Acquire chemical knowledge to ensure sustainable use of the world's resources and ecosystems services.
3. Engage in simple and advanced analytical tools used to measure the different types of pollution.
4. Explain the energy crisis and different aspects of sustainability.
5. Analyze key ethical challenges concerning biodiversity and understand the moral principles, goals and virtues important for guiding decisions that affect Earth's plant and animal life.

II Syllabus : *(Total Hours: 90, including Teaching, Lab, Field Skills Training, Unit tests etc.)*

UNIT-I

Introduction 10h

Environment Definition – Concept of Environmental chemistry- Scope and importance of environmental chemistry in nowadays – Nomenclature of environmental chemistry – Pollution, Pollutant, Contaminant, Receptor, Sink, Pathway of a pollutant, Threshold limit value (TLV) Segments of environment– Composition and Structure of Atmosphere with temperature profile. Natural resources–Renewable Resources–Solar and biomass energy and Nonrenewable resources – Thermal power and atomic energy – Reactions of atmospheric oxygen and Hydrological cycle.

UNIT-II

Air Pollution 10h

Definition – Sources of air pollution – Classification of air pollutants – Acid rain – Photochemical smog – Global warming-Green house effect – Formation and depletion of ozone layer– Bhopal gas disaster – Controlling methods of air pollution.

UNIT-III

Chemical Toxicology 10h

Toxic chemicals in the environment – effects of toxic chemicals – cyanide and its toxic effects-pesticides and its biochemical effects – toxicity of lead, mercury, arsenic and cadmium. Solid waste management

UNIT-IV

Water pollution 10h

Unique physical and chemical properties of water – Classification of water pollutants – Dissolved oxygen – BOD, COD, Hardness of water – Methods to convert temporary hard water into soft water. Methods to convert permanent hard water into soft water. Eutrophication and its effects. Waste water treatment- Purification of waste water

UNIT-V

Ecosystem 10h

Concepts–structure–Functions and types of ecosystem–Abiotic and biotic components
Energy flow and Energy dynamics of ecosystem– Food chains – Food web– Tropic level
Biogeochemical cycles (carbon, nitrogen and phosphorus)

Biodiversity 10h

Definition – level and types of biodiversity – concept- significance – magnitude and distribution of biodiversity–trends-bio geographical classification of India–biodiversity at national, global and regional level. Necessity of protecting the biodiversity.

III. List of Reference books:

1. Fundamentals of ecology by M.C.Dash
2. A Text book of Environmental chemistry by W. Moore and F.A. Moore
3. Environmental Chemistry by Samir k.Banerji
4. Water pollution, Lalude, MC Graw Hill
5. Environmental Chemistry, Anil Kumar De, Wiley Eastern ltd.
6. Environmental analysis, SM Khopkar (IIT Bombay)
7. Environmental Chemistry by BK Sharma & H Kaur, Goel publishing house.
8. Fundamentals of Environmental Chemistry, Manahan, Stanley. E
9. Applications of Environmental Chemistry, Eugene R. Wiener
10. Web related references suggested by teacher.

Course6-D: Environmental Chemistry – Practical syllabus

IV. Lab work-Skills Outcomes:

On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipments in Chemistry lab.
2. Learn the procedures of preparation of standard solutions.
3. Demonstrate skills in operating instruments.
4. Acquire skills in handling spectrophotometer.
5. Analyse water and soil samples.

Practical (Laboratory) Syllabus: (30hrs) (Max.50Marks).

6. Identification of various equipments in the laboratory.
7. Determination of carbonate and bicarbonate in water samples by double titration method.

8. Determination of hardness of water using EDTA
 - a) Permanent hardness
 - b) Temporary hardness
9. Determination of Chlorides in water samples by Mohr's method.
10. Determination of pH, turbidity and total solids in water sample.
11. Determination of Ca^{+2} and Mg^{+2} in soil sample by flame photometry.
12. Determination of PH in soil samples using pH metry.

V. List of Reference books:

1. A Text Book of Quantitative Inorganic Analysis (3rd Edition)–A.I.Vogel
2. Water pollution, Lalude, MC Graw Hill
3. Environmental analysis, SM Khopkar (IIT Bombay)
4. Web related references suggested by teacher.

VI. Co-Curricular Activities:

a) **Mandatory:** (Training of students by teacher on field related skills: 15hrs)

1. For Teacher: Skills training of students by the teacher in classroom, lab and field for not less than 15 hours on field related quantitative techniques for the water quality parameters, soil pollution and air pollution.

2. For Student: Individual visit to any one of the local field agencies/research laboratories in universities/research organizations/private sector culminating writing and submission of a hand-written fieldwork/project work Report not exceeding 10 pages in the given format.

3. Max marks for Fieldwork/project work Report: 05.

4. Suggested Format for Fieldwork/project work: *Title page, student details, index page, details of places visited, observations, findings and acknowledgements.*

5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Training of students by related industrial experts.
2. Visits to research organizations and laboratories.
3. Invited lectures and presentations on related topics by field / industrial experts.
4. Assignments.
5. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
6. Preparation of videos on tools, techniques and applications of spectrophotometry.

SRI YN COLLEGE (AUTONOMOUS) – NARSAPUR, W.G.Dt.
(Affiliated to Aadikavi Nannayya University)
Four year B.Sc.(Hons)– At the end of V- SEMESTER – w.e.f. 2022-2023 (2021-24 batch)
III B.Sc. Paper- VI: Environmental Chemistry
MODEL PAPER

Time: 3 Hrs

Max. Marks: 75M

PART – A

Answer any FIVE questions choosing at least TWO questions from each SECTION - I & II.

సెక్షన్ I మరియు సెక్షన్ II లలో ప్రతి దాని నుంచి కనీసము రెండు ప్రశ్నలను ఎన్నుకుంటూ మొత్తం ఐదు ప్రశ్నలకు సమాధానములను తెలుపండి.

5X10M = 50M

SECTION – I

1. Explain the structure of Atmosphere with temperature profile.
ఉష్ణోగ్రత రేఖా సూచన చిత్రం ద్వారా వాతావరణ నిర్మాణాన్ని వివరించండి.
2. What are Renewable and Non-renewable energy resources? Explain the following.
పునరుద్ధరింపబడు మరియు పునరుద్ధరింపబడని శక్తి ఓనరులు అనగా నేమి? ఈ దిగువ వాటిని వివరించండి.
i) Solar Energy (సౌర శక్తి) ii) Atomic energy (అణు శక్తి)
3. What are the sources of Air pollution? Explain.
వాయు కాలుష్య ఓనరులు ఏవి? వివరించండి.
4. Describe the Green House Effect and write the consequences of it.
హరిత గృహ ప్రభావాన్ని వర్ణించండి మరియు దాని ప్రభావాలను తెలుపండి.
5. Explain the biochemical effects of pesticides.
చీడ నాశినులు యొక్క జీవ రసాయన ప్రభావాలను వివరించండి.

SECTION – II

6. Explain the methods to convert permanent hard water into soft water.
శాశ్వత ఖరీన జలాన్ని మృదు జలముగా మార్చు పద్ధతులను వివరించండి.
7. Describe the methods for the purification of waste water.
వ్యర్థ నీటిని శుద్ధి చేయు పద్ధతులను వివరించండి.
8. Describe the types of ecosystem.
ఆవరణ వ్యవస్థలోని రకాలను వర్ణించండి.
9. Discuss briefly about food chain.
ఆహారపు వలయమును గురించి క్లుప్తంగా చర్చించుము.
10. Give detailed account on biodiversity.
జీవ వైవిధ్యాన్ని గురించి సంగ్రహముగా తెలుపుము.

PART – B

Answer any FIVE of the following questions.

5 X 5M = 25M

ఈ దిగువున ఉన్న ఏవైనా ఐదు ప్రశ్నలకు సమాధానములు తెలుపండి.

11. Define the following terms.

ఈ దిగువ పదాలను నిర్వచించండి.

- a) Pollutant (కాలుష్యకం) b) Contaminant (మాలిన్యం)
c) Sink (కుండి) d) Threshold limit value (TLV) (కాలుష్యకం యొక్క అవధి విలువ)

12. Write the Reactions of atmospheric oxygen.

వాతావరణం నందలి ఆక్సిజన్ చర్యలను తెలుపండి.

13. How Acid rain forms? What are its effects?

ఆమ్ల వర్షము ఏవిధముగా ఏర్పడును ? దాని ప్రభావాలు ఏవి?

14. Explain the formation and depletion of Ozone layer.

ఓజోన్ పొర ఏర్పడుట మరియు తరిగిపోవుటను గూర్చి వివరించండి.

15. Write the biochemical effect of Cyanide.

సైనైడ్ యొక్క జీవ రసాయన ప్రభావమును గూర్చి తెలుపండి.

16. What is Eutrophication? What are its effects?

యుట్రోఫికేషన్ అనగా నేమి ? దాని ప్రభావాలు ఏవి?

17. Write the structure of the Ecosystem.

ఆవరణ వ్యవస్థ యొక్క నిర్మాణాన్ని తెలుపండి.

18. What is the necessity of protecting the Biodiversity?

జీవ వైవిధ్యాన్ని పరి రక్షించ ఆవశ్యకత ఏమి?

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Four year B.Sc.(Hons)– At the end of V- SEMESTER – w.e.f. 2022-2023 (2021-24 batch)
III B.Sc. Paper- VI: Environmental Chemistry

S.No		10M	5M
Section-I			
1	UNIT I: Introduction	2	2
2	UNIT II: Air pollution	2	2
3	UNIT III: Chemical Toxicology	1	1
Section-II			
1	UNIT IV: Water pollution	2	1
2	UNIT V: Ecosystem	2	1
3	Biodiversity	1	1
	Total questions	10	08

SRI Y.N.COLLEGE (AUTONOMOUS) – NARSAPUR, W.G.Dt.

(Affiliated to Aadikavi Nannayya University)

Four year B.Sc. (Hons) Domain Subject: **CHEMISTRY**

III B.Sc–Semester –V, Paper VII: Green Chemistry and Nanotechnology

At the end of V-Semester w.e.f 2022-23 (2021-24 batch)

SYLLABUS (2023-24)

1. Learning Outcomes:

Students after successful completion of the course will be able to:

1. Understand the importance of Green chemistry and Green synthesis.
2. Engage in Microwave assisted organic synthesis.
3. Demonstrate skills using the alternative green solvents in synthesis.
4. Demonstrate and explain enzymatic catalysis.
5. Analyse alternative sources of energy and carry out green synthesis.
6. Carry out the chemical method of nanomaterial synthesis.

II. Syllabus: Total Hours: 90, including Teaching, Lab, Field Training, Unit tests etc.)

UNIT-I Green Chemistry: Part- I

10 hrs

Introduction-Definition of green Chemistry, Need for green chemistry, Goals of Green chemistry Basic principles of green chemistry. Green synthesis- Evaluation of the type of the reaction

i) Rearrangements (100% atom economic), ii) Addition reaction (100% atom economic). Organic reactions by Sonication method: apparatus required and examples of sonochemical reactions (Heck, Hunsdiecker and Wittig reactions).

UNIT- II Green Chemistry: Part- II

10 hrs

A) Selection of solvent:

- i) Aqueous phase reactions
- ii) Reactions in ionic liquids, Heck reaction, Suzuki reactions, epoxidation.
- iii) Solid supported synthesis

B) Supercritical CO₂: Preparation, properties and applications, (decaffeination, drycleaning)

C) Green energy and sustainability.

UNIT-III Microwave and Ultrasound assisted green synthesis:

10 hrs

Apparatus required, examples of MAOS (synthesis of fused anthroquinones, Leukart reductive amination of ketones) - Advantages and disadvantages of MAOS. Aldolcondensation – Cannizzaro reaction- Diels-Alder reactions-Strecker's synthesis

UNIT-IV: Green catalysis and Green synthesis

10 hrs.

Heterogeneous catalysis, use of zeolites, silica, alumina, supported catalysis - bio catalysis:

Enzymes, microbes Phase transfer catalysis (micellar /surfactant)

1. Green synthesis of the following compounds: adipic acid, catechol, disodium menudo acetate (alternative Strecker's synthesis)

2. Microwave assisted reaction in water –Hoffmann elimination – methyl benzoate to benzoic acid – oxidation of toluene and alcohols–microwave assisted reactions in organic solvents. Diels-Alder reactions and decarboxylation reaction.

3. Ultrasound assisted reactions–sonochemical Simmons–Smith reaction (ultrasonic alternative to iodine)

UNIT - V: Nanotechnology and Material science

10 hrs

Nanotechnology:

Basic concepts of Nano science and Nanotechnology, Synthetic techniques of nanomaterials - Bottom-up approach and Top down approaches. Classification, properties and application of Nanomaterials.

Material science:

Super conductivity-transition temperature, properties and applications of superconductors, Types of super conductors-difference between type-I and type-II super conductors, Meissner effect, magnetic levitation, Composite materials-particle reinforced composites and fibre reinforced composites.

III. Lab work - Skills Outcomes:

On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipment in the laboratory.
2. Learn the procedures of green synthesis.
3. Demonstrate skills in the preparation of Nanomaterials.
4. Acquire skills in Microwave assisted organic synthesis.
5. Perform some applications of Nanomaterials.
6. Determination of Viscosity and Surface Tension of organic liquids

IV. Practical (Laboratory) Syllabus: (30 hrs.) (Max.50 Marks).

1. Identification of various equipment in the laboratory.
2. Acetylation of 1^o amine by green method: Preparation of acetanilide
3. Rearrangement reaction in green conditions: Benzil - Benzilic acid rearrangement
4. Radical coupling reaction: Preparation of 1,1-bis -2-naphthol
5. Green oxidation reaction: Synthesis of adipic acid
6. Preparation and characterization of biodiesel from vegetable oil/ waste cooking oil

7. Preparation and characterization of Nanoparticles of gold using tea leaves.
8. Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.
9. Photo reduction of Benzophenone to Benzopinacol in the presence of sunlight.

V. Reference books:

1. Green Chemistry Theory and Practical. P.T.Anatas and J.C. Warner
2. Green Chemistry V.K. Ahluwalia Narosa, New Delhi.
3. Real world cases in Green Chemistry M.C. Cann and M.E. Connelly
4. Green Chemistry: Introductory Text M.Lancaster: Royal Society of Chemistry (London)
5. Principles and practice of heterogeneous catalysis, Thomas J.M., Thomas M.J., John Wiley
6. Green Chemistry: Environmental friendly alternatives R S Sanghli and M.M Srivastava, Narosa Publications
7. Nanotechnology: Health and Environmental Risks, Jo Anne Shatkin, CRC Press (2008).
8. Green Processes for Nanotechnology: From Inorganic to Bioinspired Nanomaterials, Vladimir A. Basiuk, Elena V. Basiuk Springer (2015)
9. Web related references suggested by teacher.

VI. Co-Curricular Activities:

a) Mandatory: (*Training of students by teacher on field related skills: 15 hours*)

1.For Teacher: Training of students by the teacher in the classroom or in the laboratory for not less than 15 hours on field related quantitative techniques for Enzymatic catalysis, Microwave assisted organic synthesis, Biodiesel preparation etc.

2.For Student: Individual visit to any one of the local field agencies, research laboratories in universities/research organizations/private sector culminating writing and submission of a hand-written fieldwork/project work Report not exceeding 10 pages in the given format.

3. Max marks for fieldwork/project work Report: 05.

4. Suggested Format for fieldwork/project work: *Title page, student details, index page, details of places visited, observations, findings and acknowledgements.*

5. Unit tests (IE).

b) Suggested Co-Curricular Activities:

1. Training of students by related industrial experts.
2. Visits to research organizations and laboratories.
3. Invited lectures and presentations on related topics by field / industrial experts.
4. Assignments.
5. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
6. Preparation of videos on tools, techniques and applications of Green chemistry and Nano synthesis.

SRI YN COLLEGE (AUTONOMOUS) – NARSAPUR, W.G.Dt.
(Affiliated to Aadikavi Nannayya University)
Four year B.Sc.(Hons)– At the end of V- SEMESTER – w.e.f. 2022-2023 (2020-23 batch)
III B.Sc. Paper- VII: Green Chemistry and Nanotechnology
MODEL PAPER

Time: 3 Hrs

Max. Marks: 75M

PART – A

Answer any five questions choosing at least two questions from each SECTION - I & II. **5X10 = 50M**

SECTION – I

1. Write the 12 basic principles of Green Chemistry?
2. Illustrate the sonication method with any two reactions
3. Describe the preparation and properties of super critical carbon dioxide
4. Explain the synthesis of fused anthroquinones by microwave assisted organic synthesis
5. Explain the following by Microwave and Ultrasound assisted green synthesis
 - a) Aldol condensation
 - b) Cannizzaro reaction
 - c) Diels-Alder reaction

SECTION – II

6. How are adipic acid and catechol prepared by Green Synthesis?
7. Explain the following by Microwave assisted reactions in water.
 - a) Hoffmann elimination
 - b) Methyl benzoate to benzoic acid
 - c) Oxidation of toluene and alcohol
8. Explain the properties and synthetic techniques of nanomaterials
9. Write the properties and applications of the super conductors?
10. Describe the types of super conductors in detail

PART – B

Answer any five of the following questions.

5 X 5M = 25M

11. What is the need of green chemistry?
12. Discuss 100% atom economic addition reaction.
13. Write short note on Suzuki reaction and epoxidation
14. Describe the green synthetic procedure for the Strecker's synthesis
15. Brief about Bio catalysis
16. Write the applications of Nano material
17. What is Meissner effect? Write its applications.
18. Explain Magnetic levitation

BLUE PRINT

Four year B.Sc.(Hons)– At the end of V- SEMESTER – w.e.f. 2022-2023 (2020-23 batch)

III B.Sc. Paper- VII: Green Chemistry and Nanotechnology

S.No		10M	5M
Section-I			
1	UNIT-I : Green Chemistry: Part- I	2	2
2	UNIT- II: Green Chemistry: Part- II	1	1
3	UNIT-III: Microwave and Ultrasound assisted green synthesis.	2	1
Section-II			
1	UNIT-IV: Green catalysis and Green synthesis	2	1
2	UNIT – V: Nanotechnology & Material science	3	3
Total questions		10	08

DEPARTMENT OF CHEMISTRY
SYLLABUS FOR CERTIFICATE COURSE
IN
ENVIRONMENTAL CHEMISTRY

2022-23

1. Introduction:

Concept and scope of Environmental Chemistry, Definition of Environment and Environmental Chemistry, Terminology - Pollution, Pollutant, Contaminant, Receptor, Sink, Pathways of a pollutant, Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Threshold Limit Value (TLV).

2. Environmental Segments:

Atmosphere, Hydrosphere, Lithosphere -Structure of soil profile, Biosphere. Composition of Atmosphere, Atmospheric Structure-major regions(Troposphere,Stratosphere, Mesosphere and Thermosphere) of the atmosphere with temperature profile.

3. Green House Effect (Global Warming):

What is Green House Effect; How the Green House Effect is produced, Major sources of Green House gases, Consequences of Green House Effect. Measures to prevent Global Warming.

4. Chloro Fluoro Carbons (CFCs) :

What are Chloro Fluoro Carbons cause of Ozone layer depletion, Mechanism of Ozone Layer depletion by CFCs, Consequences of Ozone Layer depletion.

5. Air Pollution:

Air pollutants- Acid rain, how acid rain is formed, what are the adverse effects of acid rain. What is Photochemical smog, how Peroxy acetyl nitrate (PAN) is formed. What is the role of Tetra Ethyl Lead (TEL) in petrol?

6. Water Pollution:

Classification of water pollutants, Organic pollutants- Oxygen demanding waste, Disease causing waste, Synthetic Organic Compounds, Sewage and agricultural run-off, Oil. Inorganic pollutants- Radioactive materials, Heat. Eutrophication and its consequences. Bio-amplification.

7. Chemical Toxicology:

Toxic Chemicals in Environment, Biochemical effects of Arsenic, Lead and Mercury, Impact of toxic chemicals on Enzymes. Biochemical effects of ozone and PAN, Biochemical effects of pesticides.


CHAIRMAN 3/9/22

Certificate Course in Environmental Chemistry

Model paper

Time: 3 hrs

Max Marks: 50

Section-A

Answer any two of the following

2 X 15 = 30

1. How is atmosphere divided? Discuss the characteristics of the major regions with temperature profile
2. What is water pollution? How water pollutants are classified? Discuss various pollutants in detail
3. What is Air pollution? Explain the mechanism of depletion of Ozone layer by CFCs and what are its consequences.

Section-B

Answer any five of the following

5 X 4 = 20

4. What is Acid rain? What are its adverse effects?
5. What is BOD and COD?
6. Draw the soil profile
7. What is Green House Effect? What are its consequences
8. What is Eutrophication?
9. Give the composition of Air
10. Explain Bio-amplification
11. Define the term Sinks and TLV


CHAIRMAN 3/9/22

Certificate course in Environmental Chemistry

Blue Print

S.No	Name of the Chapter	Essay	Short note
1	Introduction		2
2	Environmental Segments	1	2
3	Green Hourse Effect		1
4	Chlorofluoro Carbons		
5	Air pollution	1	1
6	Water pollution	1	1
7	Chemical Toxicology		1

BRIDGE COURSE SYLLABUS

for the Degree 1st year 2023-24 admitted batch

- **UNIT -1:**

Basic concepts of Chemistry: Avogadro's number, mole concept, Concept of valency, Atomic number, Concept of cation and anion, Radicals, writing of formulas.

- **UNIT – 2:**

Structure of atom: Fundamental particles of atom, Atomic models- Rutherford model, Bohr's model. Electronic configuration of elements, Aufbau principle, Hund's rule, Pauli's exclusion principle.

- **UNIT – 3:**

Periodic classification of elements: Modern periodic law, Mendaleef periodic table, Periodic properties – Atomic size, Ionizational potential, Electronegativity

- **UNIT – 4:**

Chemical bonding: Types of chemical bonds, Ionic bond, Covalent bond, Coordination covalent bond, Hydrogen bond

- **UNIT – 5:**

Fundamentals in organic chemistry: Basic idea of Aliphatic and Aromatic compounds, Alkyl groups, Aryl groups, functional groups. Fundamentals of organic reaction mechanism. Hydrocarbons.