B.Sc. Major – Chemistry Honours
Semester- I Course Structure

S.No	Subject / paper	Course Code	Title	Total hrs/ w eek	Remarks	Credits
1.	**Major Paper I Course**		Essentials and applications of Mathematical, Physical and Chemical Sciences	05	No Lab	4
2.	**Major Paper II Course**		Advances in Mathematical, Physical and Chemical Sciences	05	No Lab	4
3.	**Multidisciplinary courses**		Introduction to Social Work Principles of Psychology Indian History Principles of Biological Sciences	02	A student has to choose **ONE** course from among the six courses listed against the semester.	2
4.	**Skill Enhancement courses (2 paper)**		Entrepreneurship Development Leadership Skills Analytical Skills Communication Skills	Each course/ Paper 2 hrs per week	A student has to choose any **TWO** of four courses	4
5.	**English**		A Course in Communication and Soft Skills	04		3
6.	**Telugu/ Hindi**		Relevant paper	04		3
TOTAL COURSES = 07 **TOTAL CREDITS = 20**						

B.Sc. Major – Chemistry Honours
Semester – II Course Structure

S.No	Subject/ paper	Course Code	Title	Total hrs /week	Remarks	Credits
1.	**Major III**		General & Inorganic Chemistry	3		3
2	**Major-III Practical**		Analysis of Simple Salt	2		1
3	**Major-IV**		Inorganic Chemistry	3		3
4	**Major- IV Practical**		Preparation of Inorganic Compounds	2		1
5	**Minor I**		Opted paper	3		3
6	**Minor Practical**		Opted paper	2		1
7	**First Language**		English	4		3
8	**Second Language**		Telugu/ Hindi	4		3
9	**Skill Enhancement Course I & II (2 Papers)**		Business Writing	2+2= 4	A Student has to choose any TWO of five courses	4
			Marketing Skills			
			Investment Planning			
			Stock Market Operations			
			Digital Literacy			

Total courses = 7 (Theory) + 3 (Practical)
Total Credits = 22

ADITYA DEGREE COLLEGE (A) KAKINADA
B.SC., CHEMISTRY

ANNEXURE – I

SYLLABI & MODEL PAPERS

(w.e.f. 2024 – 2025)

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs / Week	No. of Credits
I	I	1	Essentials and Applications of Mathematical,Physical and Chemical Sciences	5	4
	I	2	AdvancesinMathematical, Physicaland ChemicalSciences	5	4

ADITYA DEGREE COLLEGE (A) KAKINADA
B.SC., CHEMISTRY

I -SEMESTER

COURSE 1: ESSENTIALS AND APPLICATIONS OF MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

Hours: 5hrs/week Credits: 4

Course Objective:

The objective of this course is to provide students with a comprehensive understanding of the essential concepts and applications of mathematical, physical, and chemical sciences. The course aims to develop students' critical thinking, problem-solving, and analytical skills in these areas, enabling them to apply scientific principles to real-world situations.

Learning outcomes:

1. Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.

2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations

3. To Explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.

4. Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical

principles can be used to explain and predict phenomena in different contexts.

5 To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.

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

efinition and Scope of Chemistry- Importance of Chemistry in daily life -Branches of chemistry and significance- Periodic Table- Electronic Configuration, chemical changes, classification of matter, Biomolecules- carbohydrates, proteins, fats and 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:

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

Recommended books:

1. Functions of one complex variable by John.B.Conway, Springer- Verlag.

2. Elementary Trigonometry by H.S.Hall and S.R.Knight

3. Vector Algebra by A.R.Vasishtha, Krishna Prakashan Media(P)Ltd. 4.Basic Statistics by B.L.Agarwal, New age international Publishers

5. University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman

6. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker

7. Physics for Scientists and Engineers with Modern Physics" by Raymond A. Serway and John W. Jewett Jr.

8. Physics for Technology and Engineering" by John Bird

9. Chemistry in daily life by Kirpal Singh

10. Chemistry of bio molecules by S. P. Bhutan

11. Fundamentals of Computers by V. Raja Raman

12. Cyber Security Essentials by James Graham, Richard Howard, Ryan Olson

STUDENT ACTIVITIES

UNIT I: ESSENTIALS OF MATHEMATICS:

1: Complex Number Exploration

Provide students with a set of complex numbers in both rectangular and polar forms.

They will plot the complex numbers on the complex plane and identify their properties 2: Trigonometric Ratios Problem Solving

Give students a set of problems that require the calculation of trigonometric ratios and their relations.

Students will solve the problems using the appropriate trigonometric functions (sine, cosine,tangent, etc.) and trigonometric identities.

3: Vector Operations and Applications

Provide students with a set of vectors in Cartesian form.

Students will perform vector addition and subtraction operations to find the resultant vectors.They will also calculate the scalar and vector products of given vectors.

4: Statistical Measures and Data Analysis

Give students a dataset containing numerical values.

Students will calculate the mean, median, and mode of the data, as well as other statistical measures if appropriate (e.g., range, standard deviation).

They will interpret the results and analyze the central tendencies and distribution of the data.

UNIT II: ESSENTIALS OF PHYSICS:

1. Concept Mapping

Divide students into groups and assign each group one of the topics.

Students will create a concept map illustrating the key concepts, relationships, and

applicationsrelated to their assigned topic.

Encourage students to use visual elements, arrows, and labels to represent connections and interdependencies between concepts.

2. Laboratory Experiment

Select a laboratory experiment related to one of the topics, such as motion of objects or electricand magnetic fields.

Provide the necessary materials, instructions, and safety guidelines for conducting theexperiment.

Students will work in small groups to carry out the experiment, collect data, and analyze theresults.

After the experiment, students will write a lab report summarizing their findings, observations,and conclusions.

UNIT III: ESSENTIALS OF CHEMISTRY

1: Chemistry in Daily Life Presentation

Divide students into groups and assign each group a specific aspect of daily life where chemistry plays a significant role, such as food and nutrition, household products, medicine, or environmental issues.

Students will research and create a presentation (e.g., PowerPoint, poster, or video) that showcases the importance of chemistry in their assigned aspect.

2: Periodic Table Exploration

Provide students with a copy of the periodic table.

Students will explore the periodic table and its significance in organizing elements based on their properties.

They will identify and analyze trends in atomic structure, such as electronic configuration,

atomic size, and ionization energy.

3: Chemical Changes and Classification of Matter

Provide students with various substances and chemical reactions, such as mixing acids andbases or observing a combustion reaction.

Students will observe and describe the chemical changes that occur, including changes in color, temperature, or the formation of new substances.

4: Biomolecules Investigation

Assign each student or group a specific biomolecule category, such as carbohydrates, proteins, fats, or vitamins.

Students will research and gather information about their assigned biomolecule category, including its structure, functions, sources, and importance in the human body.

5: **Identification of drugs, brand drugs and generic drugs. Select a dozen drugs available in the market and prepare an excel table with brand drug name, generic drug name, active pharmaceutical ingredient, other ingredients, usage of the drug, and structure of the drug. (For B.Sc., Chemistry students)**

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

Examples include investigating the relationship between concentration and reaction rate,analyzing the behavior of electrical circuits, or measuring the properties of materials.

.4: Mathematical Modeling
Present students with real-world problems that require mathematical modeling and analysis.

UNIT V: ESSENTIALS OF COMPUTER SCIENCE:

1. Identifying the attributes of network (Topology, service provider, IP address and bandwidth of
2. your college network) and prepare a report covering network architecture.
3. Identify the types of malwares and required firewalls to provide security.
4. Latest Fraud techniques used by hackers.

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Course– I ESSENTIALS OF MATHEMATICAL, PHYSICAL & CHEMICAL SCIENCES

Model Scheme of Paper

Time:3Hrs (w.e.f. 2024-2025) (70Marks)

SECTION A (Multiple Choice Questions) 30x1=30M

30Multiple Choice Questions (6 Questions from each unit)

SECTION B (Fill in the blanks) 10x1=10M

10 Fill in the Blanks (2 Questions from each unit)

SECTION C (Very short answer questions) 10x1=10M

10 Very short answer questions (2 Questions from each unit)

SECTIOND(Matching)(From5Units) 2x5=10M

1 A
B
C
D
E

2 A
B
C
D
E

SECTION E (True or False) 10x1=10M

10 True or False (Each Unit 2 Questions)

ADITYA DEGREE COLLEGE (A) KAKINADA
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I - SEMESTER
(w.e.f. 2024-2025)

COURSE 2: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICALSCIENCES

Hours: 5 hrs/week Credits: 4

Course Objective:

The objective of this course is to provide students with an in-depth understanding of the recent advances and cutting-edge research in mathematical, physical, and chemical sciences. The course aims to broaden students' knowledge beyond the foundational concepts and expose them to the latest developments in these disciplines, fostering critical thinking, research skills, and the ability to contribute to scientific advancements.

Learning outcomes:

1. Explore the applications of mathematics in various fields of physics and chemistry, to understand how mathematical concepts are used to model and solve real-world problems.

2. To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations.

3. Understand the different sources of renewable energy and their generation processes and advances in nanomaterials and their properties, with a focus on quantum dots. To study the emerging field of quantum communication and its potential applications. To gain an understanding of the principles of biophysics in studying biological systems. Explore the properties and applications of shape memory materials.

3. Understand the principles and techniques used in computer-aided drug design and drug delivery systems, to understand the fabrication techniques and working principles of nanosensors. Explore the effects of chemical pollutants on ecosystems and human health.

4. Understand the interplay and connections between mathematics, physics, and chemistry in various advanced applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.

5 Understand and convert between different number systems, such as binary, octal, decimal, and hexadecimal. Differentiate between analog and digital signals and understand their characteristics.Gain knowledge of different types of transmission media, such as wired (e.g.,

copper cables, fiber optics) and wireless (e.g., radio waves, microwave, satellite)..

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 Renewable energy: 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.

Recommended books:

1. Coordinate Geometry by S.L.Lony, Arihant Publications
2. Calculus by Thomas and Finny, Pearson Publications
3. Matrices by A.R.Vasishtha and A.K.Vasishtha, Krishna Prakashan Media(P)Ltd.
4. "Renewable Energy: Power for a Sustainable Future" by Godfrey Boyle
5. "Energy Storage: A Nontechnical Guide" by Richard Baxter
6. "Nanotechnology: Principles and Applications" by Sulabha K. Kulkarni and Raghvendra A. Bohara
7. "Biophysics: An Introduction" by Rodney Cotterill
8. "Medical Physics: Imaging" by James G. Webster
9. "Shape Memory Alloys: Properties and Applications" by Dimitris C. Lagoudas
10. Nano materials and applications by M.N.Borah
11. Environmental Chemistry by Anil.K.D.E.
12. Digital Logic Design by Morris Mano
13. Data Communication & Networking by Bahrouz Forouzan.

STUDENT ACTIVITIES

UNIT I: ADVANCES IN BASIC MATHEMATICS

1: Straight Lines Exploration

Provide students with a set of equations representing straight lines in different forms, such as slope-intercept form, point-slope form, or general form.
Students will explore the properties and characteristics of straight lines, including their slopes, intercepts, and point of intersection.

2: Limits and Differentiation Problem Solving

Students will apply the concept of limits to solve various problems using standard limits.

Encourage students to interpret the results and make connections to real-world applications, such as analyzing rates of change or optimizing functions.

3: Integration Exploration

Students will explore the concept of integration as a reverse process of differentiation and apply basic methods of integration, such as the product rule, substitution method, or

integration by parts.

Students can discuss the significance of integration in various fields, such as physics and chemistry

4: Matrices Manipulation

Students will perform operations on matrices, including scalar multiplication, matrix multiplication, and matrix transpose.

Students can apply their knowledge of matrices to real-world applications, such as solving systems of equations or representing transformations in geometry.

UNIT II: ADVANCES IN PHYSICS:

1: Case Studies

Provide students with real-world case studies related to renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials.

Students will analyze the case studies, identify the challenges or problems presented, and propose innovative solutions based on the recent advances in the respective field.

They will consider factors such as energy generation, energy storage, efficiency,

sustainability, materials design, biomedical applications, or technological advancements.

2: Experimental Design

Assign students to design and conduct experiments related to one of the topics: renewable energy, nanotechnology, biophysics, medical physics, or shape memory materials.

They will identify a specific research question or problem to investigate and design an experiment accordingly.

Students will collect and analyze data, interpret the results, and draw conclusions based on their findings.

They will discuss the implications of their experimental results in the context of recent advances in the field.

3: Group Discussion and Debate

Organize a group discussion or debate session where students will discuss the ethical, social, and environmental implications of the recent advances in renewable energy, nanotechnology, biophysics, medical physics, and shape memory materials.

Assign students specific roles, such as proponent, opponent, or moderator, and provide them with key points and arguments to support their positions.

UNIT III: ADVANCES IN CHEMISTRY:

1. Experimental Design and Simulation

In small groups, students will design experiments or simulations related to the assigned topic.

For example, in the context of computer-aided drug design, students could design a virtual screening experiment to identify potential drug candidates for a specific disease target.

For nano sensors, students could design an experiment to demonstrate the sensitivity and selectivity of nano sensors in detecting specific analytes.

Chemical biology-related activities could involve designing experiments to study enzyme-substrate interactions or molecular interactions in biological systems.

Students will perform their experiments or simulations, collect data, analyze the results, and draw conclusions based on their findings.

2. Case Studies and Discussion

Provide students with real-world case studies related to the impact of chemical pollutants on ecosystems and human health.

Students will analyze the case studies, identify the sources and effects of chemical pollutants, and propose mitigation strategies to minimize their impact.

Encourage discussions on the ethical and environmental considerations when dealing with chemical pollutants.

For the dye removal using the catalysis method, students can explore case studies where catalytic processes are used to degrade or remove dyes from wastewater.

Students will discuss the principles of catalysis, the advantages and limitations of the catalysis method, and its applications in environmental remediation.

3: Group Project

Assign students to work in groups to develop a project related to one of the topics.

The project could involve designing a computer-aided drug delivery system, developing a nano sensor for a specific application, or proposing strategies to mitigate the impact of chemical pollutants on ecosystems.

Students will develop a detailed project plan, conduct experiments or simulations, analyze data, and present their findings and recommendations.

Encourage creativity, critical thinking, and collaboration throughout the project.

UNIT IV: ADVANCED APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

1: Mathematical Modelling Experiment

Provide students with a mathematical modelling experiment related to one of the topics. For example, in the context of renewable energy, students can develop a mathematical model to optimize the placement and configuration of solar panels in a solar farm.

Students will work in teams to design and conduct the experiment, collect data, and analyze the results using mathematical models and statistical techniques.

They will discuss the accuracy and limitations of their model, propose improvements, and

interpret the implications of their findings in the context of renewable energy or the specific application area.

2: Case Studies and Group Discussions

Assign students to analyze case studies related to the applications of mathematical modelling in nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.

Students will discuss the mathematical models and computational methods used in the case studies, analyze the outcomes, and evaluate the effectiveness of the modelling approach.

Encourage group discussions on the challenges, ethical considerations, and potential advancements in the field.

Students will present their findings and engage in critical discussions on the advantages and limitations of mathematical modelling in solving complex problems in these areas.

3. Group Project

Assign students to work in groups to develop a group project that integrates mathematical modelling with one of the application areas: renewable energy, nanotechnology, biophysics, medical physics, solid waste management, environmental remediation, or water treatment.

The project could involve developing a mathematical model to optimize the delivery of radiation therapy in medical physics or designing a mathematical model to optimize waste management practices.

Students will plan and execute their project, apply mathematical modelling techniques, analyze the results, and present their findings and recommendations.

Encourage creativity, critical thinking, and collaboration throughout the project.

UNIT V: Advanced Applications of computer Science

1. Students must be able to convert numbers from other number system to binary number systems

2. Identify the networking media used for your college network

3. Identify all the networking devices used in your college premises.

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Course– II : ADVANCES OF MATHEMATICS, PHYSICAL & CHEMICAL SCIENCES

Model Scheme of Paper

Time: 3Hrs (w.e.f.2024-2025) (70Marks)

SECTION A (Multiple Choice Questions) 30x1=30M

30Multiple Choice Questions (6 Questions from each unit)

SECTION B (Fill in the blanks) 10x1=10M 10

Fill in the Blanks (2 Questions from each unit)

SECTION C (Very short answer questions) 10x1=10M 10

Very short answer questions (2 Questions from each unit)

SECTION D (Matching) (From 5 Units) 2x5=10M

1 A
B
C
D
E

2 A
B
C
D
E

SECTION E (True or False) 10x1=10M

10 True or False (Each Unit 2 Questions)

ADITYA DEGREE COLLEGE (A) KAKINADA
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B.Sc., HONOURS CHEMISTRY: MAJOR

SEMESTER– II

(w.e.f.2024-2025)

Course structure

SEMESTER	Course Code	Title	Hr/ week	Credits
II	3	General & Inorganic Chemistry-(T)	3	3
		General & Inorganic Chemistry-(P)	2	1
	4	Inorganic Chemistry-I- (T)	3	3
		Inorganic Chemistry-I- (P)	2	1

ADITYA DEGREE COLLEGE (A) KAKINADA
B.SC., CHEMISTRY

II- SEMESTER

Course Code 3: GENERAL AND INORGANIC CHEMISTRY
(w.e.f.2024-2025)

Credits: 03

Course Outcomes: At the end of the course the student will be able to-

1. Understand the structure of atom and the arrangement of elements in the periodic table.
2. Understand the nature and properties of ionic compounds.
3. Identify the structure of a given inorganic compound.
4. Explain the existence of special types of compounds through weak chemical forces.
5. Define acids and bases and predict the nature of salts.

Syllabus:

Unit I: Atomic Structure and Periodic table (9 h)

Electronic configuration: Bohr theory, duel 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. 1.3 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 (9 h)

Ionic Compounds – Definition , 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. 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: The Covalent Bond (9 h)

Valance Bond theory-arrangement of electrons in molecules, hybridization of atomic orbitals and geometry of molecules-$BeCl_2$, BF_3, CH_4, PCl_5, SF_6– VSEPR model-effect of bonding and nonbonding electrons on the structure of molecules, effect of electronegativity,

isoelectronic principle, illustration of structures by VESPR model-NH_3, H_2O, SF_4, ICl^-, ^{4}

ICl^2, XeF_4, XeF_6

Molecular orbital theory -LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2, O_2, CO and NO)

UNIT 4: Metallic and Weak Bonds (9 h)

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.

UNIT 5: Acids and Bases (9 h)

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, pK_a, pK_b. Types of salts, Salt hydrolysis. Pearson's concept, HSAB principle & its importance, bonding in Hard-Hard and Soft-Soft combinations.

ADDITIONAL INPUTS: (No question should be given from additional inputs in examinations)

Solubility Product, Common ion effect, Ion induced dipole.

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,

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B.SC., CHEMISTRY

II - SEMESTER

Course Code 3: GENERAL AND INORGANIC CHEMISTRY

Credits: 01

Practical- I Qualitative Analysis of SIMPLE SALT

Qualitative inorganic analysis (Minimum of Six simple salts should be analysed) 50 M

Course outcomes:

At the end of the course, the student will be able to;

1. Understand the basic concepts of qualitative analysis of inorganic simple salt.
2. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
3. Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis

I. Laboratory course syllabus: Analysis of SIMPLESALT 50 M

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.

(Suggested to implement semi micro qualitative analysis by using chemicals and reagents in microscale to attain green approach and to reduce wastage and pollution.

Co-curricular activities and Assessment Methods

1. Continuous Evaluation: Monitoring the progress of student's learning.
2. Class Tests, Work sheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER

Reference books: 1. Vogel's Quanlitative Inorganic Analysis, Seventh edition, Pearson.

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COURSE NAME: **B.Sc., HONOURS CHEMISTRY - MAJOR**

MODEL QUESTION PAPER- THEORY

SEMESTER-II

PAPER: GENERAL & INORGANIC CHEMISTRY

(w.e.f. 2024-2025)

Time: 3 hours Max.Marks: 70M

SECTION-A

Answer any 5 questions. Each question carries 4 marks **5 x 4 = 20M**

1. Explain Heisenberg uncertainty principle and Hund's rule.
2. Write a note on stability of ionic compounds.
3. Explain structures of SF_4, NH_3 using VSEPR theory.
4. Write about inter and intra molecular hydrogen bond.
5. Write about protic and aprotic solvents.
6. Explain geometry of CH_4& SF_6 using Valence Bond theory.
7. Explain significance of wave functions.
8. Define pH, pK_a, pK_b.

SECTION-B

Answer all the questions, Each question carries 10 marks. **5 x 10 = 50M**

9. a. Write about (i) Bohr Theory. (ii) Paulis exclusion principle.

(or)

b. Explain general properties of atoms (i) atomic radii & ionic radii (ii) ionization potential (iii) electronegativity.

10. a. What are properties of ionic compounds. Explain any three factors favouring the formation of ionic compounds.

(or)

b. Write about (i) Born –Haber Cycle (ii) Fajan's rules

11. a. Write advantage of MO theory over VBT. Construct the MO diagrams for O_2 and CO molecules.

(or)

b. Explain Valence bond theory and concept of hybridization by taking any two examples.

12. a. Write about Band theory of metals. Explain about conductors, semiconductors and insulators.

(or)

b. Explain free electron theory. Explain metallic properties.

13. a. Explain Bronsted Lowry theory and Lewis acid base theory.

(or)

b. Define Pearson's concept. Explain HSAB Principle and its importance in bonding.

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II - SEMESTER

Course Code 4: INORGANIC CHEMISTRY- I
(w.e.f.2024-2025)

Credits: 03

Course outcomes:

At the end of the course, the student will be able to:

1. Understand the basic concepts of p-block elements.
2. Explain the concepts of d-block elements
3. Distinguish lanthanides and actinides.
4. Describe the importance of radioactivity.

Syllabus:

UNIT –I Chemistry of p-block elements – I 9 h

Group 13: Preparation & structure of Diborane, Borazine and $(BN)_x$ Group14: 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 9 h

Group 16: Classification of Oxides, structures of oxides and Oxoacids of Sulphur Group 17: Preparation and Structures of Interhalogen compounds. Pseudohalogens,

UNIT-III Chemistry of d-block elements: 9 h

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-IV Chemistry of f-block elements: 9 h

Chemistry of lanthanides - electronic configuration, oxidation states, lanthanide contraction, consequences of lanthanide contraction, colour, magnetic properties.

Separation of lathanides by solvent extraction & ion exchange method.

Chemistry of actinides - electronic configuration, oxidation states, actinide contraction, comparison of lanthanides and actinides.

Unit – V Radioactivity 9 h

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.

List of 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

II -SEMESTER

Course Code 4: INORGANIC CHEMISTRY- I (Practicals)

Credits: 01

Course outcomes:

At the end of the course, the student will be able to:

1. Understand the basic concepts of inorganic preparations.
2. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
3. Apply the properties of various elements for the preparation of inorganic compounds.

ADITYA DEGREE COLLEGE (A) KAKINADA
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Syllabus:

Preparation of Inorganic compounds:

1. **Methods of expressing Concentrations – Molarity, Normality, ppm, ppb, w/v, v/v, mole fraction (addition)**
2. Crystallization of compounds and determination of melting point.
3. Preparation of Cuprous chloride.
4. Preparation of Potash Alum.
5. Preparation of Chrome Alum.
6. Preparation of Ferrous oxalate
7. Preparation of Ferrous ammonium sulphate.

Co-curricular activities and Assessment Methods

1. Continuous Evaluation: Monitoring the progress of student's learning
2. Class Tests, Worksheets and Quizzes
3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
4. SEMESTER -End Examination: critical indicator of student's learning and teaching methods adopted by teachers throughout the SEMESTER .

Reference books:

1. Vogel's Quanlitative Inorganic Analysis, Seventh edition, Pearson.

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COURSE NAME: B.Sc., HONOURS CHEMISTRY - MAJOR
MODEL QUESTION PAPER- THEORY
SEMESTER-II
PAPER: INORGANIC CHEMISTRY-I

Time: 3 hours (w.e.f. 2024-2025) Max.Marks: 70M

SECTION-A

Answer any 5 questions. Each question carries 4 marks 5 x 4 = 20M

1. What are silicones. Write their classification.
2. What are Pseudohalogens. Give examples.
3. Write about variable valence of d-block elements
4. Write about magnetic properties of lanthanides.
5. Write note on isotopes and n/p ratio.
6. Explain the structure of borazine.
7. Compare Lanthanides and Actinides.
8. Write a note on oxoacids of sulphur.

SECTION-B

Answer ALL the questions, Each question carries 10 marks. 5 x 10 = 50M

9. a. Explain the preparation and Structure of diborane.
(or)
b. Explain the preparation and structure of phosphonitrilic chloride.

10. a. Explain classification of oxides. Draw structures of any two oxides of sulphur.
(or)
b. What are interhalogen compounds. Write their preparation. Explain structure of AX_5 & AX_7 interhalogen compounds.

11. a. Write the electronic configuration of 3d – series elements.
(or)
b. Explain Colour& catalytic properties of d-block elements.

12. a. What is Lanthanide Contraction. Explain the consequences of Lanthanide Contraction.
(or)
b. (i) Write about separation of lanthanides by ion exchange method.
(ii) Write about oxidation states exhibited by actinides.

13. a. Write an essay on Nuclear Fission and Nuclear Fusion reactions.
(or)
b. Write about (i) Soddy- Fajans law (ii) Applications of radioactivity

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Semester-II

Course -3: General & Inorganic Chemistry

S.No	Course Content	Long Answer Questions	Short Answer	Total marks	Blooms Taxonomy
1	Atomic Structure and Periodic table	2 with internal choice – 1 will be answered	1 from each unit – and 3 questions from any three units	14	Understanding, Application
2	Ionic bond	2 with internal choice – 1 will be answered	1 from each unit – and 3 questions from any three units	14	Remembering, Understanding
3	Covalent bond	2 with internal choice – 1 will be answered	1 from each unit – and 3 questions from any three units	14	Analysizing & Creation
4	Metallic and Weak bonds	2 with internal choice – 1 will be answered	1 from each unit – and 3 questions from any three units	14	Evaluation, Understanding
5.	Acids and Bases	2 with internal choice – 1 will be answered	1 from each unit – and 3 questions from any three units	14	Understanding, Application
	TOTAL	**5 to be answered**	**8 to be given and 5 to be answered**	**70 M**	

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SEMESTER-II

COURSE3: GENERAL AND INORGANIC CHEMISTRY PRACTICAL

Credits:1 2hrs/week

Practical-I Qualitative Analysis of Simple Salt

Qualitative Inorganic Analysis (Minimum of Six simple salts should be analyzed) 50M

Course outcomes:

At the end of the course, the student will be able to;

1. Understand the basic concepts of qualitative analysis of inorganic simple salt.
2. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
3. Apply the concepts of common ion effect, solubility product and concepts related to qualitative analysis

Laboratory course syllabus: Analysis of Simple Salt 50 M

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.

SCHEMEOFVALUATION

a. Preliminary Tests	05M
b. Identification of anion	08M
c. Confirmation tests for anion	10M
d. Identification of cation (Group separation table)	10 M
e. Confirmation of Cation	05 M
f. Report	02 M
g .Viva- voce	05M
h .Record	05M
TOTAL	**50marks**

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	ADITYA DEGREE COLLEGE (A) **KAKINADA** **DEPARTMENTOFCHEMISTY**	**Program &Semester**
Course Code CHE-4	TITLEOFTHECOURSE **INORGANIC CHEMISTRY-I**	IB.Sc. (IISemester)
Teaching	HoursAllocated:45 (**Theory**)	CREDITS: Theory = 3
Pre-requisites	Fundamentals of classification of Elements.	CREDITS: Practical = 1

CourseOutcomes:

On Completion of the course, the students will be able to		Cognitive domain
CO1	Understand the structures of Diborane, interhalogen compounds and Daily life applications of silicones.	Understanding
CO2	Identify the Charecteristics of d – block elements particularly variable oxidation states, Magnetic properties and catalytic Properties.	Knowledge, application
CO3	Understand how to separate the Lanthanide complexes.	Understanding, application
CO4	Define n / p ratio and Binding energy and predict the types of Radioactive series.	Critical thinking

CO-PO Mapping: 1: Low=1; 2:Moderate=2; 3:High=3; 4:No Correlation=0

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	2	1	3	2	2
CO2	3	1	2	2	1	1	1	3	1	2
CO3	3	2	2	3	2	2	2	3	2	2
CO4	3	1	1	1	1	1	1	2	1	1

PROGRAMME OUTCOMES

At the completion of the B.Sc. Chemistry program, the students of our department will be able to:

(PO1) Knowledge: Attain in depth knowledge about the fundamental principles, essential facts, conclusions and applications of chemical and scientific theories in various domains of chemistry.

(PO2) Critical Thinking: Carryout experiments in the area of organic analysis, estimation, derivative process, inorganic semimicro analysis, preparation, Kinetic, conductometric and potentiometric experiments and spectral analysis applying the

domain of critical thinking.

(PO3) Problem Solving: Define the background of reaction mechanisms, complex chemical structures, instrumental method of chemical analysis, and separation techniques and apply appropriate techniques for analyzing specific problems both qualitatively and quantitatively in laboratories and in industries.

(PO4): Usage of modern tools: Create data using modem chemical tools and ICT for modeling and analyze the data obtained from sophisticated instruments (like UV-Visible, FTIR, NMR, GCMS, Fluorescence, SEM, TEM and XRD)for chemical analysis

(PO5): Communication: Develop Skills to evaluate, analyze and interpret the chemical information and data and to communicate effectively within the chemical community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

(PO6): Life-long Learning: Demonstrate scholarly attitude to pursue a career in the field of chemical education and research and have the zeal and vision to engage in independent and life-long learning in the broadest context of technological and social change.

(PO7) Ethical Practices and Social Responsibility: Generate ideas and solutions for green and sustainable chemistry and approach towards planning and execution for research in frontier areas of chemical sciences.

PROGRAM SPECIFIC OUTCOMES (PSO's)

At the time of graduation, our undergraduates would be able to:

PSO1- Evaluate, analyze, interpret and effectively apply the basic laws, principles, phenomena, processes and mechanisms involved in the domain of organic, inorganic, physical and analytical Chemistry

PSO2 – Demonstrate the knowledge of Chemistry in the domain of research, education and perspective entrepreneurship.

PSO3- Evaluate distinct problems in the field of chemical data analysis, scientific interpretation and reaction mechanisms with an understanding on basic tools to be employed.

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Semester-II

Course -4: Inorganic Chemistry-1

S.No	CourseContent	Long Answer	ShortAnswer	Totalmarks	Blooms Taxonomy
1	Chemistry of p–block elements.	2 with internal choice – 1 will be answered	1 from each unit – and 3 questions from any three units	14	Understandig, Application
2	Chemistry of p–block elements.	2 with internal choice – 1 will be answered	1 from each unit – and 3 questions from any three units	14	Remembering, Understanding
3	Chemistry of d- block elements.	2 with internal choice – 1 will be answered	1 from each unit – and 3 questions from any three units	14	Analysizing & Creation
4	Chemistry of f-block elements.	2 with internal choice – 1 will be answered	1 from each unit – and 3 questions from any three units	14	Evaluation, Understanding
5.	Radioactivity	2 with internal choice – 1 will be answered	1 from each unit – and 3 questions from any three units	14	Understanding, Application
	TOTAL	**5 to be answered**	**8 to be given and 5 to be answered**	**70 M**	

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SEMESTER-II

COURSE 4: INORGANIC CHEMISTRY -I PRACTICAL

Credits:1 2hrs/week

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Course Outcomes

At the end of the course, the student will be able to:

1. Understand the basic concepts of inorganic preparations.
2. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
3. Apply the properties of various elements for the preparation of inorganic compounds.

Preparation of Inorganic compounds:

1. **Methods of expressing Concentrations – Molarity, Normality, ppm, ppb, w/v, v/v, mole fraction (addition)**
2. Crystallization of compounds and determination of melting point.
3. Preparation of Cuprous chloride.
4. Preparation of Potash Alum.
5. Preparation of Chrome Alum.
6. Preparation of Ferrous oxalate
7. Preparation of Ferrous ammonium sulphate.

SCHEMEOFVALUATION

Practical Paper–4: Inorganic Chemistry (at the end of semester II)

a. Procedure & Equation	13M
b. Preparation	20M
c. Report the yield	2M
d. Determination of Melting Point	5M
e. Viva voce	05M
f. Record	05M
TOTAL	**50marks**

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