ANDHRA KESARI UNIVERSITY

B.Sc. – Honours in CHEMISTRY - MAJOR

w.e.f. 2023-24 AY onwards

COURSE STRUCTURE

SEMESTER	Course Code	Title	Hr/ week	Credits
I	1	Essentials and applications of Mathematical, Physical and Chemical sciences (or) Introduction to Classical Biology for BiPC Students	5	4
	2	Advances in Mathematical, Physical and Chemical sciences (or) Introduction to Applied Biology for BiPC Students	5	4
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

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 applications related 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 electric and magnetic fields.

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

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

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 and bases 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.

They can create informative posters or presentations to present their findings to the class.

UNIT IV: APPLICATIONS OF MATHEMATICS, PHYSICS & CHEMISTRY

1: Interdisciplinary Case Studies

Divide students into small groups and provide them with interdisciplinary case studies that involve the interdisciplinary application of mathematics, physics, and chemistry.

Each case study should present a real-world problem or scenario that requires the integration of concepts from all three disciplines.

2: Design and Innovation Project

Challenge students to design and develop a practical solution or innovation that integrates mathematics, physics, and chemistry principles.

Students can choose a specific problem or area of interest, such as renewable energy, environmental conservation, or materials science.

3: Laboratory Experiments

Assign students laboratory experiments that demonstrate the practical applications of mathematics, physics, and 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.

I -Semester

Course: 1 INTRODUCTION TO CLASSICAL BIOLOGY

Hours/Week: 5 **Credits: 4**

Learning objectives

The student will be able to learn the diversity and classification of living organisms and understand their chemical, cytological, evolutionary and genetic principles.

Learning Outcomes

1. Learn the principles of classification and preservation of biodiversity 2. Understandthe plant anatomical, physiological and reproductive processes. 3. Knowledge on animal classification, physiology, embryonic development and their economic importance.

4. Outline the cell components, cell processes like cell division, heredity and molecularprocesses.

5. Comprehend the chemical principles in shaping and driving the macromolecules and lifeprocesses.

Unit 1: Introduction to systematics, taxonomy and Ecology.

1.1. Systematics – Definition and concept, Taxonomy – Definition andhierarchy.

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 – Eichler system of classification.

2.2. Vegetative parts of a Plant and physiological processes –outlines of water & mineral absorption, Ascent of sap, transpiration, Photosynthesis, Respiration and Growth hormones.

2.3. Structure of flower – Essential and Non – Essential organs, microsporangium - structure of anther, megasporangium, structure of ovule, pollination & fertilization.

2.4. floriculture, landscaping & plant Nursery (Basics)

Unit 3: Essentials of Zoology

3.1. The classification of Kingdom Animalia and Chordata.

3.2 Heart, lung, kidney, Organ Systems & their functions in Humans;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.

4.2. Chromosomes and heredity – Structure of chromosomes nucleosome, DNA & RNA.

4.3. Cell Cycle, Mitosis & Meiosis.

4.4. Mendel's laws & Darwin theory of evolution.

Unit 5: Essentials of chemistry

5.1. Definition and scope of Chemistry, applications of Chemistry in dailylife.
Branches of Chemistry.

5.2. Chemical bonds – ionic, covalent, noncovalent – Vander Waals,
hydrophobic, hydrogen bonds.

5.3. Green chemistry principles, prevention of waste, prevention of hazardous components,

5.4. Green synthesis of catechol, accident prevention & safety measures.

References

1. Sharma O.P., 1993. Plant taxonomy. 2nd Edition. McGraw Hill publishers. 2. Pandey B.P., 2001. The textbook of botany Angiosperms. 4th edition. S. Chand publishers, New Delhi, India.

3. Jordan E.L., Verma P.S., 2018. Chordate Zoology. S. Chand publishers, New Delhi,India. 4. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.

5. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology,Evolution and Ecology. S. Chand publishers, New Delhi, India.

6. Satyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers. 7. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S.Chand publishers, New Delhi, India.

8. Karen Timberlake, William Timberlake, 2019. Basic chemistry. 5th Edition. Pearsonpublishers.

9. Subrata Sen Gupta, 2014. Organic chemistry. 1st Edition. Oxfordpublishers.

ACTIVITIES:

1. Make a display chart of the life cycle of nonflowering plants.

2. Make a display chart of the life cycle of flowering plants.

3. Study of stomata

4. Activity to prove that chlorophyll is essential for Photosynthesis

5. Study of pollen grains.

6. Observation of pollen germination.

7. Draw the Ultrastructure of Prokaryotic and Eukaryotic Cell

8. Visit to Zoology Lab and observe different types of preservation of specimens

9. Hands-on experience of various equipment – Microscopes, Centrifuge, pH Meter,Electronic Weighing Balance, Laminar Air Flow

10. Visit to Zoo / Sericulture / Apiculture / Aquaculture unit

List out different hormonal, genetic and physiological disorders from the society

I **I- SEMESTER**

COURSE 2: ADVANCES IN MATHEMATICAL, PHYSICAL AND CHEMICAL SCIENCES

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. Iden

4. tify all the networking devices used in your college premises.

I -Semester

Course: 2 INTRODUCTION TO APPLIED BIOLOGY

Hour/Weeks: 5 **Credits: 4**

Learning objectives

The student will be able to learn the foundations and principles of microbiology, immunology, biochemistry, biotechnology, analytical tools, quantitative methods,and bioinformatics.

Learning Outcomes

1. Learn the history, ultrastructure, diversity and importance of microorganisms.
2. Understand the structure and functions of macromolecules.
3. Knowledge on biotechnology principles and its applications in food and medicine.
4. Outline the techniques, tools and their uses in diagnosis and therapy.
5. Demonstrate the bioinformatics and statistical tools in comprehending the complexbiological data.

Unit 1: Essentials of Microbiology

1.1. History and Major Milestones of Microbiology; Contributions of Edward Jenner, LouisPasteur, Robert Koch.

1.2. Groups of prokaryotic microbes – Bacteria (Structure, and Types), archaebacteria, Mycoplasma; Eukaryotic Microbes(outlines)

1.3. Applications of microorganisms in – Food, Agriculture, Environment, and Industry.

1.4. Viruses – plant virus – TMV (Structure and Disease Symptoms) Animal virus – polio virus (Structure and Disease Symptoms) & Bacteriophage(Structure and Reproduction Outlines)

Unit 2: Essentials of Biochemistry and Immunology

2.1. Biomolecules I

Introduction of carbohydrates & classification – mono di and Polysaccharides.

Lipids. Introduction, Structure & types – Biological importance.

2.2. Biomolecules II

Amino acids – classification, properties, structure & functions.Proteins – classification, properties, structure & functions.

2.3. Biomolecules III DNA – Structure & TypesRNA – Structure & Types

2.4. Immune **System –** Immunity, types of Immunity, cells & organs of Immune Systems.

Unit 3: Essentials of Biotechnology

3.1. History, scope, and significance & branches of biotechnology.

3.2. Recombinant DNA Technology and Vectors-PBR322 & PUC18

3.3. Transgenic plants – Uses and applications-B. T Cotton. Transgenic animals – DollySheep.

3.4. Environmental Biotechnology – Bioremediation, Bio – Fuels, Bio-fertilizers & Biopesticides.

Unit 4: Analytical Tools and Applications

4.1. Microscopy – Simple, compound and electron microscope.

4.2. Southern Blotting Northern Blotting and western blotting

4.3. Electrophoresis

4.4. Monoclonal antibodies and Its applications. Applications in forensics-DNA Fingerprinting and PCR

Unit 5: Biostatistics and Bioinformatics

5.1. Data collection and sampling. Measures of central tendency – Mean, Median, Mode.

5.2. Measures of dispersion – Range, standard deviation, Basics of Chi-square Test and t-test

5.3. Introduction to Bioinformatics – Genomics, Proteomics, types of biological databases – NCBI, EBI.

5.4. Accessing Nucleic Acid and Protein databases, NCBI, Genome Workbench

REFERENCES

1. Gerard J., Tortora, Berdell R. Funke, Christine L. Case., 2016. Microbiology: AnIntroduction. 11th Edition. Pearson publications, London, England.

2. Micale, J. Pelczar Jr., E.C.S. Chan., Noel R. Kraig., 2002. Pelczar Microbiology. 5thEdition. McGraw Education, New York, USA.

3. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.

4. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chandpublishers, New Delhi, India.

5. R.C. Dubey, 2014. Advanced Biotechnology. S. Chand Publishers, New Delhi, India.

6. Colin Ratledge, Bjorn, Kristiansen, 2008. Basic Biotechnology. 3rd Edition. CambridgePublishers.

7. U. Sathyanarayana, 2005. Biotechnology. 1st Edition. Books and Allied Publishers pvt. ltd.,Kolkata.

8. Upadhyay, Upadhyay and Nath. 2016. Biophysical Chemistry, Principles andTechniques. Himalaya Publishing House.

9. Arthur M. Lesk. Introduction to Bioinformatics. 5th Edition. Oxford publishers. 10. AP Kulkarni, 2020. Basics of Biostatistics. 2nd Edition. CBSpublishers.

ACTIVITIES

1. Identification of a given organism as harmful or beneficial.
2. Observation of microorganisms from house dust under microscope.
3. Finding microorganisms from pond water.
4. Visit to a microbiology industry or biotech company.
5. Visit to a wastewater treatment plant.
6. Retrieving a DNA or protein sequence of a gene'
7. Performing a BLAST analysis for DNA and protein.
8. Problems in biostatistics.
9. Field trip and awareness programs on environmental pollution by different types ofwastes and

hazardous materials.

10. Demonstration on basic biotechnology lab equipment.
11. Preparation of 3D models of genetic engineering techniques.
12. Preparation of 3D models of transgenic plants and animals.

[**NOTE**: In the colleges where there is availability of faculty for microbiology and biotechnology, those chapters need to be handled by microbiology and biotechnology faculty. In other colleges, the above topics shall be dealt by Botany and Zoology faculty.

SEMESTER-II

Course Code 3: GENERAL AND INORGANIC CHEMISTRY

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)

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: 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},[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 andSoft-Soft combinations.

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 - 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

I. 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

II. 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.

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.

II - SEMESTER

Course Code 4: INORGANIC CHEMISTRY- I

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 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

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.

Syllabus:

Preparation of Inorganic compounds:

4. Crystallization of compounds and determination of melting point.
5. Preparation of Cuprous chloride.
6. Preparation of Potash Alum.
7. Preparation of Chrome Alum.
8. Preparation of Ferrous oxalate
9. Preparation of Ferrous ammonium sulphate.

Co-curricular activities and Assessment Methods

10. Continuous Evaluation: Monitoring the progress of student's learning
11. Class Tests, Worksheets and Quizzes
12. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
13. 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.

ANDHRA KESARI UNIVERSITY-ONGOLE, PRAKASAM DISTRICT

Single Major Programme from the Year 2023-24 Onwards Programme- B.Voc Honours. Horticulture/Agriculture/Medical Lab Technology/B.Sc. Chemistry

&

B.Sc.HonoursBotany/Microbiology/Zoology/Aquaculture/Biochemistry/Biotechnology

Question Paper model,First Year-Semester-1

Course1 - Introduction to Classical Biology

Time: 3 Hours Total Marks: 75

PART –A

Answer any Five of the following.

Note: Draw labelled diagrams wherever necessary and Each unit must carry two questions 5X5=25 Marks

1. Unit-1
2. Unit-1
3. Unit-2
4. Unit-2
5. Unit-3
6. Unit-3
7. Unit-4
8. Unit-4
9. Unit-5
10. Unit-5

PART –B

Answer any **Five** of the following

Note: Draw labelled diagrams wherever necessary 5X10=50 Marks

(Paper setters must give the 2 questions from Each unit)

11. Unit-1
12. Unit-1
13. Unit-2
14. Unit-2
15. Unit-3
16. Unit-3
17. Unit-4
18. Unit-4
19. Unit-5
20. Unit-5

ANDHRA KESARI UNIVERSITY-ONGOLE, PRAKASAM DISTRICT

Single Major Programme from the Year 2023-24 Onwards Programme- B.Voc Honours. Horticulture/Agriculture/Medical Lab Technology/ B.Sc. Chemistry

&

B.Sc.HonoursBotany/Microbiology/Zoology/Aquaculture/Biochemistry/Biotechnology

Question Paper model,First Year-Semester-1

Course 2 - Introduction to Applied Biology

Time: 3 Hours Total Marks: 75

PART –A

Answer any Five of the following.

Note: Draw labelled diagrams wherever necessary and Each unit must carry two questions 5X5=25 Marks

1. Unit-1
2. Unit-1
3. Unit-2
4. Unit-2
5. Unit-3
6. Unit-3
7. Unit-4
8. Unit-4
9. Unit-5
10. Unit-5

PART –B

Answer any **Five** of the following

Note: Draw labelled diagrams wherever necessary 5X10=50 Marks

(Paper setters must give the 2 questions from Each unit)

11. Unit-1
12. Unit-1
13. Unit-2
14. Unit-2
15. Unit-3
16. Unit-3
17. Unit-4
18. Unit-4
19. Unit-5
20. Unit-5

ANDHRA KESARI UNIVERSITY-ONGOLE, PRAKASAM DISTRICT

Single Major Programme from the Year 2023-24 Onwards

Programme-B.Sc Chemistry Honours Question Paper, Semester-1

Course1 - Essentials and Applications of Mathematical, Physical and Chemical Sciences

Time: 3 Hours | Total Marks: 75

SECTION –A

Section –A Contains Eight Short Answer Questions and Answer any Five Questions

5X5=25 Marks

1.
2. } mathematics Questions
3. } physics Questions
4.
5. } chemistry questions
6.
7. } computer science Questions.
8.

SECTION –B

Section –B Contains Ten Essay Answer Questions. Answer any Five Questions

10X5=50 Marks

9.
10. } mathematics questions from unit - 1.
11. } physics questions from unit - 2
12.
13. } chemistry questions from unit - 3
14.
15. } Applications of maths / physics / chemistry } unit - 4
16.
17. } computer science questions - unit-5
18.

K. Srinivas

ANDHRA KESARI UNIVERSITY-ONGOLE, PRAKASAM DISTRICT
Single Major Programme from the Year 2023-24 Onwards
Programme-B.Sc Chemistry Honours Question Paper, Semester-1
Course 2 - Advances in Mathematical, Physical and Chemical Sciences

Time: 3 Hours | Total Marks: 75

SECTION –A

Section –A Contains Eight Short Answer Questions and Answer any Five Questions
5X5=25 Marks

1.

2.

3.

4.

5.

6.

7.

8.

SECTION –B

Section –B Contains Ten Essay Answer Questions. Answer any Five Questions.
10X5=50 Marks

9.

10.

11.

12.

13.

14.

15.

16.

17.

18.

Same as to the course - I

N. Srinivasa Rao

Single Major Programme from the Year 2023-24 Onwards
Programme-B.Sc Chemistry Honours Question Paper, Semester-2
Course 3 - General and Inorganic Chemistry

Time: 3 Hours Total Marks: 75

SECTION –A

Section –A Contains Eight Short Answer Questions and Answer any Five Questions

5X5=25 Marks

1. State de-Broglie principle and Heisenberg Uncertainty principle
2. Define Diagonal Relationship with suitable example
3. What is meant by Atomic radii, Ionic radii and covalent radii with examples?
4. Write main postulates of Valency Bond theory
5. Explain Structure of Ammonia NH_3 Molecule basing on VSEPR Theory
6. Define Conductors, Semi Conductors and Insulators
7. Define pH and Mention Scale of pH for Acids and Bases
8. Write Main Postulates of Bronsted – Lowry Acid Base theory

SECTION –B

Section –B Contains Ten Essay Answer Questions. Answer any Five Questions.

10X5=50 Marks

9. Write Schrodinger wave equation and explain its Significance
10. What is meant by Electro negativity and How to calculate Electro negativity by Pauling Scale and Mulliken Scale ?
11. Define Lattice Energy and How to calculate Lattice Energy from Born-Haber Cycle?
12. What is Hybridisation? Explain Structures of Methane CH_4 and Sulphur Hexa Fluoride SF_6
13. Write M.O Diagrams for N_2 and O_2 Molecules basing on LCAO method.
14. Define hydrogen bonding and Explain Inter, Intra molecular hydrogen bonding with Examples
15. Explain Lewis Acid –base theory with examples
16. HSAB Principle & its importance
17. Explain metallic bonding in terms of free electron theory
18. Define Ionic Bond and what are factors favouring for formation of Ionic Bond?

ANDHRA KESARI UNIVERSITY-ONGOLE, PRAKASAM DISTRICT

Single Major Programme from the Year 2023-24 Onwards

Programme-B.Sc Chemistry Honours Question Paper, Semester-2

Course 3 - General and Inorganic Chemistry Practical

Time: 3 Hours Total Marks: 50

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

ANDHRA KESARI UNIVERSITY-ONGOLE, PRAKASAM DISTRICT

Single Major Programme from the Year 2023-24 Onwards
Programme-B.Sc Chemistry Honours Question Paper, Semester-2
Course 4- Inorganic Chemistry-1

Time: 3 Hours Total Marks: 75

SECTION –A

Section –A Contains Eight Short Answer Questions and Answer any Five Questions
5X5=25 Marks

1. What is Inorganic Benzene? Write its Structure and which type of hybridisations is Involved in the molecule?
2. Write Structure of the molecules SO_2 and SO_3
3. What are the Special Characteristics of d-block elements?
4. What is Actinide contraction?
5. Define Isotopes with suitable examples
6. Write two preparations methods of Diborane molecule with suitable equations
7. Why d-block elements form complex compounds?
8. Write short notes on Soddy-Fajan's displacement law

SECTION –B

Section –B Contains Ten Essay Answer Questions. Answer any Five Questions.
10X5=50 Marks

9. Write preparation method of Phosphonitrilic Chloride $P_3N_3Cl_6$ and explains its structure
10. Explain structures of Interhalogen molecules like BrF_5 and IF_7
11. Explain Coloured Ion formation and Magnetic Properties of d-Block elements
12. What is meant by lanthanide contraction? Write its consequences
13. Write the differences between Lanthanides and Actinides
14. What is nuclear fission and nuclear fusion with suitable examples
15. Why d-Block elements exhibits variable oxidation states and explain catalytic property of d-Block elements
16. Write five applications of Radio Activity
17. Write brief notes on preparation methods and classification of Silicones
18. Write notes on classification of oxy acids of sulphur with suitable structures

ANDHRA KESARI UNIVERSITY-ONGOLE, PRAKASAM DISTRICT

Single Major Programme from the Year 2023-24 Onwards

Programme-B.Sc Chemistry Honours Question Paper, Semester-2

Course 4- Inorganic Chemistry-1 Practical

Time: 3 Hours Total Marks: 50

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