

Biology	
SYLLABUS: Class-XI	
Unit- 1: Biodiversity	
CONCEPT	LEARNING OUTCOMES
Introduction	Describe the characteristics of living organisms Explain the significance of diversity of life forms in their surroundings
History of Classification	Enlist the features of the Five Kingdom classification as proposed by R.H Whittaker Describe the characteristic features of each kingdom
Brief classification of Organisms	Define and describe the Binomial System of naming species Describe the hierarchical scheme of grouping organisms
Unit-2: Diversity in Plants and Fungi	
Introduction	Explain the basis of classification in Plants.
Characteristic Features of Plants	Describe features of algae, its classification, life cycle and economic importance Discuss features and life cycle of Bryophytes and Pteridophytes Describe and compare features of Gymnosperms and Angiosperms
Characteristic Features of Fungi	Explain the characteristics of different types of fungi with suitable examples and relate to their economic importance
Reproduction in Fungi	Explain the asexual and sexual reproduction in fungi. Describe the importance of reproduction as basis for classification in fungi
Unit- 3: Structural Organisation in Plants (Angiosperms)	
External Morphology of Plants	Present an overview of plant body. Discuss morphology of roots, stem and leaves along with their various modifications Identify and describe the inflorescence and parts of flowers and fruits
Anatomy of Plants	Study different kind of plant tissues and discuss their features. Explain the anatomy of dicot and monocot root, stem and leaf. Describe the secondary growth in root and stem of dicot plants. Detailed description of the structure of two types of seeds
Unit 4: Diversity in Animals	
Introduction to Classification	Define the basic characteristics of animals Explain the basis/ fundamental principles of animal classification such as levels of organization, symmetry, diploblastic and triploblastic organization, body plan, coelom, segmentation and notochord development
Classification based on Characters	State the different levels of classification of animals such as phylum, sub-phylum, upto species and sub species State the chief characteristics of major animal phyla and provide examples State the chief characteristics of major animal phyla and provide examples Identify the differences between chordates, non chordates, and hemichordates
Unit- 5: Life and its Chemistry	
Introduction	Explain the general concepts pertaining to living cells
Chemical Concepts	Analyse carbon as important base of biomolecules Appraise that life depends on water Describe the importance of pH and buffering activity of cell constituents Express energy flow through different processes such as diffusion, osmosis, imbibition, absorption, adsorption, mass flow and active transport

Unit-6: Biomolecules	
Introduction	Familiarize with micro- and macro-molecules
Carbohydrates	Recall that carbohydrates constitute the most abundant category of biomolecules
	Define and classify carbohydrates List the role of carbohydrates Discuss the nature of artificial or synthetic sweeteners and their impact on health
Lipids	Explain the hydrophobic nature of lipids
	Classify lipids on the basis of their chemical structure
	Differentiate between saturated and unsaturated fatty acids Describe the importance of cholesterol in human body
Proteins	State the composition of proteins
	Understand the chemical structure of amino acid
	Describe the structure of proteins List the functions of proteins
Enzymes	Name and classify Enzymes
Nucleic Acids	Describe the basic structure and functions of DNA and RNA
Vitamins	Describe the role of vitamins and minerals in life
Unit-7: Structure and Functions of a Cell	
Introduction	Establish cell as the basic unit of structure and function in living organisms Describe the cell theory based on its postulates Discuss the need of multicellularity in organisms
Cell Diversity	Correlate diversity in the structure of cells to functions they perform. Identify variations in shapes of bacteria
Cellular Organisation in Prokaryotes	Explain the general scheme of organisation of a typical prokaryotic cell. Describe the important structural features of prokaryotic cells. Classify bacteria on the basis of Gram staining technique.
	Identify cell organelles which are distinctively present in a plant cell and animal cell
Cellular Organisation in Eukaryotes	Identify and describe the structure of a plant and animal cell as seen under electron microscope
	Describe the structure of the plasma membrane and its role in regulating the entry and exit of ions and molecules within a cell
	Describe the structure and function of plant cell wall Compare the role of cell wall with that of cell membrane
	Discuss and describe the structure and function of cell organelles like endoplasmic reticulum, ribosomes, golgi apparatus, lysosomes, vacuoles, mitochondria, plastids, microtubules, flagella, cilia, centrioles and nucleus Correlate the structural organisation of different cell organelles with their respective function
	Compare and contrast between eukaryotic and prokaryotic cells in terms of size, presence and absence of cell organelles, location and structure of genetic material, and protein synthesis
Unit-8: Cell Cycle	
Introduction	Describe the cell cycle and its distinct stages Recall and appreciate the importance of cell cycle
Phases of Cell Cycle and their Significance	Comprehend the significance of the events occurring in various phases of the cell cycle Connect different phases as a rhythmic pattern.
Cell Division	Highlight the differences and similarities in the process of cell division between prokaryotes and eukaryotes
Regulation of Cell Cycle	Identify various factors that control the cell cycle
	Analyse the significance of the regulation of cell cycle/ cell division
	Discuss different stages of Mitosis and Meiosis. Compare the two types of cell division.

Unit-9: Photosynthesis in Plants	
Introduction	Describe photosynthesis as an essential process in plants
Photosynthetic Machinery	Analyse the anatomical and morphological adaptive features of leaves which make them suitable factories to carry out the process of photosynthesis
	Describe the anatomical structure of chloroplast, the site of Photosynthesis
	Draw the link between the specific structure of various photosynthetic pigments and their respective functions Differentiate between Absorption and Action spectra Draw the link between light absorbed and rate of photosynthesis
Light Reaction (or Hill reaction)	Differentiate between light dependent and carbon fixation stages of Photosynthesis
	Explain the mechanism of light dependent phase
	Describe the organisation of Photo systems I & II and their role in trapping light energy
	Explain the significance of photolysis of water in light reaction Define photophosphorylation Distinguish between cyclic and non-cyclic photophosphorylation
Carbon Fixation Reactions(or Calvin Bensen cycle)	Mention the important steps involved in investigation of light independent phase of photosynthesis by Calvin and his colleagues
	Analyse the pathway of carbon in photosynthesis through the study of the Calvin cycle Decipher the significance of the specific nomenclature/reference of Calvin cycle as C3 cycle.
Adaptations in Tropical and Sub-tropical Plants	Justify the requirement of C4 pathway/cycle in tropical and sub-tropical plants
	Draw the specialized anatomy of the leaves of C4 plants Analyse the process of photorespiration and the reason of its occurrence
Factors Affecting Photosynthesis	Describe the factors affecting the rate of photosynthesis Link the significance of photosynthesis with the productivity of agricultural/crop plants and human energy demands
Unit-10: Mineral Nutrition and Transport in Plants	
Introduction	Describe the role of nutrients in plant growth and survival Recognize the criteria of 'essential' nutrients
Macro and Micro- nutrients	Differentiate between macro and micro nutrients
	Explain deficiency symptoms and the effects of toxicity of macro and micronutrients
Nutrient Cycle	Describe and draw the nitrogen cycle
Importance of Nitrogen Cycle in Plant Systems	Describe the working of the nitrogen cycle in the ecosystem
	Describe the role of microorganisms in the nitrogen cycle.
	Describe symbiotic and non symbiotic nitrogen fixation Explain the role of ammonia produced during nitrogen fixation
Mechanism of Transport in Plants	Identify the role of pores in diffusion and facilitated diffusion
	Recognise the role of active transport in plant nutrition
	Discuss the significance of imbibition
	State the relation between water potential, solute potential and pressure potential and osmotic pressure
	Define the root pressure and suction pressure theories and identify the groups of plants exhibiting these mechanisms
	Explain the role of transpiration in the ascent of water from soil
	Recognise the symplast and apoplast theories of water transport
	Explain the unidirectional and bidirectional transport mechanisms State the mechanism of transport in phloem Relate the mass flow hypothesis with transport in phloem
Unit-11: Cellular Respiration	
Introduction	Differentiate between respiration and combustion. Define the role of ATP as the energy currency of the cell Describe cellular respiration as a series of redox reactions Discuss how photosynthesis and respiration are two similar processes yet different from each other
Aerobic and Anaerobic Respiration	Differentiate between aerobic and anaerobic respiration on the basis of their site, the process involved and energy generated in terms of ATP production
	Describe the fate of the products of anaerobic respiration
	Enlist the phases of aerobic respiration
	Analyse the fate of pyruvic acid (end product of glycolysis) through the Krebs' /TCA Cycle Summarise the pathway and significance of Electron Transporting System Calculate the total energy yield of cellular respiration.
Respiratory Output	Compare the respiratory quotients of various respiratory substrates like carbohydrates, proteins and fats.

Unit-12: Structural Organisation in Animals	
Introduction	Classify animal tissues into epithelial, connective, muscular and neural tissues
Epithelial Tissues	Differentiate between simple and compound epithelia Describe various types of simple epithelia including their modifications such as ciliated epithelium and glandular epithelium
	Discuss the role of epithelial tissues in absorption and secretion
	Identify the location and state the functions of compound epithelium
	Briefly describe the type of cell junctions
Connective Tissues	State the functions of connective tissues with examples
	Differentiate between loose and dense connective tissues
	State the location and function of areolar and adipose tissues
	Identify blood, bone, cartilage, tendon and ligament as specialized connective tissues and discuss their cellular organization
Muscular and Neural Tissues	Briefly describe the three type of muscular tissues
	Briefly comment on muscle and neural tissues
Unit-13: Nutrition, Digestion and Absorption in Animals	
Introduction	Differentiate between the terms nutrition, digestion and absorption
Human Alimentary Canal	Identify the various modes of nutrition: autotrophic and heterotrophic
	Comprehend the type of human dentition
	Identify the four types of teeth and compute the dental formula
	State the roles of tongue, teeth, epiglottis and oesophageal sphincter
	Recognize the location of: stomach and its three major parts; small intestine and its three parts; and three regions of large intestine
	Compare the stomach of ruminants with stomach of humans
Histology of Human Gut	Describe the four major layers that form the wall of the alimentary canal
	State the location and function of structures such as villi, microvilli, crypts of Lieberkühn and goblet cells
Associated Glands	State the location and function of salivary glands and their secretion
	State the location and function of liver, gall bladder and pancreas
Movement and Digestion of Food in the Alimentary Canal	State the significance of peristalsis and the role of longitudinal and circular muscles in this process
	Describe the role of various gastrointestinal secretions during digestion of food components
	Comment on the hormonal control of digestive secretions
Absorption	Differentiate between diffusion, facilitated diffusion and active transport to discuss absorption of simple products of digestion
Disorders of Digestive System	List the common disorders of the digestive system
	Comment briefly on their clinical aspects
Health and Nutrition	Discuss the concept of calorific value
	Compare the calorific value for proteins, fats and carbohydrates
	Categorize the types of nutrients into macro- and micro- nutrients and trace elements
	Discuss the concept of a balanced diet
	Discuss the role of vitamins, minerals, water and roughage in diet
	Describe the important nutritional deficiency disorders
	Discuss the relation of dietary habits and lifestyle diseases

Unit-14: Circulation and Exchange of Gases in Animals	
Introduction	Differentiate between the terms breathing and respiration List the diverse mechanisms employed by different groups of animals for respiration
Human Respiratory System	List the organs comprising the human respiratory system. Explain the mechanism of pulmonary ventilation Comprehend the meaning of terms : respiratory volumes and capacities Discuss the role of blood in the transport of respiratory gases
Introduction to Circulation	Define blood as a complex connective tissue Describe briefly the external and internal structure of human heart Differentiate between open and closed circulatory systems State the characteristic features of arteries and veins Discuss briefly the process of microcirculation
Blood Circulation	Explain the flow of blood through the heart Explain the significance of double circulation. Describe the phases of cardiac cycle Briefly state the mechanisms for regulation of heart beat Broadly relate the above process with standard ECG and identify its clinical significance
Gaseous Exchange	Describe the concept of partial pressure and explain the phenomena of pulmonary gaseous exchange Relate the same concept to explain the exchange of gases between body tissues and blood Describe how haemoglobin helps in transport of oxygen from lungs to tissues Explain the oxygen dissociation curve Describe the ways in which CO ₂ gets transported from tissues to the lungs for exhalation
Disorders of Respiratory and Circulatory System	List the major disorders of respiratory system and discuss their clinical aspects List the major disorders of human circulatory system and discuss their clinical aspects Suggest ways to maintain cardiac health
Unit-15: Osmoregulation and Excretion in Animals	
Introduction	Define the terms excretion and osmoregulation Differentiate between osmoconformers and osmoregulators
Osmoregulation	Discuss the mechanisms by which animals regulate their water-solute balance in freshwater and marine environment State the mechanisms by which animals regulate their water-solute balance in terrestrial environment including desert animals
Excretory Products	Identify the sources of nitrogenous waste in animals Discuss the elimination of various nitrogenous wastes in animals Infer CO ₂ and excess water as excretory products in animals
Excretion in Invertebrates	Briefly comment on: contractile vacuoles, protonephridia and flame cells; nephridia, malpighian tubules, green glands
Human Excretory System	Describe the excretory system in humans Describe the internal organization of kidney
Urine Formation	Discuss the mechanism of urine formation: the processes of glomerular filtration, selective reabsorption and secretion Explain the counter current mechanism for the production of concentrated urine
Regulation of Kidney Function	Describe the role of antidiuretic hormone (ADH) in regulation of renal functions Discuss the regulatory role of juxtaglomerular apparatus (JGA) or renin-angiotensin mechanism State how Atrial Natriuretic Factor(ANF) acts as a check on the renin-angiotensin mechanism
Micturition and Constituents of Urine	Define the term micturition Justify how clinical examination of urine samples can help in diagnosis of certain metabolic disorders
Accessory Excretory Organs	Recognize organs other than kidney that are involved in elimination of excretory products viz. lungs, liver, skin and discuss their role in excretion
Disorders of Excretory System	State some common disorders of excretory system and their clinical aspects Discuss briefly the techniques of haemodialysis and kidney Transplantation Reason why patient's body tends to reject a kidney transplant

Unit-16: Movement and Locomotion in Animals	
Role of Different Type of Muscles	Recognize muscle as a specialized tissue
	List important features of the skeletal, smooth and cardiac muscles
	State the unique properties of skeletal muscle and establish the relation with its structure
Structure of Contractile Proteins	Discuss the structure and function of actin and myosin filaments
Muscular Contraction	Explain the mechanism of sliding filament theory of muscle contraction and relaxation
	Describe the biochemical events that occur during muscle contraction and relaxation
	Discuss the role of calcium in muscle contraction
	Differentiate between red and white muscle fibres
The Skeletal System	State the significance of skeletal system
	List the components of axial and appendicular skeleton
Muscular and Skeletal System Disorders	Describe the arrangement of bones in the human body
	Discuss the significance of each of these structures
	Differentiate between fibrous joints, cartilaginous joints and synovial joints
	List some important disorders of the muscular and skeletal system
	Discuss briefly the clinical aspects of these disorders
	Write steps to maintain muscular and skeletal efficiency
BIOLOGY SYLLABUS: Class-XII	
Unit-1: Plant Development and Reproduction	
Content	Learning Outcomes
Introduction	Define the terms differentiation, development and growth
	Relate the processes of differentiation, dedifferentiation and re-differentiation
Growth and Development	Measure growth in plants through various methods
	Observe growth in various parts of plants and graphically represent it
	Analyze the data obtained from the observation.
	Define growth rate in terms of absolute and relative growth
	Differentiate between different patterns of growth curve observed in plants
	Study growth and development in individual parts of plants including both vegetative and reproductive parts
Plant Growth Regulators	Compare primary and secondary growth in plants and understand the role of various tissues in the process
	Explain the concept of photoperiodism and vernalisation
Reproduction in Plants	Point out the morphological and anatomical changes observed in plants in their transition from vegetative to reproductive phase
	Describe the various types of asexual reproduction
	Draw and describe the reproductive parts in flowering plants
	Understand the process of sporogenesis and gametogenesis
	Describe the process of pollination and fertilization
	Enlist the steps involved in seed formation and point out the differences between monocot and dicot seed formation
	Describe the importance of seed and fruit formation in flowering plants
Explain the concept of Apomixis and polyembryony	

Unit 2 : Animal Development and Reproduction	
Introduction	Recapitulate the differences between asexual and sexual reproduction Discuss the common modes of asexual reproduction in animals Describe parthenogenesis as alternative mode of reproduction
Human Reproductive System	Describe the male and female reproductive systems in humans Illustrate the internal structure of human testis and ovary Define spermatogenesis and describe stages involved in the process Illustrate the structure of human sperm Define oogenesis and describe stages involved in the process Illustrate the structure of human ovum Define puberty and discuss associated changes in human male and female Describe the phases of menstrual cycle and the role of hormones Define the terms menarche and menopause
Fertilization and Implantation	Describe key steps involved in the process of fertilization Discuss the mechanisms by which polyspermy is prevented in humans Discuss the sequence of events from fertilization to implantation including cleavage
Reproductive health	Discuss the important aspects of reproductive health and its significance in a society Discuss the prevent measures against STDs Suggest reasons for population explosion and methods of contraception and birth control Briefly describe certain techniques to combat infertility among couples
Unit-3 : Heredity and Variation	
Introduction to Genetics	Define genetics and discuss the emergence of genetics as an important field of Biology Define <i>inheritance</i> as the transmission of genetic information from generation to generation Explain the concept of Heredity and Variations
Mendelian Inheritance	Describe the experiments of Mendel and elucidate the laws of inheritance Describe the significance of test cross, back cross and reciprocal cross
Extension and Modification of ork	Explain the chromosomal basis of Mendel's law Analyze the significance of Mendel's work Explain the complex inheritance patterns which do not follow Mendel's laws Describe incomplete dominance, co-dominance, polygenic inheritance and multiple allelism citing suitable examples Describe the contribution of Morgan and his research on <i>Drosophila</i> Describe linkage and crossing over Discuss the implications of sex linked inheritance
Sex Determination	Discuss the basis of sex determination in human beings, birds and insects (honeybee)
Significance of Variations	Define variation and enlist the variations seen in living organisms Draw the link between meiosis and variation Describe the factors responsible for variation Compare and contrast continuous and discontinuous variation
Chromosomal abnormalities in Man	Identify and explain the genetic disorders due to change in Chromosome number and structure
Unit-4: Molecular Basis of Inheritance	
Introduction	Give experimental evidences to prove that DNA is the genetic material Compare the properties of DNA and RNA as genetic material
Genetic Material	Describe the structure of nucleic acids Describe the gene structure in prokaryotes and eukaryotes Present an overview of DNA replication in prokaryotes and eukaryotes
Regulation of Genes	Discuss the process of transcription and translation.
From Gene to Proteins	Explain the regulation of gene expression in bacteria (lac operon)
Genetic code	Familiarize with the significance of the triplet code Identify the pattern in genetic code Discuss the t-RNA and anticodon on it Write the characteristics of genetic code Discuss translocation in brief Describe human genome project in terms of its goals, features and applications

Unit- 5: Evolution	
Origin of Life	Understand and appreciate the origin of earth and life on earth Explain biochemical theory of origin of life
Mechanism of Evolution	Recognize the contribution of Lamarck towards understanding the evolution Appreciate Darwin's theory of natural selection
Evidences in Favour of Evolution	Comprehend the concept of Organic Evolution Explain the significance of Hardy Weinberg principle Differentiate between homologous and analogous organs Explain the morphological, paleontological, embryological, and molecular evidences in favour of organic evolution Trace the evolution of modern human being from its ancestors
Origin of Species	Understand the significance of Neo-Darwinism Explain the sources of variations (gene and chromosomal mutation, recombination, gene flow and genetic drift) Discuss speciation and differentiate between Allopatric and Sympatric speciation with examples Co-relate the role played by Reproductive Isolation in the origin of new species
Unit-6: Statics and Dynamics of an Ecosystem	
Environment, Ecology and Biosphere	Define the terms: environment, ecology, ecosphere, ecosystem and biosphere Co-relate the concept of environment, ecology and biosphere Discuss the levels of ecological organisation Understand the concept of population and community with respect to the biosphere
Components of the Environment	List various components of the environment Differentiate between the biotic and abiotic components Define autotrophs (producers), heterotrophs (consumers), decomposers, scavengers and parasites
Ecosystem Concepts and Principles	Define and discuss 'ecosystem' Discuss the inter-relationship between plants and animals in an aquatic ecosystem and terrestrial ecosystem
Nutrient and Energy Flow in Ecosystem	Explain the concept of ecological succession Explain food chain and food web with examples Draw a relationship between food chain, food web, different trophic levels and energy flow Explain the significance of food chain and food web Trace the path of energy flow in a food chain Appreciate the importance of various trophic levels in an ecosystem Explain the concept and types of ecological pyramids Discuss the significance of studying ecological pyramids
Adaptation	Discuss the concept of ecological adaptations Relate the concept of ecological adaptation with the organism's habitat Justify the role of adaptation in the living world Describe the concept of habitat and niche
Unit-7: Statics and Dynamics of Organisms and Population	
Adaptive Responses of Organisms	Discuss the mechanisms of homeostasis such as regulation, conformation, migration and suspension Describe the concept of adaptation in reference to different abiotic factors
Population and its Regulation	Discuss the concept of population Define Natality, Mortality, Immigration, Emigration and dispersal Explain the signification of S-shaped and J-shaped curve List the various factors that can control population growth Discuss the phenomena of population explosion
Population Interaction	Explain population interaction, mutualism, commensalism, symbiosis, amensalism, predation, parasitism, and competition with examples

Unit-8: Neurons and Nervous System	
Neurons and Functioning of the Nervous System in Humans	Describe the parts of the human nervous system
	Describe briefly the transmission of an impulse through a nerve fiber
	Explain the significance of the neurotransmitters in conduction of the nerve impulse in a chemical synapse
	Explain the structure and function of human brain and spinal cord
	Describe and illustrate the process of reflex action
	Enumerate structural and functional differences between the sympathetic and parasympathetic nervous systems
	Describe the structure and function of human eye and ear
Unit-9: Hormones and Hormonal Control	
Introduction	Justify the need of chemical coordination in human body
	Compare neural and chemical coordination
	Explain the coordination between neural and chemical/hormonal system to ensure smooth and continuous activity of various organ systems
Endocrine Glands	Differentiate between endocrine and exocrine glands
	Categorize endocrine glands according to their location, secretion and function
	Tabulate hormones of endocrine glands and their specific functions
	Appreciate the role of endocrine glands in maintaining homeostasis
Hormones	Define the term Hormones
	Classify hormones on the basis of their site of secretion and mode of action (trophic and non trophic)
	Describe the role of hypothalamus and its secretion in functioning of pituitary /master gland
Disorders of Endocrine glands	Discuss the feedback mechanism of hormonal action
	Describe the symptoms of the disorders caused by underer and over production of various endocrine hormones
Unit-10: Conservation and Restoration Ecology: Issues and Concerns	
Introduction	Describe biodiversity and discuss the magnitude of global bio diversity
	Describe the importance of conservation of biodiversity
Biodiversity Hotspots	Map the biodiversity hotspots identified all over the world and discuss their importance
Extinction of species	Discuss the reason for extinction of species by natural and anthropogenic actions
	Sensitize of the learner about the need of conservation of species hence Biodiversity
	Analyze the implication of introduction of exotic species and its impact on the ecosystem
Conservation of Biodiversity	Describe the initiatives taken for conservation of bio diversity
	Differentiate between <i>in situ</i> and <i>ex situ</i> conservation
	Discuss case studies of some of the above mentioned initiatives
	Discuss the latest research on wild life conservation
	Enlist at least ten endangered species and the significance of the red data book
Restoration Ecology	Differentiate between restoration and regeneration Appreciate the emergence of restoration as an important field in ecology by citing suitable examples
Pollution	Emphasize the role of local people as protectors of their environment
	Define and describe air, water, land and noise pollution
	Explain the effects of air, water, noise and land pollution on organisms
	Suggest possible ways to reduce pollution of air, water, noise and land
	Describe various control measures to be used for air pollution such as electrostatic precipitators
	Discuss the Euro IV norms and use of alternate fuels to control pollution
	Explain the terms eutrophication, bioaccumulation and biomagnifications
Discuss the concept of waste management	
Global Warming and Ozone Depletion	Discuss the effects of global warming and ozone depletion

Unit-11: Biology and Human Health	
Introduction	Discuss the role of immune system in fighting diseases
	Enlist the types of communicable diseases, the causative pathogens and methods of prevention and treatment
	Autoimmune diseases
Medicinal Field	Discuss the role of Antibiotics in controlling bacterial diseases
	Enlist the various non communicable diseases and their treatment
	Explain the concept of allergy and immunodeficiency
	Discuss the latest diagnostic techniques in field of medicine
	Describe the advancements made in stem cell therapy for treatment of diseases.
	Explain the effects of alcohol and drug abuse
Unit-12: Role of Biology in Human Welfare	
Introduction	Understanding the link between the study of biology and its real life applications
	Identify the fields in which biology has made significant contribution.
Animal Husbandry	Discuss the importance of Livestock wealth of a nation
	Describe the processes involved in animal husbandry
	Role of Poultry for supplying egg protein
	Describe the importance of animal breeding
	Discuss the role of Apiculture, Pisciculture and Aquaculture as careers in enhancing the economic development of a nation as well as fulfilling the food requirement of its people
	Importance of sericulture and lac culture
Crop Improvement	Discuss the importance of food production and food security
	Analyse various strategies to enhance the food production of a nation on the basis of its food crops produce
	Enlist the major food crops of their respective nation Discuss the traditional method and modern techniques of crop improvement citing suitable methods
	Describe and explain Biofortification
	Describe the strategies apart from crop hybridisation in improvement of crop production like pest control, application of manures and fertilizers, irrigation facilities etc.
	Appreciate the role of Integrated pest Management as a strategy to improve crop production
Microbes in human welfare	Describe the role of Single Cell Protein in enhancing food production
	Explain the role of microbes and plants in reducing environmental pollution
	Discuss the role of microbes as bio control agents and as biofertilisers
	Discuss the role of microbes in manufacture of Dairy and Bakery Products and alcoholic beverages
	Discuss the role of microbes in manufacture of food supplements such as amino acids, proteins, vitamins etc.
	Discuss the role of microbes and plants in production of fuels
Unit-13: Biotechnology and its Application	
Introduction to Biotechnology	Define Biotechnology
	Recognise biotechnology as an interdisciplinary science
Recombinant DNA Techniques	Define Recombinant DNA Technology
	Define restriction enzymes, ligase, cloning vectors (pBR322) and describe their significance in recombinant DNA technology
	Explain the application of Recombinant DNA Technology to generate recombinant DNA molecule
	Explain the use of polymerase Chain reaction (PCR) to amplify DNA <i>in Vitro</i>
	Describe various methods of Transformation
Applications of Biotechnology	Discuss the use of Genetic Engineering to create transgenic micro-organisms, plants and animals (GMOs)
	Explain the importance of stem cells and their applications
	Describe the principle, procedure and application of DNA finger printing
	Discuss the application of Biotechnology in agriculture and medicine with suitable examples
	Describe the procedure for obtaining foreign gene product
Safety and Ethical Issues	Discuss the safety and ethical issues related to Biotechnology
Scope of Biology	Identify the various career options in Biology