

Class - XI

Biology

Unit	Theme / Topic	Subject Matter	Activities
I	Theme : Living World		
	Topic : 1. Insight to Living World	Biology and its branches; relationships with other sciences; scope of Biology; career options; Role of Biology in dispelling myths and disbeliefs. Characters of living organisms (elementary idea about metabolism, transfer of energy at molecular level, open and closed system, homoeostasis, growth and reproduction, adaptation, survival and death).	Controlled experiment

	2. Diversity of Life.	Diversity of living organisms; classification of living organisms, two kingdom system, five kingdom system, their merits and demerits, major groups and principles of classification within each kingdom. Status of viruses.	1. Study the large variation of living organisms in the neighbourhood.
		Binomial system of nomenclature. Classification; non chordates upto phylum level and chordates up to class level . Plants (major groups –Angiosperms up to class.	2. Study preserved specimens of each group to understand correlations between them. 3. Learn how to collect, press, dry and prepare plant specimens with labels for the herbarium.

II	Theme : Structure and Function		
	1. Cell : The Unit of Life.	<p>Cell, cell theory, And overview of cell, unicellular and multicellular organisms..</p> <p>Cell wall, cell membrane (Unit membrane concept.</p> <p>Fluid mosaic model</p> <p>Cell organelles (Plastids, mitochondria, endoplasmic reticulum, golgi bodies/ dictyosomes, ribosomes, lysosomes, vacuoles, centrioles) and nucleus.</p>	<p>Demonstrate : Magnification and resolution of a microscope.</p> <p>Microscope : How to use it to observe a cell.</p> <p>How to draw the observed cell.</p>

	2. Cell Biomolecules	<p>Basic chemical constituents of living bodies (Inorganic and organic molecules).</p> <p>Structure and functions of carbohydrates, proteins, lipids and nucleic acids.</p>	Demonstrate : The structural models of Amino Acids, Cholesterol, ATP, DNA.
	3. Cell Cycle	<p>Mitosis vs Amitosis.</p> <p>Meiosis</p> <p>Difference between mitosis and meiosis and their significance.</p>	
	4. Enzymes	Types, properties, Chemical nature, mechanism of action, and their functions.	Demonstration of activity

			Effect of pH and temperature on enzyme activity.
III	Structural Organisation in Animals and Plants		
	1. Tissues	Plant Tissues (Meristematic and permanent) Animal Tissues (Epithelial, connective, muscular and Nervous.).	Temporary slide Permanent slide
	2. Morphology of flowering Plants.	Root, stem, leaf, inflorescence, flower, fruit and seed. Description of families (Solanaceae, Brassicaceae, Fabaceae, Asteraceae, Liliaceae, Poaceae). Can be reduce to fire families.	Study of locally available plants and animals for their external morphology.
	3. Anatomy of Flowering Plants.	Root, stem, leaf (dicot and monocot). Secondary growth (Root and stem in dicots).	
	4. Morphology of Animals.	Salient features of earthworm, cockroach and frog.	

IV	Ecology and Environment		
	1. Organisms and The Environment	<p>Organisms and their environmental factors, range of tolerance, ecological adaptations;</p> <p>Level of organization –population, species, community, ecosystem, biosphere;</p> <p>Ecological Interactions – Symbiosis, mutualism, commensalism, parasitism, predation and competition.</p>	Collect some plants from different ecological habitat and study ecological habitat and study their ecological adaptations.
	2. Ecosystem	Components and functions, productivity, energy flow, nutrient cycling, major biomes (brief).	
	3. Ecological Succession	Types and mechanism.	

	4. Natural Resources	Types, use and misuse of natural resources. Conservation.	
	5. Environmental Pollution.	Kinds, sources and abatement of air, water, soil, noise and radioactive pollution. Green house gases, global warming, sea level rise, and Ozone layer depletion.	
	6. Biodiversity	General idea about biodiversity : Magnitude and levels, value of biodiversity, threats to biodiversity, conservation of biodiversity in situ & ex situ and hot spots of biodiversity. Botanical gardens, herbaria, zoological part, sanctuaries and museums.	Endemic/Threatened species of Himachal Pradesh.

V	Biology in Human Welfare		
	1. Immune system and human health.	Innate immunity, acquired immunity, clonal selection primary and secondary immune responses. Lymphoid organs Vaccination and immunization Organ transplants and antibodies Immune system disorders.	
		Pathogens, parasites (Common diseases caused by helminthes) Ascariasis, Filoria), Protozoa (Amoebiasis, Malaria), Bacteria (Typhoid, pneumonia), Viruses (Common cold, AIDS) and Fungi (Ringworms). Cancer and AIDS	

	2. Population & Community Health	<p>Population, environment and development factors (notality, mortality, immigration, emigration, age and sex ratio); impact of population growth; population as a resource, elaborate reproductive health.</p> <p>Biological changes during adolescence.</p>	
		<p>Common problems of adolescence (Drugs, Alcohol and tobacco); Alcoholism in tribal areas of Himachal Pradesh, social and moral implications; mental and addictive disorders. Risks of indiscriminate use of drugs and antibiotics.</p>	

Class - XII

Biology

Unit	Theme / Topic	Subject Matter	Activities
I	Theme : physiology of Plants		
	Topic : 1. Absorption and movement of Water in Plants	Cell as physiological unit; Water relations – absorption and movement (diffusion, osmosis, plasmolysis, permeability, water potential, imbibition); theories of water translocation- root pressure, transpiration pull; transpiration – significance, factors affecting rate of transpiration; mechanism of stomatal opening and closing (Potassium ion theory).	Study imbibition of water by seeds/raisins. Observation on the experiment to show suction due to transpiration.
	2. Mineral Nutrition	Functions of minerals, essential major elements and trace elements, deficiency symptoms of elements; translocation of solutes, nitrogen and	Study of Cuscuta and its adaptation for the parasitic mode of life.

		nitrogen metabolism with emphasis on biological nitrogen fixation; modes of nutrition (autotrophic, heterotrophic, saprophytic, parasitic and insectivorous plants); Chemosynthesis.	
	3. Photosynthesis	Photosynthesis – significance, site of photosynthesis (functional aspect of chlorophyll structure); photochemical and biosynthetic phases; electron transport system, photophosphorylation (Cyclic and non-cyclic); C3 and C4 Pathway; Photorespiration; factors affecting photosynthesis ; chemosynthesis;	Demonstrate requirement of chlorophyll and light for photosynthesis. Comparison of distribution of stomata in the upper and lower surface of leaves.
	4. Respiration	Mechanism of respiration – glycolysis, Krebs cycle, pentose, pathway, anaerobic respiration, respiratory quotient, compensation point; fermentation.	Demonstrate anaerobic respiration. Determining of rate of respiration

			in flower buds, leaf tissue and germinating seeds in different plant material.
	5. Reproduction	Modes or reproduction in flowering plants – vegetative propagation (natural and artificial); significance of vegetative propagation; micropropagation; sexual reproduction- development of male and female gametophytes; pollination (types and factors); double fertilization; incompatibility, embryo development; parthenogenesis and parthenocarpy; fruits – dispersal of fruits and seeds; seed-seed dormancy.	Demonstrate : Controlled pollination- emasculation, tagging & bagging. Pollen germination of stigma. Flower adapted to pollination by different agencies- wind, insect etc. Dispersal of seeds by various agencies.

	6. Growth and Development	Characteristics of plant growth; growth regulators (Phytohormones, Auxins, Gibberellins, Cytokinins, Ethylene, ABA); seed germination – mechanism and factors affecting germination, role of growth regulators in seed dormancy; senescence; abscission; stress factors (salt and water) and growth; plant movement – geotropism, phototropism, turgor growth movements (tropic, nastic and nutation); process of flowering –photoperiodism, vernalization.	Study the effect of apical bud removal on plant. Observation on the experimental set up on phototropism.
II.	Physiology of Animals		
	1. Digestion & Absorption	Nutrition and its types; nutrient –food and vitamins; intracellular and extra cellular digestion; digestive system of invertebrate (prawn); digestive system and process of digestion in humans (Ingestion, digestion, absorption, assimilation and egestion); role of	Test for the presence of carbohydrates (glucose and starch) proteins and fats and their detection of

		enzymes and hormones in digestion; malnutrition, disorders related to nutrition.	suitable plant and animal material.
	2. Respiration	Gaseous exchange in animals (earthworm, cockroach); respiration in humans-respiratory organs, mechanism; breathing and its regulation; transport of gases through blood; common respiratory disorders – prevention and cure.	Demonstration of respiratory system of an insect.
	3. Body Fluids and circulation.	Circulation of body fluids- Intracellular circulation, extra cellular circulation, extra organismic circulation (sponges, hydra), intra organismic circulation – parenchymal circulation (Fasciola); body cavity circulation (Ascaris); blood vascular system –open circulatory system (cockroach) and closed circulatory system (humans); blood and	Blood smear preparation. Staining of WBC's by Leichman or Gimera stain. Comparison of pulse rate during

		<p>its composition; structure and pumping action of human heart, pulmonary and systemic circulation; heartbeat and pulse; rythmicity of heartbet; blood related disorders – hypertension, atheroma, arteriosclerosis; ECG; pacemaker; lymphatic system; immunity and immune system.</p>	<p>rest and exercise. Demonstration of change of heart beat of Daphinia with drugs [if not regular expt, their project].</p>
	<p>4. Excretion and Osmoregulation</p>	<p>Nitrogenous waste elimination – ammonotelism, ureotelism, excretory and osmoregulatory organs of protozoans, invertebrates and vertebrates (humans); formation and composition of urine micturition; role of kidney in osmoregulation, role of ADH; role of skin and lungs in excretion; kidney failure; dialysis, kidney transplantation.</p>	

	5. Locomotion and Movement	Locomotion and movement –types of locomotion and movements; skeletal system – types; main parts of skeleton and their bones; joints and their types; bone, cartilage and their disorders; mechanism of muscle contraction; red and white muscles in movements.	Demonstration of different types of joints in human skeleton relating to different types of movements.
	6. Nervous System	Nervous coordination in human – structure and function of brains and spinal cord; transmission of nerve impulse; reflex action; sensory receptors; structure and function of sense organs –eye, ear, nose, tongue and skin.	Demonstration of different parts of brain with a model or Illustrated parts and listing the functions of each.
	7. Endocrine System	Human endocrine system – hormones and their functions; role of hormones as messengers and regulators; Role of nervous system and endocrine system in behaviour and experience; feedback controls; hormonal imbalance and disease.	

	8. Reproduction and Growth	<p>Reproduction – <u>a general account (a sexual and sexual)</u> repetition of lower classes; human male and female reproductive system; reproductive cycle in female; gametogenesis; fertilization- physical and chemical events; implantation; pregnancy, development of zygote upto 3 germinal layers and their derivatives; extra embryonic membranes; general aspects of placenta; parturition.</p> <p>Reproductive health – birth control (dangers of early pregnancy), contraception; in vitro fertilization, abortion; pre-natal sex determination and sexually transmitted diseases.</p> <p>Cellular growth – growth rate and growth curve; hormonal control of growth; mechanism and types of regeneration; ageing – cellular and extracellular changes; theories of ageing.</p>	
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III.	Genetics and Evolution		
	1. Continuity of Life	Continuity of life – Heredity, variation; Mendelian inheritance; chromosome theory of inheritance, deviations from Mendelian ratio (gene interaction – incomplete dominance; codominance, complementary genes, quantitative inheritance, multiple allelism.	Study Mendelian inheritance using seeds of different colour/size of any plant.
	2. Chromosomes	Chromosomes – ultrastructure of chromosome and gene; parallism between genes and chromosomes; genome; linkage and crossing over; recombination; sex chromosomes – sex determination and sex linked inheritance; mutations; chromosomal aberrations. Human genetics – Karyotype analysis ; genetic disorders.	

	3. DNA : The Genetic Material	DNA as genetic material – its structure and replication; structure of RNA and its role in protein synthesis; Gene expression transcription and translation in prokaryotes and eukaryotes; Genome –concept, Genomics, Human Genome Project	
	4. Gene : Its Nature, Regulation & Manipulation.	Gene-expression-induction, repression; types of genes; oncogenes;recombinant DNA technology; cloning, gene library v/s gene bank; DNA fingerpringing; genomics; principles and applications, transgenic plants (Bt cotton), animals andmicrobes.	DNA fingerpringing, genomics can be shifted to bio-technology.
	5. Evolution.	Origin and evolution of life-oparin, Haldane theory; Miller experiment; theories and evolution; evidences of evolution; sources of variation (mutation, recombination, genetic drift,	Study analogous and homologous organs in various plants and animals.

		<p>migration, natural selection); concept of species; speciation and isolation (geographical and reproductive); origin of species.</p>	
IV	Biology & Human Welfare.		
	<p>1. Animal & Plant Improvement</p>	<p>Animal breeding – improved varieties; common animal diseases.</p> <p>Plants – improved varieties; bio-fertilizers; bio-pesticides; plant tissue culture and its applications; brief account of some common crop and disease; genetically modified food, biowar; biodiesel, biopiracy; biopatent; biosafety issues.</p> <p>IPR (Intellectual Property Rights)</p> <p>Biotechnology in agriculture, health and industry</p>	

	<p>2. Diagnostic Techniques</p>	<p>Modern techniques in disease diagnosis – Haemoglobin estimation; estimation of sugar and urea in blood; TLC;DLC; TSR; lipid profile; ELISA and VIDAL tests (elementary knowledge).</p> <p>Biotechnology therapeutics – hormones; interferon and immunomodulations.</p> <p>Basic concepts of EEG, CT Scan, MRI and Ultrasound.</p>	
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