



Syllabus for Biology

Secondary School Biology (IX - X)

Anatomy and Physiology

Animal Tissues - Different Types Of Epithelial Tissues, Types Of Connective Tissues, Types Of Muscles Fibres, Nervous Tissue

Control and Coordination - Hormones In Animals, Adrenaline, Endocrine System, Thyroid Gland, Growth Hormone, Feedback Mechanisms, Sense Organs, Nervous system, Structure Of Neuron, Reflex Actions, Reflex Arc, Parts Of The Brain, Central Nervous System, Involuntary Actions, Functioning of Nervous tissue

Nutrition and The Human Digestive System - Nutritional Requirements and Procuring nutrition, Autotrophic Nutrition, Photosynthesis, Heterotrophic Nutrition, Nutrition In Human Beings, Alimentary Canal and digestion

Human Excretory System - Excretion In Human Beings, Structure Of A Nephron, Artificial Kidney (Hemodialysis)

Respiration and Circulation in Animals - Break-Down Of Glucose, Mitochondria, Build-Up Of Lactic Acid, ATP as Energy Currency, Human circulatory system, Respiratory Pigment and Transportation In Human Beings, The Heart, Oxygenation of Blood, Blood Pressure, Blood Vessels, Synthesis Of Blood, Lymph

Reproduction in Animals - Replication of Organisms, Replication of DNA, The Importance Of Variation, Modes Of Reproduction Used By Single Celled Organism, Fission, Fragmentation, Regeneration, Budding, Vegetative Propagation, Tissue Culture, Spore Formation, Sexual Reproduction, Advantages of Sexual Reproductions, Human Reproductive System - Sexual Maturation Of The Body, Male Reproductive System, Female Reproductive System, Placenta, Consequence of Fertilisation and lack of Fertilisation, Menstruation, Reproductive Health, Contraceptive Methods

Human Health - Health And Its Failure, The Significance Of 'Health', Effect of Personal and community issues on Health, Distinctions Between 'Healthy' And 'Disease-Free', Acute And Chronic Diseases, Chronic Diseases And Poor Health, Causes Of Diseases, Infectious And Non-Infectious Causes, Means Of Spread of Infectious Agents, Organ-Specific And Tissue specific Manifestations, Principles Of Treatment, Principles Of Prevention, Inoculation, Immunisation

Plant Tissues - Difference between plant and animal tissue, Meristematic Tissue, Permanent Tissue, Types of Simple Permanent Tissue - Parenchyma, Collenchyma, Sclerenchyma, Epidermis, Stomata, Cutin, Suberin, Types of Complex Permanent Tissue - Xylem And Phloem, Vascular Or Conductive Tissue, Tracheids, Vessels, Xylem Parenchyma, Sieve Tubes

Plant Reproductive System - Sexual Reproduction In Flowering Plants, Parts Of A Flower, Self-Pollination, Cross Pollination, Germination

Plant Coordination and Transportation System - Coordination In Plants, Response To Stimulus, Movement Due To Growth, Environmental Triggers, Tropism, Plant Hormones, Transportation In Plants -Water, Food And Other Substances, Transpiration

Diversity and classification

Biological Classification - Basis Of Classification, Characteristics, Form And Function, Classification And Evolution, Evolution, Biodiversity, The Hierarchy Of Classification Groups (Kingdoms to Species), Monera, Protista, Fungi, Saprophytes, Chitin, Symbiotic Life Forms Are Called Lichens, Plantae, Animalia, Classification of Plantae -Thallophyta, Bryophyta, Pteridophyta, Cryptogamae, Phanerogams, Gymnosperms and Angiosperms, Gymnosperms, Angiosperms, Cotyledons, Monocots, Dicots, Classification of Animalia, Porifera, Coelenterata, Platyhelminthes, Triploblastic, Nematoda, Annelida, Arthropoda, Mollusca, Echinodermata, Protochordata, Notochord, Vertebrata and its Classifications - Pisces, Amphibia, Reptilia, Aves, Mammalia

Environment and Ecology

Ecosystem - Effect of Waste on the Environment, Ecosystem and Its Components (Biotic, Abiotic), Producers, Consumers And Decomposers, Food Chains And Webs, Trophic Levels, Energy Flow Diagram, Food Web, Ozone Layer and its depletion, Waste Management

Cell Biology

Structure and Function of Cells - Cells as the Fundamental Unit Of Life, Compound Microscope, Types Of Cells, Structural Organisation Of A Cell, Organelles - Plasma Membrane (Selectively Permeability), Diffusion, Osmosis, Hypotonic Solution, Isotonic, Solution, Hypertonic Solution, Endocytosis, Cell Wall, Cellulose, Plasmolysis, Nucleus, Nuclear Membrane, Chromosomes, DNA And Protein, Genes, Chromatin, Nucleoid, Prokaryotes, Eukaryotes, Cytoplasm, Cell Organelles, Rough And Smooth Endoplasmic Reticulum, Ribosomes, Membrane Biogenesis, Golgi Apparatus, Lysosomes, Mitochondria, Plastids, Vacuoles

Genetics and Evolution

Evolutionary Processes - Accumulation Of Variation During Reproduction, Process Of Evolution, Variations In A Population, Natural Selection, Genetic Drift, Acquired And Inherited Traits, Speciation, Geographical Isolation, Evolution And Classification, Characteristics, Tracing Evolutionary Relationships, Homologous Organs, Analogous Organs, Fossils, Evolution By Stages, Molecular Phylogeny, Difference Between Evolution and Progress, Human Evolution

Heredity - Heredity, Inherited Traits, Rules For The Inheritance Of Traits – Mendel's Contributions, Dominant Traits, Recessive Traits, Expression Of Traits, Genes, Chromosome, Sex Determination

Senior Secondary School Biology (XI - XII)

Zoology - Anatomy and Physiology

Animal Organ Systems - Structural organisations in animals (organ systems, anatomy and morphology) - earthworm, frog, cockroach

Animal Tissues- Epithelial tissue and its classification, Connective tissue and its classification, Muscular tissue and its classification, Neural tissue

Neural Control and Coordination - animal neural systems, human nervous system - central and peripheral nervous systems, parts of the brain and its functions, Somatic, Autonomic, parasympathetic and sympathetic nervous system, Structure and function of a neuron , types of neurons and neurotransmitters, Generation And Conduction Of Nerve Impulse, Reflex Action And Reflex Arc

Body Fluids and Circulation - animal circulatory systems : open and closed circulatory system, Components of blood and their roles, Blood grouping, Process of Coagulation , Parts of the Human Heart, Initiation and Conduction of the Cardiac Cycle, Double Circulation, Regulation Of Cardiac Activity and Disorders Of Circulatory System

Digestion and Absorption - Parts and functions of the Alimentary canal, Dentition, Digestive glands, Process of Digestion of food, Absorption Of Digested Products, Disorders Of Digestive System

Chemical Coordination and Integration - Intercellular Messenger, The Hypothalamus and its hormones, The Pituitary Gland and its hormones, Thyroid gland and its hormones, Hypo and Hyper hypothyroidism, Adrenal gland and its hormones, The pineal gland and its hormones, Parathyroid Gland and its hormone, The Thymus, The Pancreas and its hormones , Diabetes Mellitus, Testis and Ovaries as a gland and the hormones they synthesize, Hormones Of Heart, Kidney And Gastrointestinal Tract, Mechanism Of Hormone Action, Hormone-Receptor Complex, Peptide, Polypeptide, Protein Hormones Steroid, Iodothyronines, Amino-Acid Derivatives

Excretory products and their Elimination - different excretory waste and their elimination (uricotelic, ammonotelic and ureotelic), Parts and functions of the Kidney, Parts and functions of the nephron, Urine Formation, Glomerular Filtration, Ultrafiltration, Reabsorption, Mechanism Of Concentration Of The Filtrate, Counter Current Mechanism, Regulation Of Kidney Function - Renin-Angiotensin Mechanism Atrial Natriuretic Factor, Micturition, Role Of Other Organs In Excretion, Disorders Of The Excretory System

Locomotion and Movement - Types Of Movement, Different types of Muscles and their functions, Structure of Muscles, Structure of Contractile Proteins, Mechanism Of Muscle Contraction, Human Skeletal system - different parts of the axial skeletal system, Different parts

of the appendicular skeletal system, Different types of joints and its range of mobility, Disorders Of Muscular And Skeletal System

Breathing and Exchange of Gases - Different Respiratory Organs - Gills and Lungs, Different parts of the human respiratory system and its functions, Mechanism of Breathing, Respiratory Volumes and Capacities - important terms and their definitions, Alveolar exchange of gases, Transport of Oxygen and Carbon dioxide, Regulation Of Respiration, Disorders Of Respiratory System, Occupational Respiratory Disorders

Neural Coordination and Control - Sensory Reception And Processing 1) The Eye - Parts of the Eye and their functions, Mechanism Of Vision, Role of Retinal and Opsin, Visual Cortex 2) The Ear - Parts of the Ear and its functions, Mechanism Of Hearing

Human Reproductive System - Population Explosion And Birth Control, Different methods of contraception, Maternal Mortality Rate (Mmr) And Infant Mortality Rate (Imr), Lactational Amenorrhea, Medical Termination Of Pregnancy, Sexually Transmitted Diseases (Stds), Infertility, Assisted Reproductive Technologies - In Vitro Fertilisation, Embryo Transfer, Zift, Parts of the Male Reproductive system and its glands, Parts of the Female reproductive system, Gametogenesis, Structure Of A Sperm, Oogenesis, Menstrual Cycle, Fertilisation And Implantation, Pregnancy And Embryonic Development, Parturition And Lactation, Foetal Ejection Reflex

Reproduction in Animals - Different types of Asexual reproduction in Organisms with examples, Sexual Reproduction and its different phases, Oestrus Cycle, Menstrual Cycle, Events In Sexual Reproduction, Homogametes, Sexuality In Organisms, Different modes of Gamete Transfer ,Fertilisation, Parthenogenesis, Syngamy, External Fertilisation, Internal Fertilisation, Post-Fertilisation Events, The Zygote, Embryogenesis, Oviparous And Viviparous

Botany - Anatomy and Physiology

Plant Growth and Development - Plasticity of Plant growth, Plant Growth Regulators - Discovery and Physiological Effect, Characteristics of Plant Growth, Apical Dominance, Phases Of Growth, Growth Rates, Conditions For Growth, Differentiation, Dedifferentiation And Redifferentiation, Photoperiodism and Types of Plants based on Photoperiodism

Morphology and Anatomy of Flowering Plants - The Root System and its Types, Regions Of The Root, Modifications Of Root, The Stem and its parts, Modifications Of Stem, The Leaf and its parts, Venation, Types Of Leaves, Modifications Of Leaves, The Flower and its parts, Types of flowers - symmetry, parts present and absent, arrangement of parts, position of different parts, The Fruit and its parts, Parthenocarpic, The Seed and its parts, Structure Of A Dicotyledonous Seed, Structure Of Monocotyledonous Seed

Plant Nutrition System - Methods To Study The Mineral Requirements Of Plants, Essential Mineral Elements, Criteria For Essentiality, Macronutrients, Micronutrients, Role Of Macro- And Micro-Nutrients, Deficiency Symptoms Of Essential Elements, Toxicity Of Micronutrients,

Mechanism Of Absorption Of Elements, Translocation Of Solutes, Soil As Reservoir Of Essential Elements, Metabolism Of Nitrogen, Nitrogen Cycle, Biological Nitrogen Fixation

Photosynthesis in Higher Plants - Early Experiments by Joseph Priestley, Jan Ingenhousz, Julius Von Sachs, T.W Engelmann, Cornelius Van Niel, Structures involved in Photosynthesis, Light Reactions, Dark Reactions, Pigments involved in Photosynthesis, Light reactions - Light Harvesting Complexes, Reaction Centre, The Electron Transport, Cyclic And Noncyclic Photo-Phosphorylation, Chemiosmotic Hypothesis and Use of ATP and NADH, Biosynthetic Phase- The Calvin Cycle, The C_4 Pathway, Kranz Anatomy, PEP Carboxylase, Photorespiration, Differences, Between C_4 and C_3 plants, Factors Affecting Photosynthesis, Law Of Limiting Factors

Respiration in Plants - What is Plant Respiration, Glycolysis, Krebs' Cycle, Fermentation, Aerobic, Respiration, Tricarboxylic Acid Cycle, Electron Transport System (ETS) And Oxidative Phosphorylation, The Respiratory Balance Sheet, Amphibolic Pathway, Respiratory Quotient

Anatomy of Flowering Plants - Different Plant Tissues, Meristematic Tissues - characteristics and types, Permanent Tissues - Different Types of Simple and Complex Tissue, Structure of Xylem and Phloem, Epidermal Tissue System, Stomatal Apparatus, Root Hairs, Trichomes, The Ground Tissue System, The Vascular Tissue System, Open Vascular Bundles, Structure Of Dicotyledonous Root, Structure Of Monocotyledonous Roots, Structure Of Dicotyledonous Stem, Structure of Monocotyledonous Stem, Structure Of Dorsiventral (Dicotyledonous) Leaf, Structure Of Isobilateral (Monocotyledonous) Leaf, Bulliform Cells, Secondary Growth, Formation Of Cambial Ring, Activity Of The Cambial Ring, Spring Wood And Autumn Wood, Heartwood And Sapwood Bark, Secondary Growth In Roots, Translocation

Plant Transportation System - Means Of Transport, Diffusion, Facilitated Diffusion, Porins, Passive Symports And Antiports, Active Transport, Comparison Of Different Transport Processes, Plant-Water Relations, Transpiration, Water Potential, Solute Potential, Turgid, Pressure Potential, Osmosis, Pressure Gradient And Concentration Gradient, Plasmolysis, Isotonic, Hypotonic, Hypertonic, Turgor Pressure, Imbibition, Long Distance Transport Of Water, Mass Or Bulk Flow, Water Absorption Pathways, Apoplast Pathway, Symplast Pathway, Casparian Strips, Water Movement Up A Plant, Root Pressure, Guttation, Cohesion-Tension-Transpiration Pull, Cohesion, Adhesion, Surface Tension, High Tensile Strength, High Capillarity, Tracheids And Vessel Elements, Transpiration And Photosynthesis – A Compromise, Uptake And Transport Of Mineral Nutrients, Active Absorption, Translocation Of Mineral Ions, Phloem Transport: Flow From Source To Sink, The Pressure Flow Or Mass Flow Hypothesis

Plant Reproductive System - Flower – as a reproductive organ, Pre-Fertilisation: Structures And Events, Pollination, Kinds Of Pollination, Different Types of fertilisation, Agents Of Pollination, Outbreeding Devices, Pollen-Pistil Interaction, Artificial Hybridisation, Double Fertilisation, Primary Endosperm Nucleus, Triple Fusion, Primary Endosperm Cell, Post-Fertilisation : Structures And Events, Seed, Dormancy, Parthenocarpic Fruits, Apomixis And Polyembryony

Cell Biology and Biochemistry

Biomolecules - Analysing Chemical Composition, Primary And Secondary Metabolites, Biomacromolecules, Proteins, Polysaccharides, Nucleic Acids, Structure Of Proteins, Nature Of Bond Linking Monomers In A Polymer, DNA Watson-Crick Model, Dynamic State Of Body Constituents – Concept Of Metabolism, Catalysed Reaction, Enzymes, Metabolic Basis For Living, Anabolic and Catabolic reactions, The Living State, Chemical Reactions, Mechanism of Enzyme Activity, Factors Affecting Enzyme Activity, Inhibition, Competitive Inhibitor, Co-Factors, Classification And Nomenclature Of Enzymes

Characteristics and Functions of Cell Organelles - Cell Theory, An Overview Of Cell and its Organelles, Classification of Cells - Prokaryotes and Eukaryotes, Prokaryotic Cells - Cell Envelope And Its Modifications, Ribosomes And Inclusion Bodies, Eukaryotic Cells - Cell Membrane, Fluid Mosaic Model, Passive Transport and Active Transport, Cell Wall, Endomembrane System, The Endoplasmic Reticulum, Golgi Apparatus, Lysosomes, Vacuoles, Mitochondria, Plastids, Ribosomes, Cytoskeleton, Cilia And Flagella, Centrosome And Centrioles, Nucleus, Microbodies

Cell Cycle and Cell Division - Phases Of Cell Cycle, Mitosis (Equational Division) - steps involved and its significance, Meiosis (Reductional Division) - steps involved and its significance, Difference between Mitosis and Meiosis

Diversity and Classification

Biological Classification - Identification and Nomenclature of organisms, Generic Name And The Specific Epithet, Binomial Nomenclature, Taxonomy, Systematics, Five Kingdom Classification - different kingdoms and their characteristic traits Kingdom Fungi - Characteristics and Classification, Plasmogamy, Karyogamy, Meiosis In Zygote Resulting In Haploid Spores, Dikaryophase, Kingdom Plantae, Alternation Of Generation, Algae - its Uses and Classification, Bryophytes, Mosses, Pteridophytes, Gymnosperms, Angiosperms, Haplontic, Diplontic, Kingdom Animalia - Levels Of Organisation (Cellular , Tissue Level , Organ Level , Organ System), Open Type Circulatory System, Closed Type Circulatory System, Symmetry, Diploblastic And Triploblastic Organisation, Germ Layers, Coelom, Segmentation, Metamerism, Notochord, Classification Of Animals - 7 Phylums and their Characteristic Features, Classes of Chordata and their characteristic traits, Viruses, Viroids And Lichens

The Living World - Biodiversity, Taxonomic Categories, Taxonomic Hierarchy, The Different Taxonomical Aids

Biology in Practice

Principles Biotechnology - Principles Of Biotechnology, Genetic Engineering, Restriction Enzymes, Cloning, Processes Of Recombinant Dna Technology, Isolation Of The Genetic Material (Dna), Cutting Of Dna At Specific Location, Amplification Of Gene Of Interest Using Polymerase Chain Reaction - steps involved in PCR Insertion Of Recombinant Dna Into The Host, Cell/Organism, Obtaining The Foreign Gene Product, Downstream Processing, Tissue Culture, Totipotency, Tools Of Recombinant Dna Technology, Separation And Isolation Of Dna Fragments,

Cloning Vectors and their features, Vectors For Cloning Genes In Plants And Animals, Competent Host (For Transformation With Recombinant Dna)

Application of Biotechnology - Biotechnological Applications In Agriculture - Genetically Modified Organisms, Pest Resistant Plants, Biotechnological Applications In Medicine - Production of Genetically Engineered Insulin, Gene Therapy, Molecular Diagnosis, Transgenic Animals, Ethical Issues

Plant Breeding - Basics of Plant Breeding, Collection Of Variability, Evaluation And Selection Of Parents, Cross Hybridisation Among The Selected Parents, Selection And Testing Of Superior Recombinants, Testing, Release And Commercialisation Of New Cultivars, Plant Breeding For Disease Resistance, Plant Breeding For Developing Resistance To Insect Pests, Plant Breeding For Improved Food Quality, Biofortification, Single Cell Protein

Animal Husbandry - Management Of Farms And Farm Animals, Dairy Farm Management, Poultry Farm Management, Animal Breeding, Inbreeding Depression, Bee-Keeping, Fisheries

Human Health and Diseases - Common Diseases In Humans, Pathogens, Typhoid, Pneumonia, Common Cold, Malaria, Amoebiasis, Ascariasis, Elephantiasis, Ringworms, Immunity, Innate Immunity - Physical Barriers, Physiological Barriers, Cellular Barriers, Cytokine Barriers, Acquired Immunity - Humoral Immune Response, Cell-Mediated Immunity, Active And Passive Immunity, Vaccination And Immunisation, Allergies, Auto Immunity, Immune System In The Body - Lymphoid Organs, Aids -Retrovirus, Elisa, Prevention Of Aids, Cancer -Contact Inhibition, Causes Of Cancer, Carcinogens, Oncogenic Viruses, Cancer Detection And Diagnosis, Treatment Of Cancer, Drugs And Alcohol Abuse, Opioids, Cannabinoids Smoking, Addiction And Dependence, Effects Of Drug/Alcohol Abuse

Microbes in Human Welfare - Microbes In Household Products, Microbes In Industrial Products, Fermented Beverages, Antibiotics, Chemicals, Enzymes And Other Bioactive Molecules, Microbes In Sewage Treatment, Microbes In Production Of Biogas, Microbes As Biocontrol Agents, Biological Control Of Pests And Diseases, Microbes As Biofertilisers

Environment and Ecology

Biodiversity and Conservation - Biodiversity , Genetic Diversity, Species Diversity, Ecological Diversity, Patterns Of Biodiversity, Latitudinal Gradients, Species-Area Relationships, The Importance Of Species Diversity To The Ecosystem, Loss Of Biodiversity, Causes Of Biodiversity Losses, Habitat Loss And Fragmentation, Over-Exploitation, Alien Species Invasions, Co-Extinctions, Biodiversity, Conservation, Strategies for Conservation - In Situ Conservation, Endemism, Ex Situ Conservation

Organisms and Populations - Organism And Its Environment, Biome Distribution, Major Abiotic Factors, Different types of Responses To Abiotic Factors, Adaptations, Population Attributes, Growth Models, Life History Variation, Different types of Population Interactions with examples

Ecosystems - Ecosystem – Structure And Function, Stratification, Productivity, Net Primary Productivity, Decomposition Energy Flow, Photosynthetically Active Radiation, Producers, Consumers and Decomposers - their Mode of Action and Consequences, Detritus Food Chain, Fragmentation, Catabolism, Humification, Saprotrophs, Food Web, Trophic Level, Standing Crop, Ecological Pyramids, Ecological Succession, Succession Of Plants, Pioneer Species, Nutrient Cycling- Carbon Cycle, Phosphorus Cycle, Ecosystem Services

Pollution and its Control - Air Pollution And Its Control , Electrostatic Precipitator, Water Pollution And Its Control, Domestic Sewage And Industrial Effluents, Biochemical Oxygen Demand, Planktonic, Algal Bloom, Biomagnification, Eutrophication, Solid Wastes, Sanitary Landfills, Agro-Chemicals And Their Effects, Radioactive Wastes, Greenhouse Effect And Global Warming, Ozone Depletion In The Stratosphere, Chlorofluorocarbons (Cfcs), Ozone Hole, Snow-Blindness, Degradation By Improper Resource Utilisation And Maintenance, Soil Erosion And Desertification, Waterlogging And Soil Salinity, Deforestation, Reforestation

Evolution and Genetics

Evolutionary Processes- Origin Of Life, Evolution Of Life Forms – A Theory, Evidences For Evolution - Paleontological Evidence, Divergent Evolution, Convergent Evolution, What Is Adaptive Radiation, Mechanism Of Evolution, Hardy-Weinberg Principle, Founder Effect, A Brief Account Of Evolution, Origin And Evolution Of Man

Heredity - Genes, Alleles, Genotype, Phenotype, Dominant, Recessive, Mendel's Laws Of Inheritance, Inheritance Of One Gene, Punnett Square, Law Of Dominance, Law Of Segregation, Incomplete Dominance, Co-Dominance, Inheritance Of Two Genes, Law Of Independent Assortment, Chromosomal Theory Of Inheritance, Linkage And Recombination, Sex Determination in animals, Sex Determination In Humans, Mutation

Genetic Disorders - Pedigree Analysis, Mendelian Disorders, Haemophilia, Sickle-Cell Anaemia, Phenylketonuria, Chromosomal Disorders, Aneuploidy, Polyploidy, Down's Syndrome, Klinefelter's Syndrome, Turner's Syndrome

Molecular Genetics - The Dna - Structure Of Polynucleotide Chain, Double Helix, Transforming Principle, Hershey-Chase Experiment, Properties Of Genetic Material (Dna Versus Rna), RNA Replication, Messelson And Stahl's Experiment, The Machinery And The Enzymes involved in RNA Replication, Transcription - Transcription Unit And The Gene, Types Of Rna And The Process Of Transcription, Codons For The Various Amino Acids, Mutations And Genetic Code - Frame-Shift Insertion Or Deletion Mutations, Trna– The Adapter Molecule, Translation - Charging Of Trna Untranslated Regions (Utr), Regulation Of Gene Expression, The Lac Operon, Human Genome Project, Salient Features Of Human Genome, Bioinformatics Methodologies, Applications And Future Challenges, Dna Fingerprinting, Repetitive Dna, Satellite Dna, Polymorphism, Variable Number Of Tandem Repeats