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Biology

Unit I Diversity in Living World

- **Biology**- its meaning of relevance to mankind
- **Taxonomy** – Concept of species and taxonomical hierarchy
- **Systematic** – Introduction to plant Systematic, its aims, objectives and importance, classification, brief history, introduction, various systems of classification of living organism (Two kingdom system, five kingdom system) Brief introduction to nomenclature and binomial system of nomenclature
- **Salient features and classification of kingdom Monera** (including Archaeobacteria and cyno bacteria) General structure, occurrence, reproduction and economics importance.
- **Kingdom protista**- General structure, occurrence, reproduction and economic importance
- **Kingdom Fungi**- General structure, occurrence, reproduction and economic importance, diseases of economically important crop plant, rusts, smuts, downy and powdery mildew damping off.
- **Kingdom Plantae**- salient features and classification of plants into major groups.
Algae- General account, structure, life cycle of biological importance of green algae, brown algae and red algae.
Bryophytes- General account, structure, life cycle and economic importance of liverworts and mosses.
- **Pteridophytes**- General account, structure, classification, life cycle and economic importance.
- **Gymnosperms**- General account, structure, classification life cycle and economic importance.
- **Angiosperms**- classification up to class, General account, structure, life cycle and economic importance.
Viruses- General structure, types and reproduction of viruses
Lichens- General account, structure and life history.
- **Kingdom Animalia** – salient features (in the reference to habitat, habits morphology and economic importance) and classification of non chordates up to phylum level.
Salient features (in the reference to habitat, habits, morphology and economic importance) classification of chordates up to class level.

Unit II Structural organization in plants

- **Tissue, Tissue system in plants**
 - **Morphology, function and modification of root, stem and leaf**
 - **Anatomy of root, stem and leaf, primary and secondary growth in dicot stem**
 - **Inflorescence, Types of Inflorescence, flower (including position and arrangement of different whorls) placentation, fruit, types of fruit, seed.**
 - **Diagnostics features, economic importance and distribution pattern of Angiospermic families**
 - A) Family Brassicaceae
 - B) Family Fabaceae
 - C) Family solnaceae
 - D) Family Liliaceae
 - E) Family Poaceae
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Unit III Plant Physiology

Transport in Plants - Movement of water. (including diffusion, osmosis, plasmolysis and water relations of cell) and nutrients, long distant of water - absorption, apoplast, symplast, transpiration pull, root pressure and guttation, transpiration opening and closing of stomata, uptake and translocation of mineral nutrients- Transport of food, phloem transport, mass flow hypothesis.

Mineral Nutrition - Essential minerals, macro and micro nutrients and their role, deficiency symptoms, Mineral toxicity, Elementary idea of hydroponics as a method to study mineral nutrition.

Nitrogen Metabolism - Biological nitrogen fixation, Nitrogen cycle.

Photosynthesis - Photosynthesis as means of autotrophic nutrition, pigments involved in Photosynthesis, absorption and action spectra, photochemical and biosynthetic phases of Photosynthesis, photophosphorylation: cyclic and non cyclic of photophosphorylation, chemiosmotic hypothesis, photorespiration, factors affecting Photosynthesis.

Respiration- Aerobic respiration: Glycolysis; Kerbs's cycle Electron transport chain and oxidative phosphorylation, Anaerobic respiration, respiratory substance and respiratory quotient

Plant Growth and development - phases of plant growth and plant growth rate, conditions of growth, Differentiation, and dedifferentiation, Redifferentiation Growth regulators - Role of auxins, gibberlin, cytokinin, ethylene, abscisic acid photoperiodism, role of phytochrome and harmones in photoperiodism, Dormancy, methods of breaking seed dormancy, vernalization.

Plant movements- Tropic movements, phototropism, gravitropism and their mechanism, Nastic movements.

Unit IV Strutral organization In Animals

-Tissue in animals

- Morphology, anatomy and function of different systems (digestive, circulatory respiratory nervous and reproductive)

of earthworm, frog and an Insect (Cockroach)

Unit V Animal Physiology

Human Physiology

Digestion and absorption :- Alimentary canal and digestive glands, role of digestive enzymes and gastrointestinal harmones, digestion, absorption and assimilation of proteins carbohydrates and fats, egestion, nutrition and digestive disorders.

Breathing and respiration - respiratory organs in human beings, Mechanism of Breathing and its regulation in human, Transport of respiratory gases, Respiratory volumes, respiratory disorders.

Circulation

Composition of Blood, Blood groups, coagulation of blood, composition of lymph and its functions, structure of human heart and blood vessels, Cardiac cycle, Cardiac output, ECG, double circulation, Disorders of circulatory systems.

Excretion- Modes of excretion, structure and function of excretory system, Urine formation, osmoregulation, Regulation of kidney function, Renin- angiotensin, role of other organs in excretion, Disorders of excretory system.

▪ Locomotion and Movement :- Types of movement, Skeletal muscle - contractile proteins and muscle contraction, skeletal system and its function, joints. Disorders of muscular and skeletal system

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Neural control and coordination: Neuron and nerves; Nervous system in humans- central nervous system, peripheral nervous system and visceral nervous system; Generation and conduction of nerve impulse; Reflex action; Sense organs; Elementary structure and function of eye and ear.

- Chemical coordination and regulation: Endocrine glands and hormones; Human endocrine system- Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary Idea); Role of hormones as messengers and regulators, Hypo- and hyperactivity and related disorders (Common disorders e.g. Dwarfism)

Unit VI Reproduction

Reproduction in organisms: Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction – Asexual and sexual; Asexual reproduction; Modes- Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.

Sexual reproduction in flowering plants: Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreeding devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events-Development of endosperm and embryo, Development of seed and formation of fruit; Special modes-apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation.

Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis-spermatogenesis & oogenesis; Menstrual cycle; Fertilisation, embryo development upto blastocyst formation, Implantation; Pregnancy and placenta formation (Elementary Idea); Parturition (Elementary idea); Lactation (Elementary Idea).

Reproductive health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control-Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies – IVF, ZIFT, GIFT (Elementary Idea for general awareness).

Unit VII Cell biology, genetics and Evolution.

Structure and function of bio molecules : Carbohydrates, lipids proteins, and nucleic acid.

Enzymes- types, properties, functions and enzymes action

Cell-physico-chemical nature of plasma membrane , cell wall.

Ultra structure of cell organelles with brief description and functions.

1. Endoplasmic reticulum, golgibodies, lysosome, vacuoles, mitochondria, ribosomes, plastids, cilia, flagella, centrioles nucleolus.
2. Cell division : cell cycle, mitosis , meiosis and their significance.

Heredity and variation: Mendelian inheritance; Deviations from Mendelism-Incomplete dominance, Co-dominance, Multiple alleles and inheritance of blood groups, Pleiotropy; Elementary Idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination-In humans, birds, honey bee; Linkage and crossing over; Sex linked inheritance-Haemophilia, Colour blindness; Mendelian disorders in humans-Thalassemia; Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

- Molecular basis of inheritance: Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation-Lac Operon; Genome and human genome project; DNA finger printing.

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Evolution: Origin of life; Biological evolution and evidences for biological evolution from Paleontology, comparative anatomy, embryology and molecular evidence); Lamarck's theory of evolution Darwin's contribution, Modern Synthetic theory of Evolution; Mechanism of evolution-Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg's principle; Adaptive Radiation; Human evolution.

UNIT VIII Biology and Human Welfare

Health and Disease; Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology-vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse.

- Improvement in food production; Plant breeding, tissue culture, single cell protein, Biofortification; Apiculture and Animal husbandry.

- Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

UNIT IX Biotechnology and Its Applications

- Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).

- Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy; Genetically modified organisms-Bt crops; Transgenic Animals; Biosafety Issues-Biopiracy and patents.

UNIT X Ecology and environment

- Organisms and environment: Habitat and niche; Population and ecological adaptations; Population interactions-mutualism, competition, predation, parasitism; Population attributes-growth, birth rate and death rate, age distribution.

- Ecosystem: Patterns, components; productivity and decomposition; Energy flow; Pyramids of number, biomass, energy; Nutrient cycling (carbon and phosphorus); Ecological succession; Ecological Services-Carbon fixation, pollination, oxygen release. Biogeochemical cycle

- Biodiversity and its conservation: Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries.

- Environmental issues: Air pollution and its control; Water pollution and its control; Agrochemicals and their effects; Solid waste management; Radioactive waste management; Greenhouse effect and global warming; Ozone depletion; Deforestation; Any three case studies as success stories addressing environmental issues.

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