

BIOLOGYDiversity of living world

Taxonomic aids, keys, specimen management ; Systematic and binomial system of nomenclature; Classification of living organisms (five kingdom classification, major groups and principles of classification within each group); General description of monera, protozoa, fungi, algae, bryophytes, pteridophytes, gymnosperms, angiosperms (major groups of angiosperms upto sub class) ; Botanical gardens, herbaria, zoological parks and museums. Salient features of animal (nonchordates up to phylum level and chordates up to class level).

Structural organisation in plants and animals

Morphology, Anatomy and histology of angiosperms: Root, stem, leaf, flower, inflorescence, fruits and seeds. Tissues: Meristematic and permanent (epidermal, ground, vascular). Cambial activity, secondary growth, type of wood. Animal tissues; Morphology, Anatomy and histology of annelids, insects, amphibians.

Structural and functional organization of cell

Cell cycle, detailed study of Cell division (mitosis, meiosis); Cell death; Structure and function (metabolism) of carbohydrates, proteins, lipids and nucleic acids; Enzymology: Classification and nomenclature of enzymes; Structure; Mechanism of action, single substrate and bisubstrate enzyme; Activators and inhibitors of enzymes; Factors affecting the activity of enzymes.

Plant physiology

Water relations: Properties of water, water in tissues and cells, Transport of water and solutes (food, nutrients, gases): Transport across cell membrane; soil-plant-atmosphere continuum; Minerals required by plant, their absorbable form, functions, deficiency symptoms, essentiality of mineral, N_2 metabolism, biological fixation; Cellular Metabolism: Gluconeogenesis, Glycogenesis and glycogenolysis, hormonal regulation; Oxidation of food, respiratory efficiency of various food components; transport and detoxification of ammonia, Lipid Metabolism; Photosynthesis: Basic principles of light absorption, excitation energy transfer, electron transports, cycles (C_2 , C_3 , C_4 , CAM), plant productivity, measurement of photosynthetic parameters; Physiological responses to abiotic stresses; Sensory photobiology; Plant growth regulators: Growth, differentiation/de-differentiation and re-differentiation, development; Physiological affects and mechanism of action of plant growth hormones, Flowering: Photoperiodism and its significance, endogenous clock and its regulation, floral induction and development, vernalisation; Plant movements.

Sexual Reproduction

Plants: Structural details of angiospermic flower, development of gametophytes, pollination and its types, agencies of pollination, pollen-pistil interaction, fertilization, Artificial hybridization (emasculation and bagging) development of seed and fruit; Apomixis and Polyembryony; Self incompatibility: Structural and biochemical aspects; methods to overcome incompatibility; Experimental Embryology; Human Reproduction: Morphology, Anatomy, Histology and Physiology of reproduction; Neuro-endocrine control; Sexual behavior in infancy, pre-adolescence, adolescence and of adult; Implantation, Pregnancy and Parturition; Mammary gland and Lactation; Infantile mammary gland, pubertal changes in mammary gland; Structure of adult mammary gland, galactopoiesis, milk let down; Menopause. Senescence-Impact of age on reproduction. Foetal and Embryonic Gonads and Genital ducts; Hormonal basis of sex differentiation; Disorders of sexual differentiation development; Reproductive Health: Problems and strategies, Population explosion -causes and effects, birth control measures-natural methods, physical/barrier, bio-chemical, hormonal, immunological, surgical methods, IUD's, amniocentesis, female feticide, MMR, IMR, MTP, STD's, infertility Disorders of female and female reproductive systems - Sexual dysfunction; Infertility - Causes and curative measures; Reproductive toxicology of environmental and industrial chemicals, drug and alcohol; Medically assisted human reproductive technologies, GIFT, IUT, ZIFT, TET; Embryo culture.

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Genetics

Principles of Inheritance and Variation: Mendelian genetics, Inheritance of one gene, two genes, post mendelian inheritance; Recombination frequency, chromosomal theory of inheritance; Drosophila genetics, linkage and recombinations; Mutation: General properties of mutations; Adaptation versus mutation; molecular basis of gene mutation: DNA repair mechanisms; Pedigree analysis; Human karyotype-banding; genetic and environmental basis of sex determination, Y- and X-linked genes; Numerical and Structural abnormalities of human chromosomes and related syndromes; Human metabolic disorders.; Molecular Basis of Inheritance: Chemical nature of DNA and RNA, Biological functions of nucleic acids; Search for genetic material, RNA world; Replication; Transcription and processing of RNA, Genetic code; Translation, post-translational modifications; Ribosomes and Proteins; Regulation of Gene expression; DNA Fingerprinting; Gene mapping; Chromosome banding; Restriction enzyme, nucleotide sequence comparisons and homologies; Molecular clocks; Genetics in modern agriculture, animal breeding, medicine, human behaviour; Misuse of genetics; Genetic Counseling; Gene therapy; HGP; Gene Activity in prokaryotes and eukaryotes; Signals for gene control – Hormones and growth factors; Totipotency & Pluripotency; Stem cell and Gene therapy; Bacterial transformation, transduction and conjugation, Bacterial chromosome; Bacteriophages: Types, structure and morphology; Evolutionary biology: Cosmic evolution – Physical basis of life; Theories of origin of life; Origin of life through biochemical evolution; Experimental evidences for origin of life; The origin of natural selection; Extraterrestrial life; Evolution of the eukaryotic cell; Evolution of the Metazoa; Evolution of chordata and the evolution of the major vertebrate classes; Origin and evolution of man: Population Genetics; Genetic variations; Polymorphism; Gene frequency; Hardy Weinberg equilibrium; Genetic drift, founder effect; adaptive radiations, ecological significance of molecular variations.

Biology in Human welfare

Health and disease; types of diseases, common diseases in humans; Immunology – Innate and Acquired immunity; Passive and active immunization; Organization and structure of lymphoid organ; Cells of the immune system and their differentiation; Lymphocyte traffic; Nature of immune response ; Structure and Functions of antibodies: Antigen-Antibody interactions; Humoral immune response; Cell mediated immunity; Immunological memory; Auto-immunity; Allergies; HLA system in human: MHC haplotypes; Transplantation types and problems; Immunodeficiency disorders; etiology of HIV; types, genetics and biochemistry of cancer; Drugs and alcohol abuse, Addiction, drug dependence, ill effects, prevention, its abuse in adolescents and its management; Strategies for food production and enhancement: Animal husbandry, management of farm animals, breeding strategies (natural and artificial) and their types, economic importance of each; Plant breeding, method of release of new variety, HYV of common cereals and pulses, bio-fortification, SCP; Tissue culturing, somatic hybridization; Microbes in Human Welfare: Technology associated and use of Microbes in household, industries, medicine, bio-active molecules, sewage treatment and STP, Ganga and Yamuna action plan, biogas production, biocontrol agents, biofertilizers.

Principles of Biotechnology

Genetic engineering tools and technique, technique of separation and isolation of DNA, cloning vectors, electrophoresis, bio reactors, processing of its products. Tissue engineering; Cryopreservation; Fusion methods, detection and applications of monoclonal antibodies, DNA vaccines, Edible vaccines.; Application in agriculture: GMO for pest resistance, RNAi and dsRNA technology, Application in Medicine, genetically engineered products, gene therapy.

Molecular diagnosis: serum and urine analysis, PCR, ELISA; Transgenic animals: their physiology, biological products and their use for testing the safety of vaccine and chemicals; Bioethics issues; biopyracy.

Ecology

Organism and its environment, distribution of biomes, major physical factors and the physiological responses shown by organisms; Physical adaptation of plants and animals, rules governing adaptations; Population attributes and growth, logistic curves, Darwinian fitness; Population interactions and their theories; Ecosystem structure and functions, ecosystem productivity and standing crop, decomposition in nature, energy flow in GFC / DFC, ecological pyramids, succession of community; Nutrient cycle; ecosystem services; Biodiversity types and its patterns, importance of diversity, its loss and their causes, conservation strategies; Environmental issues: Types of pollution, their indicators, causes, effects, prevention and treatment; Deforestation, recommended forestation, reforestation, case studies of people's participation in conservation.

Animal Physiology :

Digestion and absorption,

Breathing and Respiration,

Body fluids and circulation,

Excretory product and their elimination,

Locomotion and movement,

Neural control and coordination,

Chemical coordination and regulation,

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