

BIOLOGY

Taxonomy

Linnaean system of classification and Binomial nomenclature; history and types of classification; status of bacteria and viruses; classification of angiosperms up to sub-class level (Bentham and Hooker' systems); salient features of non-chordates up to phylum levels and chordates up to class levels.

Evolution

Modern concepts of organic evolution, evidences of organic evolution (Fossil records and biochemical evidences). Darwinism and neo – Darwinism, Lamarckism, Neo-Lamarckism, sources of variation, mutation, recombination, genetic drift, migration, natural selection. Origin and concepts of species: speciation and isolation (geographical pre-mating and post-mating or post zygotic), adaptive radiations.

Cell and Molecular Biology

Discovery of cell, cell as a contained unit, pro and eukaryotic cells and its ultra structure. Cell division: amitosis, mitosis and meiosis. The cell: cell wall, cell membrane and cell organelles (Plastids, mitochondria, endoplasmic reticulum, Golgi bodies, ribosomes, lysosomes, vacuoles, and centrioles)

DNA and RNA, DNA as genetic material, RNA as genetic material replication, transcription, genetic code, translation, gene expression and regulation, protein synthesis, DNA repair.

Reproduction and genetics

Reproduction in organisms: asexual and sexual reproduction, sexual reproduction in flowering plants, structure of flowers, pollination , fertilization,

development of seeds and fruits, apomixes, and poly-embryony

Human reproduction: reproductive system in male and female, menstrual cycles, production of gametes, fertilization, implantation, embryo development, pregnancy, parturition and lactation. Sex determination in human, XX and XY

Chromosomes: structure and types, genes and genomes, linkage and crossing over, recombination of chromosomes, mutation, chromosomal aberration, Mendelian inheritance, chromosomal theory of inheritance, deviation from Mendelian ratio (gene interaction, incomplete dominance, co-dominance, complimentary gene, multiple allelism), chromosomal disorders in humans.

Microbiology and Immunology

Introduction to microbial diversity, history of medical microbiology, discovery of antibiotics, pasteurization, microscopes. Fungi, bacteria, virus, protozoa, algae – beneficial and harmful. Parasites and pathogens. Structure of microbes and diseases caused by them.. Microbes in households, food processing, industrial production of microbial products, Sewage treatment, waste management, and energy generation. Basic concepts of immunology: Innate and humoral immunity, lymphoid organs, lymph nodes and spleen, antibodies, vaccines, transplantation immunology, immune system disorders.

Biochemistry

Structure and function of carbohydrates, lipids, proteins. Disaccharide, starch, glycogen, fats, cholesterol, amino acids, peptides. Primary, Secondary and tertiary structure of proteins. Enzymes, structure and mechanism of enzyme catalysis, specificity of enzymes, co factors and co-enzymes.

Physiology: Plant and Human

Plant Physiology: Movement of water, food, nutrients, gases and minerals. Respiration, photosynthesis (light and dark reactions), Factors affecting photosynthesis, electron transport chain (ETC), glycolysis, Krebs's cycle, pentose phosphate pathway, hormones and growth regulators, Photo-periodism and vernalization.

Human Physiology: Digestion and absorption, breathing and respiration, body fluids and circulation, excretory system, endocrine system, nervous system, skeletal and muscular systems: locomotion, and movement, growth, aging and death. Hormones; types of hormones and its functions.

Biotechnology and its applications

Recombinant DNA technology, applications in health, agriculture and industries; genetically modified organisms; bio-safety issues, insulin and Bt cotton, transgenic plants and microbes, plant tissue culture and its application, micropropagation, protoplasmic fusions, single cell proteins, biotechnology products in animal sciences and dairy.

Biodiversity, ecology, and environment

Ecosystems: components, types, and energy flow in ecosystem; species, population and community, ecological adaptations, centers of diversity and conservation of bio-diversity, botanical gardens, national parks, sanctuaries and museums, environmental issues, human population explosion, green house effects, ozone layer depletion, government and Non-government agencies handling environmental issues: poverty and freshwater crisis, and management.

Applied biology and human welfare

Bio-pesticides, genetically modified foods, bio-war, bio-piracy, bio-pattern, sustainable agriculture and medicinal plants, economic important plants (food

crops, oil seeds, fiber yielding, sugar crops and timber yielding), bio-pharming, pesticides, organic agriculture. Population and birth control, contraception and MTP, sexually transmitted diseases, infertility, cancer and AIDS. Adolescence and drug/or alcohol abuse.

Advanced Biology

Plant and human genome projects, DNA fingerprinting and its applications, Bioinformatics and its applications, DNA sequencing and protein structure and biological databases.