

HPSC PGT Syllabus 2024 - BIOLOGY

Below is the HPSC PGT Syllabus 2024 for Biology:

Diversity 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 up to subclass); Botanical gardens, herbaria, zoological parks and museums. Salient features of animals (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 bi-substrate 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/dedifferentiation and redifferentiation, 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, fertilisation, 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.

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 mutation; 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; Regulations 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; Genetics 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; biopiracy.

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.