

Foundation Course for PhD Candidates: Biology

Diversity in Living World: Biodiversity; Taxonomy & Systematics; Binomial nomenclature; Five kingdom classification; Algae, Bryophytes, Pteridophytes, Gymnosperm and Angiosperm. Classification of animals.

Structural Organisation in Animals and Plants: Morphology and modifications; Tissues; Anatomy and functions of different parts of flowering plants: Animal tissues; Morphology, anatomy and functions of different systems.

Cell Structure and Function: Cell theory; Structure of prokaryotic and eukaryotic cell; Plant cell and animal cell; different functional elements in cells. Biomolecules—structure and functions, Enzymes—types, properties, enzyme action. Cell division : Cell cycle, mitosis, meiosis.

Plant Physiology: Transport in plants: Cell to cell transport— Diffusion, Imbibition, water potential, osmosis, plasmolysis; Long distance transport of water, minerals. Nitrogen metabolism – Nitrogen cycle, Photosynthesis: photophosphorylation; Photorespiration; C3 and C4 pathways; TCA cycle, Phases of plant growth; Growth regulators.

Human Physiology: Digestion and absorption: Breathing and Respiration: Body fluids and circulation: Human circulatory system—Cardiac cycle; Excretory products and their elimination: Regulation of kidney function—Locomotion and Movement: Neural control and coordination: Neuron and nerves; Nervous system in humans—Sensory perception; Sense organs; Chemical coordination and regulation: Endocrine glands and hormones; Human endocrine system;

Reproduction: Reproduction in organisms: 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, Outbreedings devices; Double fertilization; Post fertilization events— Development of endosperm and embryo, Development of seed and formation of fruit; Special modes— apomixis, parthenocarpy, polyembryony; Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis- spermatogenesis & oogenesis; Menstrual cycle.

Genetics and Evolution Heredity and variation: Mendelian Inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex linked inheritance- Mendelian disorders in humans— Chromosomal disorders in humans; Molecular Basis of Inheritance: Structure of DNA and RNA; DNA replication; Genome and human genome project; DNA finger printing. Evolution: Origin of life: Darwin's contribution, Modern Synthetic theory of Evolution.

Biology and Human Welfare: Health and Disease: Basic concepts of immunology—vaccines; Cancer, HIV and AIDS; Adolescence, Improvement in food production: Biofortification; Microbes in human welfare.

Biotechnology and Its Applications: Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology). Genetically modified organisms- Bt crops; Transgenic Animals.

Ecology and environment: Organisms and environment: Population and ecological adaptations; Population interactions—Population attributes—Ecosystems: Energy flow; Nutrient cycling; Ecological succession; Ecological Services: Biodiversity and its conservation: Hotspots, National parks and sanctuaries. Environmental issues: Air, water, soil pollution and its control; Radioactive waste management; Greenhouse effect and global warming; Ozone depletion; Deforestation.

Reference

P.Raven, G.B. Johnson, "Biology", Mc Graw Hill, 2010