

# Biology Syllabus for BITSAT-2025

## Diversity in Living World

- Biology – its meaning and relevance to mankind
- What is living; Taxonomic categories and aids; Systematics and Binomial system of nomenclature.
- Introductory classification of living organisms (Two-kingdom system, Five-kingdom system);
- Plant kingdom – Salient features of major groups (Algae to Angiosperms);
- Animal kingdom – Salient features of Nonchordates up to phylum, and Chordates up to class level.

## Cell: The Unit of Life; Structure and Function

- Cell wall; Cell membrane; Endomembrane system (ER, Golgi apparatus/Dictyosome, Lysosomes, Vacuoles); Mitochondria; Plastids; Ribosomes; Cytoskeleton; Cilia and Flagella; Centrosome and Centriole; Nucleus; Microbodies.
- Structural differences between prokaryotic and eukaryotic, and between plant and animal cells.
- Cell cycle (various phases); Mitosis; Meiosis.
- Biomolecules – Structure and function of Carbohydrates, Proteins, Lipids, and Nucleic acids.
- Enzymes – Chemical nature, types, properties and mechanism of action.

## Genetics and Evolution

- Mendelian inheritance; Chromosome theory of inheritance; Gene interaction; Incomplete dominance; Co-dominance; Complementary genes; Multiple alleles;
- Linkage and Crossing over; Inheritance patterns of hemophilia and blood groups in humans.
- DNA –its organization and replication; Transcription and Translation;
- Gene expression and regulation; DNA fingerprinting.
- Theories and evidences of evolution, including modern Darwinism.

## Structure and Function – Plants

- Morphology of a flowering plant; Tissues and tissue systems in plants; Anatomy and function of root, stem (including modifications), leaf, inflorescence, flower (including position and arrangement of different whorls, placentation), fruit and seed; Types of fruit; Secondary growth;
- Absorption and movement of water (including diffusion, osmosis and water relations of cell) and of nutrients; Translocation of food; Transpiration and gaseous exchange; Mechanism of stomatal movement.
- Mineral nutrition – Macro- and micro-nutrients in plants including deficiency disorders; Biological nitrogen fixation mechanism.
- Photosynthesis – Light reaction, cyclic and non-cyclic photophosphorylation; various pathways of carbon dioxide fixation; Photorespiration; Limiting factors.
- Respiration – Anaerobic, Fermentation, Aerobic; Glycolysis, TCA cycle; Electron transport system; Energy relations.

## Structure and Function - Animals

- Human Physiology – Digestive system – organs, digestion and absorption; Respiratory system – organs, breathing and exchange and transport of gases.
- Body fluids and circulation – Blood, lymph, double circulation, regulation of cardiac activity; Hypertension, Coronary artery diseases.
- Excretion system – Urine formation, regulation of kidney function
- Locomotion and movement – Skeletal system, joints, muscles, types of movement.
- Control and co-ordination – Central and peripheral nervous systems, structure and function of neuron, reflex action and sensory reception; Role of various types of endocrine glands; Mechanism of hormone action.

## Reproduction, Growth and Movement in Plants

- Asexual methods of reproduction;
- Sexual Reproduction – Development of male and female gametophytes; Pollination (Types and agents); Fertilization; Development of embryo, endosperm, seed and fruit (including parthenocarpy and elminth).
- Growth and Movement – Growth phases; Types of growth regulators and their role in seed dormancy, germination and movement;
- Apical dominance; Senescence; Abscission; Photo- periodism; Vernalisation;
- Various types of movements.

## Reproduction and Development in Humans

- Male and female reproductive systems;
- Menstrual cycle; Gamete production; Fertilisation; Implantation;
- Embryo development;
- Pregnancy and parturition;
- Birth control and contraception.

## Ecology and Environment

- Meaning of ecology, environment, habitat and niche.
- Ecological levels of organization (organism to biosphere); Characteristics of Species, Population, Biotic Community and Ecosystem; Succession and Climax. Ecosystem – Biotic and abiotic components; Ecological pyramids; Food chain and Food web;
- Energy flow; Major types of ecosystems including agroecosystem.
- Ecological adaptations – Structural and physiological features in plants and animals of aquatic and desert habitats.
- Biodiversity and Environmental Issues – Meaning, types and conservation strategies (Biosphere reserves, National parks and Sanctuaries), Air and Water Pollution (sources and major pollutants); Global warming and Climate change; Ozone depletion; Noise pollution; Radioactive pollution; Methods of pollution control (including an idea of bioremediation); Deforestation; Extinction of species (Hot Spots).

## Biology and Human Welfare

- Animal husbandry – Livestock, Poultry, Fisheries; Major animal diseases and their control. Pathogens of major communicable diseases of humans caused by fungi, bacteria, viruses, protozoans and helminthes, and their control.
- Cancer; AIDS.
- Adolescence and drug/alcohol abuse;
- Basic concepts of immunology.
- Plant Breeding and Tissue Culture in crop improvement.

## Biotechnology and its Applications

- Microbes as ideal system for biotechnology;
- Microbial technology in food processing, industrial production (alcohol, acids, enzymes, antibiotics), sewage treatment and energy generation.
- Steps in recombinant DNA technology – restriction enzymes, NA insertion by vectors and other methods, regeneration of recombinants
- Applications of R-DNA technology in human health –Production of Insulin, Vaccines and Growth hormones, Organ transplant, Gene therapy.
- Applications in Industry and Agriculture – Production of expensive enzymes, strain improvement to scale up bioprocesses, GM crops by transfer of genes for nitrogen fixation, herbicide-resistance and pest-resistance including Bt crops.