ADDENDUM

Ph.D. Admission August, 2023

In continuation to the Ph.D. Admission Brochure August 2023, the syllabus for the screening test for Ph.D. programme in Biotechnology is as under:

DEPARTMENT OF BIOTECHNOLOGY
Entrance Exam Syllabus -PhD
(2023-2024)

1. **Molecules and their Interaction Relevant to Biology:** Structure and functions of biomolecules; Carbohydrates; Fatty acids; Lipids; Amino acids; Proteins; Nucleic acids – DNA, mRNA, tRNA, rRNA; Hormones; Vitamins; Enzymes; Bioenergetics; Cell metabolism; Protein-protein and protein-DNA interactions

2. **Cellular Organization:** Cell theory; Cell as basic unit of life; Hierarchy of cell organization; Structure and organization of prokaryotic and eukaryotic cells; Structure and function of cell organelles; cell cycle; Bio-membranes; Cytoskeletal elements; Chromosome structure; Karyotype; Chromatin organization

3. **Fundamental Processes:** Photosynthesis; Cellular respiration; Movement through cell membrane; Nutrition; Blood clotting; Human physiological systems; Replication; Transcription; Translation; DNA repair mechanisms; Plant physiology; Bacterial growth; Microbial genetics, Secondary metabolites

4. **Cell Communication and Cell Signaling:** Tight adherents and communicating cell junctions; Cell adhesion molecules; Cadherins and Integrins; Extracellular matrix; Cell cycle; Basics of cancer; Basics of cell signaling; Major signaling pathways.

5. **Developmental Biology:** Stages of development; Mechanism of differentiation; Germ layers; Potency; Morphogenetic movements; Early and late development in model organisms;Cell division; Gametogenesis and fertilization in animals and flowering plants; Embryology; Seed germination; Dormancy

6. **Plant and Animal Biotechnology:** Plant tissue culture techniques; Totipotency; Organogenesis and Somatic embryogenesis; Suspension culture; Protoplast isolation and somatic hybridization; Production of secondary metabolites; Basic techniques in animal cell and organ culture; Bioreactors for large scale culture of animal cells; Stem cells; Transgenic plants and animals

7. **Immunology and Immunotechnology:** Immunity; Antigen; Structure of antibody; Hapten; Antigen-antibody interaction, Introduction to antigen presentation; Role of MHC; Complement system; Bacterial diseases of humans; Types of vaccines; Immunization; Recombinant vaccines.

8. **Inheritance Biology:** Mendelian's principles, Extensions of Mendelian principles, Gene mapping methods, Extra chromosomal inheritance, Human genetics, Mutations, Structural and numerical alterations of chromosomes.

9. **Diversity of Life Forms:** General characteristics of life forms; General characteristics of bacteria,

fungi, algae, Microbial growth curve; plant and animal viruses; Classification of plant and animal kingdom

10. **Ecological Principles and Environmental Biology:** Ecosystem; Ecological relationships; Habitat and niche; Ecology of ecosystems; Air, water, and soil pollution; Greenhouse effect and global warming; Noise pollution; Pollution abatement; Wastewater treatment; Disposal of solid wastes; Biogeochemical cycles of elements; Bioremediation; Bioleaching; Biopesticides; Biofertilizers

11. **Evolution and Behaviour:** Evolution and natural selection; Mendel's law of heredity; Evidences of DNA as genetic information carrier; Hardy-Weinberg law; Extra-chromosomal inheritance; Sex-linked inheritance in humans; Mutations.

12. **Applied Biology:** Basics of fermentation technology; Microbes in industry; Biosensors; Biofuels; Principles of gene cloning; Methods of gene transfer; Application of biology in agriculture, health, industry, and environment sectors.

13. **Assay techniques in Biology**: Basics of Centrifugation; Electrophoresis; Chromatography; Microscopy; UV- Visible spectrophotometry; Radiotracer technique; PCR; DNA sequencing; Southern blotting; Tests of significance; Analysis of variation; Correlation and regression; Hybridoma technology; Basic techniques in bioinformatics

14. **Bioinformatics and Computational Biology:** Sequence and Structural Databases (NCBI, GenBank, EMBL, DDBJ, PDB); SNP databases; Visualization tools- Pymol, VMD; Functional Annotation; Local and Global Alignment; Phylogenetics; Pharmacogenomics; Machine learning

15. **Diagnostic techniques:** X-Rays, CT scan, MRI, Pathology test, ECG, EEG

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Chairperson (Ph.D. Admission)