

Ph.D. Biotechnology Entrance Exam Syllabus

Section A. General Biotechnology

Scope and applications of biotechnology, History and recent advances, Biotechnology in agriculture, medicine, industry and environment

Section B. Biochemistry

Biomolecules: carbohydrates, proteins, lipids and nucleic acids, Amino acids and protein structure, Enzymes and enzyme kinetics, Bioenergetics, Metabolic pathways, Glycolysis, TCA Cycle, Electron Transport Chain, Oxidative phosphorylation, Lipid metabolism, Amino acid metabolism, Urea cycle

Section C. Molecular Biology

DNA and RNA structure, DNA replication, Transcription, Translation, Gene regulation, Operon concept, Reverse transcription, Transposable elements, DNA repair, Recombinant DNA technology

Section D. Cell Biology

Prokaryotic and eukaryotic cells, Cell organelles, Cell cycle, Cell signaling, Apoptosis, Cytoskeleton, Chromosomes

Section E. Genetics

Mendelian genetics, Linkage and recombination, Mutation, Population genetics, Quantitative genetics, Human genetics

Section F. Microbiology

Bacteria, fungi, viruses and algae, Microbial growth, Sterilization and disinfection, Microbial nutrition, Industrial microbiology, Immunology basics

Section G. Plant Biotechnology

Plant tissue culture, Callus culture, Cell suspension culture, Micropropagation, Somatic embryogenesis, Haploid production, Genetic transformation, Molecular markers, Crop improvement

Section H. Animal Biotechnology

Animal cell culture, Stem cells, Hybridoma technology, Vaccine production, Transgenic animals, Gene therapy

Section I. Immunology

Innate and adaptive immunity, Antigens and antibodies, MHC, Cytokines, Vaccines, ELISA, Immunoblotting

Section J. Genetic Engineering

Restriction enzymes, Cloning vectors, PCR, DNA sequencing, CRISPR-Cas technology, Gene editing, Expression systems

Section K. Bioinformatics

Biological databases, Sequence alignment, BLAST, Phylogenetic analysis, Genome annotation, Protein structure prediction, Omics technologies

Section L. Bioprocess Engineering

Fermentation technology, Bioreactors, Media formulation, Upstream processing, Downstream processing, Enzyme technology, Process optimization

Section M. Environmental Biotechnology

Bioremediation, Wastewater treatment, Biofertilizers, Biopesticides, Renewable bioenergy

Section N. Analytical Techniques

Spectrophotometry, Chromatography, Electrophoresis, Centrifugation, Microscopy, Flow cytometry, Mass spectrometry, NMR (basics)

Section O. Nanobiotechnology

Nanomaterials, Biosensors, Drug delivery, Nanoparticles in agriculture and medicine

Section P. Research Methodology

Experimental design, Statistical analysis, Scientific writing, Intellectual Property Rights (IPR), Biosafety, Bioethics, Good Laboratory Practices (GLP)