

2023-24

Syllabus for Entrance Test for Admission to Ph.D. (Biotechnology)

Cell Biology: Structural organization and function of intracellular organelles, Membrane structure and function, Cell division and cell cycle, Cell signalling, Cellular communication, Cancer Biology, Photosynthesis and Respiration.

Biomolecules: Structure, function and metabolism of biomolecules- Carbohydrates, lipids, proteins and nucleic acids, Structural organization of proteins, Chemical synthesis of peptides and small proteins. Protein sequencing, Structure and biochemical roles of fat and water-soluble vitamins and their co-enzymes.

Microbial Biotechnology: Historical background and scope of Microbiology, Principles of microbial nutrition, Culture techniques, Growth characteristics, Control of microorganism by physical and chemical agents. Techniques used in bacterial classification, Role of microbes in industry and agriculture

Fermentation Technology, Strain Improvement, Overproduction of primary and secondary metabolites, Fermenter Design, Aerobic and anaerobic waste treatment systems, Bioprocess technology and downstream processing

Molecular Biology: Structure of DNA and RNA, DNA replication, transcription and translation, Post-transcriptional processing, Genetic code, Post translational modification, Regulation of Gene Expression in Prokaryotes and Eukaryotes.

Immunology: Immunology- fundamental concepts and anatomy of the immune system, Immune responses generated by B and T lymphocytes, Hybridoma technology and its application, Antigen processing and presentation, Antigen-antibody interactions, Immunity to Infection, Tumor antigens

Enzymology and Enzyme Technology : Enzyme nomenclature and classification, Methods for enzyme assays, Extraction and purification of enzymes, Cofactors, Substrate and reaction specificity, Enzyme Kinetics-Michaelis-Menten hypothesis, Enzymes inhibition - Competitive, Non-competitive and uncompetitive inhibition, Allosteric enzymes and covalently regulated enzymes, Large scale production of enzymes, Industrial applications of isolated enzymes, Protein Engineering

Genetics : Inheritance, Extra chromosomal inheritance, Inheritance of quantitative traits, Sex linked, Sex influenced and sex limited traits, Molecular Organizations of Chromosomes, Genome complexity, Linkage, Crossing over and Gene mapping in Eukaryotes, Mutation, Molecular concept of the gene, Transformation, Conjugation and Transduction, Molecular mechanism of recombination in bacteria

Genetic Engineering : Restriction enzymes and modifying enzymes, Cloning and expression vectors, Methods of gene isolation, DNA sequencing techniques, Next Generation Sequencing Techniques, Molecular Probes and PCR, Real Time PCR, Molecular Markers-types and applications, Construction of molecular maps, DNA chip Technology &

Microarrays. Gene transfer methods in plants, Molecular mechanism of *Agrobacterium* mediated transformation,

Genomics & Proteomics, Applications of genomics and Proteomics

Bioinformatics: Importance, Scope of Bioinformatics, world wide web as a tool, Bioinformatics institutes and databases, Bioinformatics training & limitations

Tools in Biotechnology: Chromatography Techniques, Electrophoresis Techniques, Microscopic Techniques, Spectroscopic Techniques, Radio-isotopic Techniques, Particle Size Analyzer, Circular Dichroism

Plant Biotechnology: Techniques in plant tissue culture, Micropropagation, Clonal propagation, production of virus-free plants, Protoplast culture, Haploid production and their applications, anther and pollen culture, monoploid production, Cryopreservation and germplasm storage, Practical application of plant tissue culture, Transgenic plants, Chloroplast and mitochondria engineering, Concept of sustainable agriculture.

Animal Biotechnology: *In-vitro* fertilization and embryo transfer in humans and livestock, Transfection techniques and transgenic animals, Animal Cloning.

Medical Biotechnology: Biotechnology in medicine, Vaccines, Diagnostic, Forensic, Gene therapy, Nano Medicine & Drug Delivery, Cell & Tissue Engineering, Stem Cell therapy

Environmental Biotechnology: Role of biotechnology in pollution control, Sewage treatment, Energy management, Bioremediation, Restoration of degraded lands and Conservation of biodiversity

Nanobiotechnology: An Overview, Insights and intervention into the Nano world, Important Developments, Societal implications & Ethical issues in Nanotechnology, Applications of Nanobiotechnology in different areas.

Chairman