GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)
(Declared as Deemed to be University u/s 3 of UGC Act, 1956)
Visakhapatnam | Hyderabad | Bengaluru
Accredited by **NAAC** with **A++** Grade
Website: www.gitam.edu

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PhD Entrance Test Syllabus

PhD in Life Sciences: Biochemistry, Bioinformatics, Biotechnology and Microbiology

Biochemistry and Bioinformatics:

1. Composition, structure and function of biomolecules -carbohydrates, lipids, proteins, nucleic acids and vitamins.
2. Conformation of proteins -Ramachandran plot, secondary structure, domains, motifand folds. Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA.
3. Metabolism of carbohydrates, lipids, amino acids and nucleotides.
4. Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation.
5. General principles of cell communication. Cell surface receptors, signalling through G-protein coupled receptors, second messengers, signal transduction pathways.
6. Blood composition and fundamentals of respiratory system, nervous system, digestive system, and excretory system.
7. Endocrine glands, basic mechanism of hormone action, hormones and diseases.
8. Mendelian principles - Dominance, segregation, independent assortment. Types, causes and detection, mutant types.
9. Beer lambers law, molecular analysis by UV-Visible and mass spectrophotometry. Molecular structure determination using X-ray diffraction and NMR.
10. Molecular separation by SDS-PAGE and agarose electrophoresis.
11. Detection and measurement of different types of radioisotopes normally used in biology.
12. Detection of molecules using ELISA, RIA, western blot, immunoprecipitation, flow cytometry and immunofluorescence.
13. Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, different separation methods.
14. Photosynthesis and photorespiration, Nitrogen fixation. Plant hormones.
15. Major Bioinformatics resources-NCBI, EBI, ExPASy; Sequence and structure databases, Sequence analysis, Phylogeny, Comparative genomics; Molecular modelling and simulations.

Biotechnology:

1. Nature of Genetic material, organization of Genetic material in prokaryotes and eukaryotes,

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2. DNA replication mechanism and proteins involved.
3. Transcription mechanism, types of RNAs, RNA processing, export and degradation.
4. Translation in prokaryotes and eukaryotes. Inhibitors of Protein synthesis.
5. DNA sequencing by chemical and enzymatic methods. Whole genome sequencing strategies.
6. Gene transfer Techniques. Reporter gene assay
7. Selection and expression of r-DNA clones.
8. Construction of genomic libraries and cDNA libraries.
9. Molecular markers (RFLP and RAPD) and their applications.
10. Plant Tissue culture. Phytohormones. Plant secondary metabolites.
11. Basic techniques of animal cells, and tissue cultures.
12. Stem cells – Embryonic and Adult stem cells. Application of stem cells.
13. Concepts of immune response. Cells and organs of the immune system.
14. Antigens and antibodies - generation of antibody diversity. Antigen- antibody interactions
15. Production of Transgenic Animals and plants. knock out generation Techniques
16. Basic concepts of development: Potency, commitment, determination and differentiation; morphogenetic gradients.

Microbiology:

1. Classification of microorganisms. Sterilization techniques, staining techniques, bacterial growth kinetics. Molecular approaches of microbial strain identification.
2. Membrane structure and function: Structure of model membrane, lipid bilayer, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport.
3. Microbial fermentation, Fermented foods, and SCP. Biofertilizers, Biopesticides, Bioremediation, Biosensors, Bacterial chemotaxis and quorum sensing.
4. Metabolism of carbohydrates, lipids, amino acids, and nucleic acids. Enzymes: classification, nomenclature, assay & kinetics. Ribozymes, enzymes, enzyme inhibition, and enzyme purification.

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5. Innate and adaptive immune system, Antigen- antibody interactions, antigenicity and immunogenicity. Structure and function of antibody, generation of antibody, monoclonal antibodies, Major Histocompatibility Complex (MHC), antigen presentation, activation and differentiation of B and T cells, B and T cell receptors, Toll-like receptors, inflammation, hypersensitivity, autoimmunity.
6. Microbial genetics: DNA structure, mutations and repairs. Transformation, conjugation, and transduction, and gene mapping.
7. Recombinant DNA technology, Blotting techniques, PCR, Cloning, Genomic libraries, DNA sequencing methods, and Gene therapy.
8. Microscopy, centrifugation, chromatographic techniques, electrophoresis, and flow cytometry.
9. Host-pathogen interaction: Recognition and entry processes of different pathogens like bacteria, viruses into host cells, alteration of host cell behavior by pathogens, virus-induced cell transformation.
10. Disease pathogenesis and host immune response in tuberculosis, malaria and HIV infections.