

Department of Biotechnology
Punjabi University, Patiala
Syllabus for Ph.D. Entrance Test 2021

Section-A

Research Methodology

1. **Analytical Techniques:** Applications of spectroscopy (uv-vis, NMR, IR, spectrofluorimetry, X-Ray, ORD, CD), Chromatography, PCR, Electrophoresis atomic absorption spectroscopy, Mass spectroscopy
2. **Bioinformatics and Computational Biology:** Applications of bioinformatics; Biological databases; Analysis of Nucleic acid and Protein sequences; Prediction of macromolecular structures.
3. **Biosafety and Bioethics:** Introduction to EPA, 1986; IBSC guidelines; Guidelines for generating preclinical and clinical data, Biohazards bio containment, FSSAI; Ethical issues related to publishing, Plagiarism and Self-Plagiarism
4. **Good lab Practices:** OECD guidelines; Role of DST - NGCMA; GILSP concept.
5. **Commercialization of Technology:** Intellectual property rights, Patents and patenting systems in India; Concepts of TQM; ISO standards, Public-Private Partnership
6. **Research Method in biotechnology:** Molecular tools and techniques in Genetic Engineering; Site-directed mutagenesis; Upstream and downstream processing; Units operations Instrumentation for monitoring and controlling bioreactors

Section-B Subjective

1. **Biochemistry:** Introduction to biomolecules; Structure and function of carbohydrates, nucleic acids, lipids, vitamins; Nomenclature and characteristics of enzymes; Industrial enzymes; Immobilization of biocatalyst; Kinetic characterization; Biochemical applications; Role of enzymes in pharmaceutical and food industry; Biological membranes and cell wall; Metabolism of carbohydrates, lipids, amino acids, nucleotides; Respiration; Photosynthesis; Aroma substances, food colours; Flavour enhancers; Artificial sweeteners; Lipid peroxidation.
2. **Microbiology:** Principles and applications of microscopes; Characteristics of prokaryotic and eukaryotic microbial groups; Principles of microbial nutrition; Strain improvement; Microbial growth; Concepts of energy generation; Biogeochemical cycles; Biological nitrogen fixation; Food poisoning and food-borne infections.
3. **Microbial Genetics, Functional Genomics and Recombinant DNA Technology:** Genetic materials and genome, DNA replication; Transcription; Translation; Genomic and cDNA libraries; Cloning and Expression vectors; Transformation techniques; Applications of rDNA technology; Metabolic and protein engineering.
4. **Biochemical Engineering and Fermentation Technology:** Bioreactor design; Kinetics of batch, continuous and air sterilization; aeration and agitation at shake-flask level and bioreactors; mass transfer and heat transfer in bioreactors; Fluid rheology; Scale up of bioprocesses; fermentation economics; networking in bioprocesses; Fermentation types; Single cell proteins for food and feed; Alcoholic beverages and vinegar; Biopesticides; Biofertilizers; Organic acids; Food additives; Vaccines; By-product utilization in fermentation industry.
5. **Food Technology:** Principles & methods of food preservation; Production of condensed milk, dried milk, butter, cheese, cream, ice cream; Fermented Indian and Oriental dairy products; Meat and sea food processing; Egg processing; Processing of fruits and vegetables, Preservation; Effect of processing on organoleptic properties; Fermented vegetables; Processing of cereals, pulses and oil seeds. Unit operation in food engineering - evaporation, dehydration distillation, size reduction; Fluid flow, Modes of heat transfer, Pulsed electric field processing
6. **Environmental Technology:** Introduction to environment; Environmental applications of biotechnology; Principles of waste treatment; Heavy metal contamination and bioremediation; Aerobic and anaerobic treatment technologies; Treatment of liquid and solid waste; Biological deodorization; Bioenergy generation from waste; Construction and application of biosensors; Biosensor kits; Protein engineering for generic biosensors.