

Department of Biotechnology & Food Technology

Punjabi University, Patiala 147002
(Established under Punjab Act No. 35 of 1961)

Syllabus for Ph. D. Executive Entrance Test for Session 2026-27

Section-A (Research Methodology)

1. **Analytical Techniques:** Applications of spectroscopy (UV-VIS, NMR, IR, Spectrofluorimetry, X-Ray), chromatography, PCR, electrophoresis, atomic absorption spectroscopy, mass spectroscopy.
2. **Bioinformatics:** Applications of bioinformatics; Biological databases; BLAST, FASTA, local and global alignment algorithms.
3. **Biosafety:** Introduction to EPA, 1986; IBSC guidelines; Cartagena protocol; biohazards, bio-containment, risk assessment, risk analysis; biosafety levels, biosafety cabinets; FSSAI.
4. **Commercialization of Technology:** Concepts of TQM; ISO standards, good laboratory practices, good manufacturing practices.
5. **IPRs:** Intellectual property rights, Patents and patenting system in India; Ethical issues related to publishing, Plagiarism.
6. **Research Methods in biotechnology:** Molecular tools and techniques in genetic engineering; Site-directed mutagenesis; upstream and downstream processing in a fermentation process; unit operations; instrumentation for monitoring and controlling bioreactors.

Section-B (Subject)

7. **Biochemistry:** Introduction to biomolecules; structure and function of carbohydrates, nucleic acids, lipids, vitamins; nomenclature and characteristics of enzymes; Kinetic characterization of enzymes; metabolism of carbohydrates, lipids, amino acids, nucleotides.
8. **Microbiology:** Principles and applications of microscopes; principles of microbial nutrition; pure culture; microbial growth; biogeochemical cycles; biological nitrogen fixation; food poisoning and food-borne infections.
9. **Microbial Genetics and Recombinant DNA Technology:** Genetic materials and microbial genomes, DNA replication; transcription; genomic and cDNA libraries; cloning and expression vectors; transformation techniques; applications of rDNA technology.
10. **Biochemical Engineering and Fermentation Technology:** Bioreactor design; aeration and agitation systems in bioreactors; types of bioreactors; mass transfer and heat transfer in bioreactors; fluid rheology, scale up of bioprocesses; fermentation types; media for industrial fermentation; inoculum development; single cell proteins; alcoholic beverages and vinegar; biopesticides; biofertilizers; organic acids; vaccines; antibiotics.
11. **Food Technology:** Principles & methods of food preservation; production of condensed milk, dried milk, butter, cheese, cream, ice cream; fermented Indian and Oriental dairy products; Processing of fruits and vegetables; fermented vegetables; evaporaion, dehydraion, distillation, size reduction; mass and heat transfer.
12. **Environmental Technology:** Environmental applications of biotechnology; principles of waste treatment; Primary, secondary and tertiary treatment of waste water, bioremediation; aerobic and anaerobic treatment technologies; treatment of solid waste; biological deodorization; biofuels from industrial waste.