

**Department of Botany
Punjabi University, Patiala**

Proposed Syllabus for M.Phil. & Ph.D. Entrance Test-2020

**SECTION-A
(RESEARCH METHODOLOGY)**

1. **TECHNIQUES IN MOLECULAR:** Techniques of molecular biology and recombinant DNA technology and their applications.
2. **CELL AND TISSUE CULTURE TECHNIQUES:** Requirements and Techniques for micro propagation of plants, embryo anther and pollen application of cell and Tissue culture.
3. **ANATOMICAL AND HISTOCHEMICAL TECHNIQUES:** Stains and staining techniques; Maceration; Principle of fixation, types of fixatives and their applications, Functioning and application of microtomy. Principle and methods of histochemical localization of biomolecules.
4. **CENTRIFUGATION:** Principle, functioning and applications of low speed, high speed and ultracentrifugation.
5. **SPECTROSCOPY:** Principle, functioning and applications of UV-visible spectrophotometry, spectrofluometry.
6. **ELECTROPHORESIS:** Principle, functioning and applications of simple and 2D gel electrophoresis.
7. **CHROMATOGRAPHIC TECHNIQUES:** Principle and applications of paper chromatography, column chromatography, thin layer chromatography, Ion Exchange, Gel filtration chromatography and Gas HPLC chromatography.
8. **MICROSCOPIC TECHNIQUES:** Principal and application of light microscope, phase contract microscope, scanning and transmission electron microscope.
9. **IMMUNOTECHNIQUES:** Detection of biomolecules using ELISA, RIA, western blotting, immuno-precipitation immuno-fluorescence microscopy.
10. **CHROMOSOME TECHNIQUES:** Fixation of buds for cytological studies, stains for chromosomes staining, chromosome techniques, FISH and GISH.

**SECTION- B
(SUBJECT SPECIFIC)**

11. **DIVERSITY OF LIFE FORMS:** Principles and methods of taxonomy and outlines of latest criteria for classification of Algae, Fungi, Bacteria and Plants. Reproduction and evolutionary relationships among taxa of different groups of organisms.
12. **CELL BIOLOGY AND CYTOGENETICS:** Membrane structure and function; Structural organization and function of intracellular organelles; Organization of genes and chromosomes; Cell division & cell cycle. Genomatic (Chromosomal aberrations, aneupoidy, polyploidy) and point mutations.
13. **FUNDAMENTAL PROCESSES:** DNA replication, repair and recombination; RNA synthesis and processing; Protein synthesis; Control of gene expression at transcription and translation level; Host parasite interaction against pathogens in plants;
14. **DEVELOPMENTAL BIOLOGY:** Microsporogenesis, Megasporogenesis and Post fertilization development. Morphogenesis and organogenesis in plants. Programmed cell death, aging and senescence.
15. **PLANT PHYSIOLOGY:** Photosynthesis; Respiration & photorespiration; Nitrogen metabolism; Plant hormones, their mechanism of action and functions; Sensory photobiology; Solute transport & photoassimilate translocation; Secondary metabolites; Stress physiology; Signal transduction in plants.
16. **MOLECULES & THEIR INTERACTION:** Bioenergetics, coupled reaction, group transfer, biological energy transducers; Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes; Conformation of proteins (Ramachandran plot, 2⁰, 3⁰ & 4⁰ structures; domains; motif and folds); Conformation of nucleic acids (A-, B-, Z-, DNA), t-RNA, micro-RNA).
17. **ECOLOGICAL PRINCIPLES:** The Environment; Habitat and niches; Population ecology; Species interactions; Community ecology; Ecological succession; Ecosystem; Environmental pollution; global environmental change; Conservation biology
18. **APPLIED BIOLOGY:** Transgenic plants, molecular approaches to diagnosis and strain identification; Genomics and its application to health and agriculture; Bioresource and uses of biodiversity; Breeding in plants, including marker – assisted selection; Bioremediation and phytoremediation; Economic importance of Algae, Fungi, Lichens and Bacteria. Economic plants as a source of Food, Timber, Drugs, Essential oils, Rubber, Beverages and Fiber.