

Syllabus of Ph.D. Entrance Examination

18. BIOTECHNOLOGY

- 1. Cell Signaling:** Endocrine, Exocrine and synaptic signaling, surface and intracellular receptors, G proteins and generation of secondary messengers, mode of action of cAMP and Ca^{++} calmodulin, Target cell adaptation, cellular responses to environmental signals in plants and animals.
- 2. Water:** Weak interactions in aqueous systems, Ionization of Water, pH, pKa, Titration curves of weak acids, Buffers, Henderson- Hasselbalch equations, Water as a reactant.
- 3. Enzymes:** Introduction, Classification and Mechanism of action, Concept of activation energy, Enzyme Kinetics- Michaelis-Menten and Lineweaver- Burk equation for single enzyme substrate catalyzed reactions, Units of enzyme activity, Turnover number.
- 4. Methods in Microbiology:** Pure culture techniques, The theory and practice of sterilization, Principles of microbial nutrition, Construction of culture media, Enrichment of culture techniques for isolation of chemotrophs and photosynthetic microorganisms, Pure culture and its maintenance.
- 5. Modes of plant regeneration:** Micropropagation of Plants, Clonal fidelity of micropropagated plants, Explant factors, Nutrient medium factors, Somatic embryogenesis, Organogenesis, Synthetic seeds, Production of virus free plants; Somaclonal variations.
- 6. Cells and organs of the immune system including B-cells, t-cells. Antigen presenting cells, Natural killer cells, Haemopoiesis. Innate, acquired, active and passive**

immunity. Cell mediated and humoral immunity, Antibody dependent cell mediate cytotoxicity.

7. DNA as a genetic material, DNA replication in prokaryotes and eukaryotes, Bidirectional replication and rolling circle process, DNA damage and repair, Mechanisms including recombinations.
8. Preparation of genomic and cDNA libraries, rDNA transfer methodologies. Cloning of genes in microbes, plants and animal systems
9. Concepts of Genetics: Mendel and experimental approach of genetics, Mendel rediscovered, Molecular explanation of Mendel's Laws, Extension of Mendel's work, Mitochondrial and Chloroplast DNA.
10. Molecular approach to environment arrangement, degradative plasmids, Xenobiotics, Biological detoxification