

# Biotechnology Syllabus for Ph.D. Entrance test in JSS Science and Technology University, Mysuru

## **Unit 1: Basic concepts of Biotechnology**

Cell and its types in Eukaryotes, cell and its organelles-structure and function, cell to cell communication, Cell cycle and its regulation, mitosis and meiosis, programmed cell death. Microscopy – Light & Electron, Pure culture Techniques, Sterilization Techniques, Morphology, Ultrastructure and Reproduction of Bacteria, Fungi & Viruses, Microbial nutrition, Microbial growth process, Microbial Metabolism, Study of common Microbial Diseases – Typhoid, Cholera, Tuberculosis, Acquired Immuno Deficiency, Polio & Rabies.

## **Unit 2: Biochemistry and Biochemical Techniques**

Carbohydrates and their classification, Amino acids and their classification, Peptide bond – Structure and conformation. Structure of proteins, naturally occurring peptides. Structure of Insulin, Ribonuclease and Myoglobin. Quaternary structure – Hemoglobin. Classification of lipids. Types of fatty acids, triglycerides, structure and biological activity. Principle and procedure of TLC, Ion-exchange Chromatography, Affinity Chromatography, HPLC, GLC. Introduction to spectroscopy, turbidometry, UV-Vis spectrophotometry, atomic spectrophotometry, Principles of Electrophoretic techniques: agarose and polyacrylamide, SDS-PAGE

## **Unit 3: Bioprocess Technology**

Laws of thermodynamics, Basic concepts of Unit operations and Unit Processes, Kinetics of microbial growth and Product formation, Basic Design, equation for different bioreactors, Stoichiometry of cell growth and product formation, Upstream processing, Media design and Sterilization, Inoculum development, Overview of Downstream processing, Primary separation techniques, Enrichment operations, Membrane based separation processes, Product separation techniques, Solid and waste water treatment techniques.

#### **Unit 4: Immunology and Cell culture techniques**

Innate & Adaptive Immunity, Cells & Organs of Immune System, Complement and their activation, Immunoglobulin classes and sub classes, Antigens, Monoclonal antibodies, MHC, Immunosuppression, Immunotolerance, Elisa, Western Blotting, Radio Immuno Assay (RIA). cellular totipotency, cytodifferentiation, organogenesis, media constituents and their importance, Explant selection and culture, embryo culture, Somatic embryogenesis, isolation and culture of single cell, bioreactors for suspension culture, Androgenesis and Gynogenesis, production of haploids, protoplast isolation, culture and fusion, media for culturing cells and tissues of animals, sterilization, primary culture, isolation of cell lines, culturing, developing and maintenance of different cell types and cryopreservation.

#### **Unit 5: Molecular Biotechnology**

Organisation of Prokaryotic and Eukaryotic Chromosomes, Central Dogma, DNA Replication – Prokaryotic & Eukaryotic, Protein Synthesis – Prokaryotic & Eukaryotic, Operon – Lac & Gal, DNA damage & repair, Gene, restriction enzymes, Vectors in recombinant DNA technology: types of vectors and their applications, Methods of Nucleic acid hybridization, amplification, construction of genomic and c-DNA libraries, gene transfer techniques, transgenic technology in plant and animal improvement. Biological databases, sequence alignment methods and tools: Pairwise and MSA, FASTA, BLAST, Phylogenetic analysis, gene predictive methods, genome mapping and protein predictive methods