

SYLLABUS FOR Ph.D. ENTRANCE EXAMINATION

FOR MICROBIOLOGY & BIOTECHNOLOGY AS GIVEN BELOW:

General Microbiology:

Introduction, Historical Background and Scope of Microbiology, Impact of Microbes on Human Affairs, Differences between Eubacteria & Archaeobacteria, Isolation and Pure Culture Techniques for Microorganisms, Preservation Techniques for Microorganisms, Culture Collection Centers across the world and their role, General Nature, Characteristics and Economic Importance of Various Microorganisms including Bacteria, Viruses, Fungi, Algae and Protozoa, Role of Microorganisms in the fertility of Soil. Control of Microorganisms by Physical and Chemical Agents. Role of Microorganisms in Food, Environment, Industries and Agriculture Fields.

Microbial Physiology:

General Properties, Structure and Functions of Various Biomolecules: Carbohydrates, Proteins, Lipids, Nucleic Acids and Vitamins; Enzymes: Classes, General Properties, Types, Induction and Inhibition of Enzymes, Models used to study enzyme catalyzed reactions, Allosteric Regulation of Enzyme activity; The Operon Concept; Glucose Metabolism: Glycolysis, Gluconeogenesis, Glycogenolysis, ED, HMP, PP Pathways ; TCA Cycle, Gateway step; Oxidation of Fatty Acids; Nucleic Acid Synthesis; Synthesis of Peptidoglycan; Structure and Functions of Various bacterial cell organelles: CellWall, Flagella, Cell Membrane, Pili, etc.; Fundamental Principles of Microbial Nutrition and Growth; Synchronous Growth, Continuous culture concept and models.

Industrial Microbiology:

Introduction, Scope and Historical Milestones in the fields of Industrial Microbiology; Primary and secondary screening of Industrially Important Microorganisms; Primary and Secondary Metabolites; Microbial Production & Applications of Different Organic Acids; Microbial Production and Applications of Different Enzymes; Fundamental Aspects of Fermenter Design, Types of Fermentation Processes: Submerged vs. Solid State Fermentation Processes; Fermentation Economics; Methods used for sterilization, Down stream processing of fermentation products; Methods of Cell Disruption; Methods of Centrifugation; Principles and Applications of various Chromatographic techniques.

Molecular Biology:

Introduction, Scope and Historical Milestones in the fields of Molecular Biology and Genetics; Concept of Gene and Genome; Regulation of Genes in Prokaryotes and Eukaryotes; Organization of Genes and Chromosomes; Operons; Prokaryotic Genetics: DNA Replication, Synthesis of mRNA and Synthesis of Proteins in Bacteria; Fundamental Processes of Gene Transfer: Conjugation, Transformation and Transduction; Jumping Genes: The Transposons; Types of Mutations: DNA Damage and its Repair; Principles of rDNA Technology; Concept of GMO & Its Applications; Enzymes used in Gene Cloning: Restriction Endonucleases, Alkaline Phosphatases, DNA Ligases, etc;

Microbial Diversity & Environmental Biotechnology:

Fundamental concepts of Diversity; Microbial Diversity of Extreme Environments: Hypersaline Environments, High Temperature Environments, Alkaline, Acidic and Others; Different Methods Used for Assessment of microbial diversity

Microbial degradation of Pollutants: Recalcitrants and Xenobiotic Compounds;
Bioremediation, Bioleaching of Heavy Metals from Low Grade ores; MEOR

Biostatistics & Bioinformatics:

Fundamental Aspects of Statistics Applied to Biology; Principles of Biostatistics; Mean, Median, Mode, Std. Deviation; Tools of Biostatistics; Applications of Biostatistics
Basics and Principles of Bioinformatics; Classification and Types of Databases, Tools of Importance in Bioinformatics; Applications of Bioinformatics.