

513. MICROBIOLOGY

Historical developments in microbiology and contributions of important scientists

Microscopy: Principles and working of light and electron microscope

Structure and molecular functions of Eukarya, Archaea and Bacteria

Microbiological techniques – Methods of Sterilization (physical and chemical), Enrichment culturing and development of pure cultures. Preservation and maintenance methods of microbial cultures.

Identification characteristics and classification of bacteria. Bergy's manual and its latest status.

General characters Bacteria, Mycoplasma, Rickettsia, Chlamydia, algae and fungi.

Microbial nutrition and metabolism – Nutritional requirements and groups, autotrophy, heterotrophy, respiration and fermentation. Types of microbiological media and application.

Microbial growth curve, methods of growth measurement, continuous culturing and synchronous cultures. Bacterial endospores.

Immunology: Immune system, antigens, antibodies, antigen-antibody reactions, application of Ag-Ab reactions, hypersensitivity, immunity and its types.

Viruses: General characters, cultivation and assay methods, structure and replication of T2, lambda phages, adenovirus, RNA tumor virus.

Biometry: Introduction, population, sampling procedures, frequency distributions, probability, distributions, correlation and regression for application in biological research.

Computers: Basic concepts – (Input, output, CPU, ALU), INPUT and output devices.

Microbial biochemistry – pH and buffers, concepts in bioenergetics, free energy, high energy compounds, biological redox systems. ETS, Oxidative phosphorylations, bacterial photosynthesis structure and functions of important lipids. Nucleic acids- purines, pyrimidines, nucleotides and their metabolism. Amino acids and proteins – structure and properties of amino acids and proteins. Amino acid biosynthesis and degradation – an overview. Enzymes – Properties and classification, enzyme activity curves and enzyme inhibition. Regulation of enzyme activity. Cell disruption methods, isolation and purification of biomolecules, spectrophotometry.

Microbial Genetics: Mutations, mutagenesis, types of mutagens. Mutagenicity evaluation using microbial system. Gene structure, function and regulation. Plasmids and transposable elements and their application in gene cloning. Genetic recombination – transformation, transduction, conjugation. Genetic engineering – Vectors, restriction mapping, cloning, enzymes of engineering.

Structure and function of DNA. Structure and types of RNA and their functions. Genetic code and gene translation in prokaryotes and eukaryotes.

Industrial Microbiology: Exploitation of microorganisms for economic products. Screening, detection and assay methods for fermentation products. Types of fermentations. Factors affecting fermentations, strain development for industrial application. Fermentative production of alcohol, beverages, organic acids, amino acids, vitamins, antibiotics, microbial enzymes. Microbial transformation of steroids.

Agricultural microbiology: Soil and its nature. Soil microorganisms and their importance. Microbial decomposition of organic matter. Mineralization of organic nitrogenous matter and soil humus formation. Nitrification, denitrification and nitrogen fixation by microorganisms. Microbial transformation of phosphorous, sulfur, iron. Plant microbe interaction – rhizosphere, mycorrhizae. Phillosphere, microbial biofertilizers and biopesticides. Rumen microorganisms and their importance.

Microbiology of food and water: Microorganisms of milk and milk products and their importance. Fermented foods. Bacteriological examination of foods, food spoilage, food preservation.

Microorganisms in water and water pollution. Microbiological testing of water quality (coliform test). Microbiological treatment of sewage.

Medical microbiology: Host parasite interaction and microbial diseases. Normal flora of human body. Diagnostic microbiology for infectious diseases. Bacterial diseases caused by *Clostridium tetani*, *Streptococcus*, *Corynebacterium*, *Mycobacterium*, *Neisseria*, Spirocheates, *Vibrio cholerae*. Viral pathogens and their diseases – Diseases caused by artho and paramyxo viruses, Rabies virus, encephalitis virus, pox, Herpis, Hepatitis, HIV. Water borne infections – Hepatitis-A, Poliovirus. Diseases caused by pathogenic parasites – Malaria, Amoebiasis, Helminthic infections, Round worm and Hook worm infections. Diseases caused by pathogenic fungi – Dermatomycosis and Deepmycosis and their causative organisms and diagnosis. Epidemiology of infectious diseases and its importance. Prevention and control of infectious diseases.

Therapeutic control of infectious diseases. Concept of selective toxicity. Synthetic and antibiotic drugs. Mode of action of drugs acting on cell wall (Penicillin), membrane (polymyxin, polyenes), protein synthesis (streptomycin), intermediary metabolism (sulphanilamide).

Microbiological assays for growth promoting and inhibiting agents, testing for drug sensitivity.