

<b>XL - S</b>	<b>Microbiology</b>
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**Section 1: Historical Perspective**

Discovery of microbial world; Landmark discoveries relevant to the field of microbiology; Controversy over spontaneous generation; Role of microorganisms in transformation of organic matter and in the causation of diseases.

**Section 2: Methods in Microbiology**

Pure culture techniques; Principles of microbial nutrition; Enrichment culture techniques for isolation of microorganisms; antigen and antibody detection methods for microbial diagnosis; Light-, phase contrast-, fluorescence- and electron-microscopy; PCR, real-time PCR for quantitation of microbes; Next generation sequencing technologies in microbiology.

**Section 3: Microbial Taxonomy and Diversity**

Bacteria, Archea and their broad classification; Eukaryotic microbes: Yeasts, molds and protozoa; Viruses and their classification; Molecular approaches to microbial taxonomy and phylogeny.

**Section 4: Prokaryotic Cells: Structure and Function**

Prokaryotic Cells: cell walls, cell membranes and their biosynthesis, mechanisms of solute transport across membranes, Flagella and Pili, Capsules, Cell inclusions like endospores and gas vesicles; Bacterial locomotion, including positive and negative chemotaxis.

**Section 5: Microbial Growth**

Definition of growth; Growth curve; Mathematical expression of exponential growth phase; Measurement of growth and growth yields; Synchronous growth; Continuous culture; Effect of environmental factors on growth; Bacterial biofilm and biofouling.

**Section 6: Control of Micro-organisms**

Disinfection and sterilization: principles, methods and assessment of efficacy.

**Section 7: Microbial Metabolism**

Energetics: redox reactions and electron carriers; Electron transport and oxidative phosphorylation; An overview of metabolism; Glycolysis; Pentose-phosphate pathway; Entner-Doudoroff pathway; Glyoxalate pathway; The citric acid cycle; Fermentation; Aerobic and anaerobic respiration; Chemolithotrophy; Photosynthesis; Calvin cycle; Biosynthetic pathway for fatty acids synthesis; Common regulatory mechanisms in synthesis of amino acids; Regulation of major metabolic pathways.

**Section 8: Microbial Diseases and Host Pathogen Interaction**

Normal microbiota; Classification of infectious diseases; Reservoirs of infection; Nosocomial infection; Opportunistic infections; Emerging infectious diseases; Mechanism of microbial

pathogenicity; Nonspecific defense of host; Antigens and antibodies; Humoral and cell mediated immunity; Vaccines; passive immunization; Immune deficiency; Human diseases caused by viruses, bacteria, and pathogenic fungi.

### **Section 9: Chemotherapy/Antibiotics**

General characteristics of antimicrobial drugs; Antibiotics: Classification molecular mechanism of mode of action and resistance; Antifungal and antiviral drugs.

### **Section 10: Microbial Genetics**

Types of mutation; UV and chemical mutagens; Selection of mutants; Ames test for mutagenesis; Bacterial genetic system: transformation, conjugation, transduction, recombination, plasmids, transposons; DNA repair; Regulation of gene expression: repression and induction; Operon model; Bacterial genome with special reference to *E.coli*; Phage  $\lambda$  and its life cycle; RNA ; mutation in virus genomes, virus recombination and reassortment; Basic concept of microbial genomics.

### **Section 11: Microbial Ecology**

Microbial interactions; Carbon, sulphur and nitrogen cycles; Soil microorganisms associated with vascular plants; Bioremediation; Uncultivable microorganisms; basic concept of metagenomics and metatranscriptomics.