

BIO-TECHNOLOGY

Semester I

MBT- 747: Macromolecules and Basic Enzymology (M.Sc.; Paper-I)

M. M. 70

Unit I

Properties of water, pH, Henderson Hasselbalch equation, buffer, physiological buffer & its significance; Carbohydrates: Classification, structure, function and properties, Glycoconjugates: glycolipids, glycoproteins, proteoglycans, Glycosaminoglycans.

Unit II

Lipids: Classification, structure, function and properties, Sterols, Lipoproteins, Vitamins (fat soluble and water soluble), structure, properties, deficiency diseases.

Unit III

Nucleic Acids: types, structure, properties, Porphyrins, DNA sequencing, DNA polymorphism, Supramolecular assemblies: molecular assemblies like membranes, ribosomes, extracellular matrix, organization of macromolecular complexes-chromatin and ribosomes.

Unit IV

Proteins: Classification, hierarchy in structure: Primary, secondary, tertiary and quaternary structure, Ramachandran map, Protein folding: Biophysical and cellular aspects. Protein-protein and protein-ligand interactions and physical and chemical methods for their study. Sequencing of proteins, Protein denaturation.

Unit V

Introduction and Classification of enzymes: Kinetics and thermodynamic analysis, concept of Activation energy, Michaelis-Menten and Lineweaver Burk graphs for single substrate enzyme catalyzed reaction, unit of enzyme activity, Isozymes. Catalytic antibodies and functional proteins: Structure and drug targets (enzymes and receptors).

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**MBT- 748: Molecular Cell Biology
(M.Sc.; Paper-II)**

M. M. 70

Unit I

General structure of Cell, Historical origins of cell biology: The discovery of cell, development of the cell theory, the molecular evolution, Intercellular communication- Gap junctions, tight junction and Desmosomes.

Unit II

Structure of prokaryotic and eukaryotic cells: Isolation and growth of cells, Cellular organelles: Plasma membrane, cell wall, cytoskeleton, their structural organization, mitochondria, chloroplast, nucleus and other organelles and their organization, genetic constitution of mitochondria and chloroplast, lysosome, membrane models.

Unit III

Membrane transport: passive and facilitated diffusion, active transport, symport, antiport, transport of nutrients, ion and macromolecules across membranes, liposomes, molecular biology of some important pathogen of AIDS, malaria, hepatitis, tuberculosis, filaria, kalazar.

Unit-IV

Cell cycle: Molecular events and regulation in model systems, Genes for social control of cell, Cellular responses to environmental signals in bacteria, plants and animals: Mechanism of signal transduction, Exocrine, Endocrine, Paracrine and Synaptic strategies of chemical signaling, surface receptor mediated transduction (DAG, Ca²⁺, c-AMP, G-Proteins), intracellular protein traffic, secretory and endocytic pathway.

Unit-V

Cellular basis of differentiation and development: Cell division, gametogenesis and fertilization, differential gene activity and cell differentiation, morphogenetic determinants in egg cytoplasm and programmed cell death- apoptosis, Heterocyclic compounds and secondary metabolites in living system: Nucleotides, pigments, isoprenoids

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MBT- 749: Microbial Physiology and Genetics
(M.Sc.; Paper-III)

M. M. 70

Unit I

History, development and scope of microbiology, Structure and function of prokaryotic cells, classification of bacteria: modern approaches of bacterial taxonomy (Numerical Taxonomy, 16S rRNA analysis), prokaryotic diversity, Bacteria: General properties, structure and classification, Viruses: General properties, structure and classification of viruses based on their genomes, bacterial viruses (phage Lambda), plant viruses (CaMV), animal viruses (Hepatitis A and B, retroviruses), viroids and prions.

Unit II

Methods in Microbiology: Theory and practice of sterilization, pure culture techniques, principles of microbial nutrition, construction of culture media, enrichment of culture techniques, isolation and culture of aerobic and anaerobic bacteria. Microbial growth: growth curve, measurement of growth and growth yields, synchronous growth, continuous culture, growth affected by environmental factors, culture collection, preservation and maintenance of cultures, Antibiotics and Chemotherapy: Antimicrobial agents, sulfa drugs, Penicillins and Cephalosporins, broad-spectrum antibiotics, antibiotics from prokaryotes, antifungal antibiotics, mode of action of antibiotics, resistance to antibiotics.

Unit III

Microbial diseases: Disease reservoirs, epidemiological terminologies, infectious disease transmission, respiratory infections caused by bacteria and viruses, tuberculosis, sexually transmitted diseases, diseases transmitted by animals (rabies, plague), insects and ticks (rickettosias, chlamydia and lyme diseases), food and water borne diseases, pathogenic fungi, Host-parasite relationships, normal microflora of skin, oral cavity, gastrointestinal tract, Entry of pathogens into the host: colonization and factors predisposing to infections. Types of toxins: Exotoxins, endotoxins, enterotoxins, their structure and mode of action, virulence and pathogenesis.

Unit IV

Overview of basic metabolism. Metabolic diversity among microorganisms. Photosynthesis in microorganisms: Role of chlorophylls, carotenoids and phycobilins, Calvin cycle. Chemolithotrophy, hydrogen-iron-nitrite-oxidizing bacteria, nitrate and sulphate reduction, methanogenesis and acetogenesis. Fermentation: Diversity, syntrophy and role of anoxic decompositions, nitrogen metabolism, nitrogen fixation, hydrocarbon transformation.

Unit V

Bacterial genetic system, recombination transformation, conjugation, transduction, plasmids and transposons, bacterial genetic map with reference to *E. coli*. Viruses and their genetic system, Phage I and its life cycle, RNA phages, RNA viruses, retroviruses, Genetic Systems of yeast and Neurospora, extra-chromosomal inheritance.

M.Sc. Biotechnology Course Programme (Effective from session 2018-19)

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