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M.A. M.Sc. BIOTECHNOLOGY
Exam. Dec., 2014
First/Third Semester (FIRST SEM)
Pages 04 to 08

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101: CELL BIOLOGY

UNIT I

1. Cell Membrane: Physicochemical Properties and asymmetrical organization of lipids, proteins and carbohydrates
2. Transport of small molecules across cell membranes: Types and Mechanism
3. Active transport by ATP-Powered pumps Types: p-type, V-type, F-type ABC transporters
4. Properties and mechanisms of transporters; Patch clamp technique

UNIT II

1. Protein targeting-Cell map: Signal hypothesis and default protein secretory pathway
2. Protein glycosylation-N and O linkages
3. Protein targeting- ER, Golgi Body and Lysosome
4. Protein targeting- Mitochondria, Chloroplast, Nucleus

UNIT III

1. Ultra structure and function of Lysosomes and Peroxisomes
2. Cell motility: Structure and functions of microfilaments
3. Cell motility: Structure and functions of microtubules and intermediary filaments
4. Cell junctions: Occluding junctions, anchoring junctions and communicating junctions

UNIT IV

1. Molecular mechanism of Ca^{++} dependent cell adhesion
2. Molecular mechanism of Ca^{++} independent cell adhesion
3. Organization and functions of Extra-cellular matrix in animals
4. Extra-cellular matrix receptors on animal cells: integrins

UNIT V

1. Cell Signaling: G-protein signaling. Initiation and regulation of MAP kinase and tyrosine kinase pathway
2. Molecular events accompanying eukaryotic cell cycle
3. The cell cycle control proteins: Cyclins
4. Apoptosis: Morphological and biochemical changes, pathways and regulators

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Practical Exercises

1. Sub cellular fractionation
2. Chromosome preparation: Mitosis - Onion root tip, rat/mouse cornea, rat/mouse bone marrow, human lymphocytes
3. Chromosome preparation: Meiosis - Rat/mouse testis, Grasshopper testis
4. Polytene chromosome preparation from Drosophila salivary gland
5. Identification of tissue typing: Histological preparation of tissue
6. Identification of different biomolecules in different tissues by histochemical techniques
7. Electron microscopy: Demonstration and good photographs for interpretation.

Reference Books

1. Molecular Biology of the Cell (2002), Alberts et al
2. Molecular Cell Biology (2004), Lodish et al
3. Working with Molecular Cell Biology: A study Companion (2000), Storrie et al
4. Cell and Molecular Biology: Concepts and Experiments (3rd Ed., 2002), Gerald Karp
5. The Cell: A Molecular Approach (2004), G.M. Cooper
6. The Word of the Cell (1996), Becker et al
7. Cell Proliferation and Apoptosis (2003), Hughes and Mehnet
8. Essential Cell Biology (1998), Alberts et al
9. Biochemistry and Molecular Biology of Plants (2000), Buchanan et al
10. Harpers Biochemistry Murray et al

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103. MICROBIOLOGY

UNIT I

1. Classification of microorganisms
2. Morphology and structure of cell wall; eubacteria, archeobacteria and fungi
3. Preparation of culture media, pure culture techniques and microbial staining
4. General account and economic importance of Cyanobacteria

UNIT II

1. Sterilization: Physical and chemical methods
2. Microbial growth: growth curve, measurement of growth and factors affecting growth
3. Nutrition based classification of microorganisms, different carbon and nitrogen sources, mode of nutrition, transport of nutrition across membrane
4. Oxygen toxicity: Study of catalase, peroxidase, superoxide dismutase, mechanism of oxygen toxicity

UNIT III

1. Infection and disease: Types of infection, Mechanism of pathogenesis of bacterial and viral diseases
2. *Staphylococcal* and *Clostridial* food Poisoning, Bacterial Diseases: Salmonellosis and Shigellosis
3. Fungal diseases: Histoplasmosis, Aspergillosis and Candidiasis
4. Viral diseases: Hepatitis B and HIV

UNIT IV

1. Viruses: Types, isolation, cultivation, identification
2. Lytic and lysogenic cycle of bacteriophages
3. Life cycle of DNA viruses: SV 40, RNA viruses: Retroviruses
4. Plant viruses: TMV, Gemini, CaMV

UNIT V

1. Bacterial Recombination: Transformation, conjugation, transduction, F-duction
2. Chemotherapeutic agents: Classification of antibiotics, Broad and narrow spectrum antibiotics; Antibiotics from prokaryotes
3. Anti-fungal and antiviral antibiotics, mode of action of antibiotics
4. Mechanism of drug resistance, plasmids and transposons

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Practical Exercises

1. Preparation of Liquid and Solid media for growth of microorganisms.
2. Isolation and maintenance of organisms by plating, streaking and serial dilution method, slant and stab cultures, storage of microorganisms.
3. Isolation of pure cultures from soil and water
4. Growth; Growth curve; Measurement of bacteria population by turbidometry and serial dilution methods. Effect of temperature, pH and carbon and nitrogen sources on growth.
5. Microscopic examination of bacteria, Yeast and mold and study of organism by Gram's stain, acid fast stain and staining for spores
6. Study of mutation by Ame's Test.
7. Assay of antibiotics and demonstration of antibiotic resistance
8. Analysis of water for potability and determination of MPN.
9. Bacterial transformation.
10. Biochemical Characterization of selected microbes.
11. One Step growth curve of coliphage.

Reference Books

1. General microbiology, R.Y. Ingraham, J.L. Wheelis, M.L. and Painter, P.R. The Macmillan Press Ltd.
2. Brock Biology of microorganism, M.T. Martinko, J.M. and Parker, J. Prentice-Hall.
3. Microbiology, Pelczar, M.J., Chan E.C.S. and Kreig, N.R., Tata McGraw Hill.
4. Microbial Genetics, Malloy, S.R., Cronan, J.E. Jr and Freifelder, D.Jones, Bartlett Publishers
5. Microbiology-A Laboratory Manual, cappuccino, J.G. Sherman, N. Addison Wesley.
6. Microbiological Applications (A Laboratory Manual in General microbiology) Benson, H.J. WCB: Wm C Brown Publishers

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