M.Sc.(Previous) ZOOLOGY-2005-06

PAPER-IV
MOLECULAR CELL BIOLOGY AND CYTOGENETICS

Duration : 3 hours **M.M. 100**

UNIT-I

1 A brief introduction and scope of Cell Biology.

2 Biomembranes : Molecular composition, arrangement and functions.

(a) Transport across cell membrane-Diffusion, active transport and pumps, uniports, symports and antiports.

(b) Membrane potential.

(c) Co-transport by symporters and antiporters.

(d) Transport across epithelia.

3 Cytoskeleton :

(a) Microfilaments and microtubules- structure and dynamics

(b) Microtubules and mitosis

(c) Cell movements: Intracellular transport, role of kinesin and dynein, signal-transduction mecha-

UNIT-II

4 Cilia and flagella.

5 Cell-cell signalling:

(a) Cell surface receptors.

(b) Second messenger system.

(c) MAP Kinase pathways.

(d) Signalling from plasma membrane to nucleus.

6 Cell- cell adhesion and communication.

(a) Tight junctions, belt desmosomes, and spot desmosomes.

(b) Ca^{++}-dependent homophilic cell-cell adhesion.

(c) Ca^{++}- independent homophilic cell-cell adhesion.

UNIT-III

7 Cell cycle :

(a) Cyclines and cyclin dependent kinase.

(b) Regulation of CDK-cycline activity.

8 Intracellular protein traffic:

(a) Protein synthesis on free and bound polysomes.

(c) Membrane proteins, Golgi sorting, Post-translational modifications.

(d) Biogenesis of mitochondria and nuclei.

(e) Trafficking mechanisms

9 Biology of chromosomes.

(a) Molecular anatomy of eukaryotic chromosomes.

(b) Metaphase chromosomes : Centromere, kinetochore, telomere and its maintenance.

(c) Giant chromosomes : Polytene and lampbrush chromosomes.

(d) Heterochromatin and euchromatin.

UNIT-IV

10 Somatic cell genetics:

(a) Cell fusion and hybrid agents and mechanism of fusion

(b) Heterokaryon : selecting hybrids and chromosome seggregation.

11 Human cytogenetics :

(a) International nomenclature (Paris conference) for the description of human chromosomes.

(b) The normal human karyotype, karyotyping

(c) Sex chromosomes, sex determination and sex linked inheritance.

12 Numerical & structural abnormalities of human chromosomes (Syndromes)

(a) Klinefelter's syndrome, Turner's syndrome

(b) Down's syndrome, chronic myelogenous leukaemia

UNIT-V

13 Genome analysis :

(a) C-value paradox, detailed account of various models of prokaryotic genomes, viral genome and eukaryotic genomes, organization of genes in organelle genomes.

(b) DNA damage and repair.

(c) Transposable element in prokaryotes and eukaryotes. Role of transposable elements in genetic regulation.

(d) Genome analysis- Human, Drosophila.

14 Biology of cancer.

15 Biology of ageing.

REFERENCE BOOKS (LATEST EDITIONS):

1 J.Darnell, H.Lodish and D. Baltimore : Molecular Cell Biology Scientific American Book, Inc. USA.