M.Sc. (PREVIOUS) BOTANY

PAPER-IV
CELL BIOLOGY AND GENETICS

UNIT-I

Structure of prokaryotic and eukaryotic cells, membrane structure and function, intracellular compartments, protein sorting (organelles). Biochemical energetics..

Structures and functions of cell wall, mitochondria, chloroplasts, Golgi apparatus, lysosomes, endoplasmic reticulum, ribosomes, and cytoskeleton .

UNIT-II

Chromatin organization, chromosome structure and packaging of DNA, Nucleolus and rRNA genes, Karyotype, banding patterns, lampbrush and B-chromosome

Nucleus, cell cycle, role of cyclins and cyclin-dependent kinases, C-value, Cot curve and its significance. Structure, chemical composition and type of nucleic acids, DNA replication in chromosomes and cell free system, enzymes of DNA replication.

UNIT-III

Structural and numerical alterations in chromosomes: duplication, deficiency, inversion, translocation heterozygotes, Haploids, aneuploids and euploids.

Genetics of eukaryotes and prokaryotes organelles : Mapping the bacteriophage genome, phage phenotypes, genetic recombination in phage; genetic transformation, conjugation and transduction in bacteria, genetics of mitocondria and cytoplasmic male sterility.

UNIT-IV

Restriction mapping-concept and techniques, multigene families and their evolution, physical mapping of genes in chromosomes. Techniques in cell biology : in situ hybridization, FISH, GISH, Light, confocal, electron microscopy. Genetic Code, transcription and translation : Operon Model, RNA polymerases, reverse transcriptase, RNA processing. Regulation of gene expression in pro- and eucaryotes, the control sequences (operator, promoter, terminator, attenuator, enhancer, cis-acting elements and trans-acting factors, tissue specific gene expression).

UNIT-V

Genetic recombination and genetic mapping : Recombinations, Role of Rec-A protein, independent assortment and crossing over, molecular mechanism of recombinations, chromosome mapping, linkage groups, genetic markers, somatic cell genetics.

Mutations : Spontaneous and induced mutations, physical and chemical mutagens, molecular basis of gene mutations, transposable elements in eukaryotes and prokaryotes, mutations induced by transposons, site-directed mutagenesis, DNA damages and repair mechanisms, inherited human diseases and defects. Initiation of cancer at cellular level.