

PAPER- III: CELL BIOLOGY AND MOLECULAR GENETICS

Unit I: Structure of pro- and eukaryotic cells; membrane structure and function, intra-cellular compartments, secretory and endocytotic pathways; cytoskeleton; mitochondria and chloroplast and their genetic organization. Methods of separation of cellular organelles, Cell lysis, Membrane ghost preparation, Protoplast fusion.

Unit II: Nucleus, cell cycle events, cyclins, cyclin-dependent kinases, inhibitors, control of cell division in multicellular organisms. C-value paradox; chromatin; structure, types organization and chemistry of the chromosome. Nuclear dyes and their application in staining of chromosomes. Karyotyping, Polytene, lambrush and B-chromosomes. Chromosome banding and its staining.

Unit III: Numerical and structural changes in chromosomes. Linkage and crossing over, cytological basis of crossing over. Genetic recombination at molecular level. Breakage and reunion of DNA, Double strand breaks initiating, recombination, specialized recombination involving breakage and reunion at specific sites. Role of RecA in recombination.

Unit IV: Linkage and gene mapping, linked gene inheritances. Mutation – molecular basis of spontaneous and induced mutations. Luria-delbruck fluctuation test, Adaptive mutations in bacteria. Detection of mutations. Ames test. Use of base analogs and alkylating agents for mutagenesis. Use of ionizing radiations. Molecular mechanism of radiation and chemical mutagenesis.

Unit V: Transposons: Types, structure, properties and their significance. Mechanism of transposition, transposon mutagenesis. Integrons, Insertion sequences (IS), Composite transposons. Replicative and non replicative transpositions. Role of transposase and resolvase. Examples of Transposable elements, Retrotransposon. Plasmids: Types, structure, properties and their significance. Detection, isolation and plasmid curing. Cell to cell transfer of plasmid.