

**M.Sc., FIRST SEMESTER
HARD CORE PAPER – 2
GENETICS AND CYTOGENETICS**

THEORY

32 Hrs

PART A GENETICS

UNIT I

8 Hrs

- A. Mendelian principles in haploid organisms (Chlamydomonas and Neurospora), Tetrad analysis
- B. Dominance relationships (Incomplete dominance, Codominance, Overdominance)
- C. Allelic variations and gene function (Lethal genes, Conditional lethals)
- D. Gene concept: Concept of allelism (Factors, alleles, multiple alleles, pseudoalleles), Cis-trans test, Benzer's work on rII locus in T4 phage, Fine structure of gene (cistron, recon and muton)

UNIT II

8 Hrs

- A. Types of mutations (Spontaneous, Induced, Base substitutions and frameshifts - Transitions, Transversions, gain in function, loss in function, Neutral mutations),
- B. Molecular mechanism of mutations (Base analogs, alkylating agents); Detection of mutations : Dominant lethal test, Sex-linked recessive lethal test, II-III translocations, Ames test, P-mediated mutagenesis
- C. Cytogenetic effects of ionizing and nonionizing radiations
- D. Linkage and construction of genetic maps: Cytogenetic and linkage maps, Two and three point cross in Drosophila, RFLP mapping

PART B

UNIT III

8 Hrs

- A. Molecular mechanism of cell division: Amitosis, Endomitosis and Mitosis, Ultra structure and organization of centrosome, centromere, Kinetochore, Microtubules and their dynamic instability, Microtubule Associated proteins, Anaphasic movements, Cytokinesis
- B. Molecular organization of eukaryotic chromosomes, Telomeres,
- C. Karyotyping and its importance
- D. Molecular mechanism of sex determination in Drosophila and man,

UNIT IV

8 Hrs

- A. Heterochromatin - Cytological features and localization, Facultative and constitutive heterochromatin,
- B. Structural organization and significance of polytene, lampbrush and supernumerary chromosomes
- C. Structural and numerical variations of chromosomes, Chromosomal rearrangements and their cytogenetic consequences with examples from plants, Drosophila and Man, Practical applications of chromosome rearrangements - Balancers and attached X-chromosome in Drosophila

GENETICS AND CYTOGENETICS PRACTICALS

4X16 =64 Hrs.

- 1) Study of stages of mitosis and meiotic chromosomes of grass hopper by observation of permanent slides and calculation of chiasma frequency (4x4)
- 2) Study of morphology of *Drosophila melanogaster* (2x4)
- 3) Study of mutants of *Drosophila melanogaster* (3x4)
- 4) Preparation of polytene chromosomes of *Drosophila melanogaster* (3x4)
- 5) Preparation of genital plate of *D. melanogaster* (2x4)
- 6) Study of Barr body using buccal smear of volunteers (1x4)
- 7) Study of eye pigmentation in *Drosophila* mutants by TLC (1x4)

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