

PRINCIPLES OF GENETICS

Paper 15

THEORY

(48 Periods)

Unit 1: Mendelian Genetics and its Extension

(7)

Principles of inheritance, Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Sex-linked inheritance.

Unit 2: Linkage, Crossing Over and Chromosomal Mapping

(9)

Linkage and crossing over, Cytological basis of crossing over, Molecular mechanisms of crossing over, Recombination frequency as a measure of linkage intensity, Two factor and three factor crosses, Interference and coincidence, Somatic cell hybridization.

Unit 3: Mutations

(9)

Gene mutations, Chromosomal mutations: Deletion, duplication, inversion, translocation, aneuploidy and polyploidy; Induced versus spontaneous mutations; Backward and forward mutations; Suppressor mutations; Molecular basis of mutations in relation to UV light and chemical mutagens; Detection of mutations: CLB method, attached X method, DNA repair mechanisms

Unit 4: Sex Determination

(4)

Chromosomal mechanisms of sex determination; Sex-linked, sex-influenced and sex-limited characters

Unit 5: Extra-chromosomal Inheritance

(5)

Criteria for extra-chromosomal inheritance, Antibiotic resistance in *Chlamydomonas*, Mitochondrial mutations and Maternal effects.

Unit 6: Quantitative Genetics

(3)

Polygenic inheritance and Transgressive variation

Unit 7: Recombination in Bacteria

(6)

Conjugation, Transformation, Transduction

Unit 8: Transposable genetic elements

(5)

Transposons in bacteria, Ac-Ds elements in maize and P elements in *Drosophila*, Transposons in humans

PRINCIPLES OF GENETICS

Paper 15

PRACTICAL

1. To study the Mendelian laws and gene interactions and their verification by Chi-square analyses using seeds/beads/*Drosophila*.
2. Identification of various mutants of *Drosophila*.
3. To calculate allelic frequencies by Hardy-Weinberg Law.
4. Linkage maps based on data from *Drosophila* crosses.
5. Study of human karyotype (normal and abnormal).
6. Pedigree analysis of some human inherited traits.
7. Preparation of polytene chromosomes from *Chironomous/Drosophila* larva.
8. To study mutagenicity in *Salmonella/E. coli* by Ames test.

ESSENTIAL READINGS

- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). *Principles of Genetics*. VIII Edition. Wiley India.
- Snustad, D.P., Simmons, M.J. (2009). *Principles of Genetics*. V Edition. John Wiley and Sons Inc.
- Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Cummings.

SUGGESTED READINGS

- Russell, P. J. (2009). *Genetics- A Molecular Approach*. III Edition. Benjamin Cummings.
- Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. *Introduction to Genetic Analysis*. IX Edition. W. H. Freeman and Co.