

Paper No: 7
Semester-III
CONCEPTS OF GENETICS

THEORY

MARKS: 100

Unit 1 Introduction to Genetics

No. of Lectures: 5

- 1.1 Historical developments
- 1.2 Model organisms in genetic analyses and experimentation: *Escherichia coli*, *Saccharomyces cerevisiae*, *Neurospora crassa*, *Caenorhabditis elegans*, *Drosophila melanogaster*, *Arabidopsis thaliana*

(Introduction to Genetic Analysis by Griffiths AJF, Wessler SR, Lewontin RC, Carroll SB. 9th Ed, W.H. Freeman and Company, 2007, Pages: 759-771)

Unit 2 Mendelian Analysis

No. of Lectures: 12

- 2.1 Mendel's Laws
- 2.2 Rediscovery of Mendel's principles
- 2.3 Chromosome theory of inheritance
- 2.4 Extensions of Mendelian genetics: Allelic interactions, concept of dominance, recessiveness
- 2.5 Incomplete dominance and co-dominance
- 2.6 Multiple alleles
- 2.7 Epistasis, penetrance and expressivity

(Chapters 3 & 4, Concepts of Genetics by Klug WS, Cummings MR, Spencer CA, Palladino M. 10th Ed, Benjamin Cummings, 2012, Pages: 42-63, 71-86, 91-92)

Unit 3 Linkage and Crossing over

No. of Lectures: 8

- 3.1 Linkage and recombination of genes
- 3.2 Cytological basis of crossing over
- 3.3 Crossing over at four-strand stage
- 3.4 Molecular mechanism of crossing over

(Chapter 7, Principles of Genetics by Gardner EJ, Simmons MJ, Snustud DP, 8th Ed., John Wiley & Sons, 2008, Pages: 158-167)

Unit 4 Extra-Chromosomal Inheritance

No. of Lectures: 8

- 4.1 Rules of extra nuclear inheritance
- 4.2 Organelle heredity - Chloroplast mutations in *Chlamydomonas*, mitochondrial mutations in *Saccharomyces*
- 4.3 Maternal effects – Shell coiling in *Limnaea peregra*
- 4.4 Infectious heredity - Kappa particles in *Paramecium*

(Chapter 9, Concepts of Genetics by Klug WS, Cummings MR, Spencer CA, Palladino M. 10th Ed, Benjamin Cummings, 2012, Pages: 222-225, 231-233)

(Chapter 20, Principles of Genetics by Gardner EJ, Simmons MJ, Snustud DP, 8th Ed., John Wiley & Sons, 2008, Pages: 544-547)

Unit 5 Characteristics of Chromosomes

No. of Lectures: 15

- 5.1 Structural organization of chromosomes - centromeres, telomeres and repetitive DNA

- 5.2 Packaging DNA molecules into chromosomes
- 5.3 Concept of euchromatin and heterochromatin
- 5.4 Normal and abnormal karyotypes of human chromosomes
- 5.5 Chromosome banding
- 5.6 Giant chromosomes: Polytene and lampbrush chromosomes
- 5.7 Variations in chromosome structure: Deletion, duplication, inversion and translocation
- 5.8 Variation in chromosomal number and structural abnormalities - Klinefelter syndrome, Turner syndrome, Down syndrome

(Chapters 6, 18, 19, *Principles of Genetics* by Gardner EJ, Simmons MJ, Snustad DP, 8th Ed., John Wiley & Sons, 2008, Pages:499-506, 516-520, 134-143)

(Chapters 8, 12, *Concepts of Genetics* by Klug WS, Cummings MR, Spencer CA, Palladino M. 10th Ed, Benjamin Cummings, 2012, Pages: 298-300, 198-214)

PRACTICALS

MARKS: 50

1. Mendelian deviations in dihybrid crosses
2. Studying Barr Body with the temporary mount of human cheek cells
3. Studying *Rhoeo* translocation with the help of photographs
4. Karyotyping with the help of photographs
5. Chi-Square Analysis
6. To study polytene chromosomes by using temporary mounts of salivary glands of *Chiromonas / Drosophila* larvae

SUGGESTED READING

1. Gardner EJ, Simmons MJ, Snustad DP (2008). *Principles of Genetics*. 8th Ed. Wiley-India
2. Snustad DP, Simmons MJ (2011). *Principles of Genetics*. 6th Ed. John Wiley and Sons Inc.
3. Weaver RF, Hedrick PW (1997). *Genetics*. 3rd Ed. McGraw-Hill Education
4. Klug WS, Cummings MR, Spencer CA, Palladino M (2012). *Concepts of Genetics*. 10th Ed. Benjamin Cummings
5. Griffith AJF, Wessler SR, Lewontin RC, Carroll SB. (2007). *Introduction to Genetic Analysis*. 9th Ed. W.H.Freeman and Co., New York
6. Hartl DL, Jones EW (2009). *Genetics: Analysis of Genes and Genomes*. 7th Ed, Jones and Bartlett Publishers
7. Russell PJ. (2009). *i Genetics - A Molecular Approach*. 3rd Ed, Benjamin Cummings

ONLINE READING MATERIAL

1. http://www.ebook3000.com/Concepts-of-Genetics--8th-Edition-_104663.html
2. http://highered.mcgraw-hill.com/sites/0073525332/information_center_view0/
3. http://www.freebookspot.es/Description.aspx?Element_ID=293661