

Paper No: 8
SEMESTER--IV
MICROBIAL GENETICS & GENOMICS

THEORY

MARKS: 100

Unit 1 Genome Organization and Mutations **No. of Lectures: 13**

- 1.1 Genome organization in microbes:** *E. coli, Saccharomyces, Tetrahymena*
1.2 Mutations and mutagenesis: Definition and types of Mutations; Physical and chemical mutagens; Molecular basis of mutations; Functional mutants (loss and gain of function mutants); Uses of mutations
1.3 Reversion and suppression: True revertants; Intra- and inter-genic suppression; Ames test; Mutator genes

*(Chapter10, Microbial Genetics by Maloy SR, Cronan JE and Friefelder D., 2nd Ed., Jones and Barlett Publishers, reprint 2004, Pages: 179-212;
 i Genetics - A Molecular Approach by Russell PJ., 3rd Ed., Benjamin Cummings, 2009, Pages: 202-205)*

Unit 2 Plasmids **No. of Lectures: 7**

- 2.1 Types of plasmids** - F plasmid, colicinogenic plasmids, Ti plasmids, linear plasmids, yeast 2 μ plasmid
2.2 Plasmid replication and partitioning
2.3 Host range, plasmid-incompatibility, plasmid amplification
2.4 Regulation of copy number, curing of plasmids

(Chapter11, Microbial Genetics by Maloy SR, Cronan JE and Friefelder D, 2nd Ed., Jones and Barlett Publishers, reprint 2004, Pages: 213-238).

Unit 3 Mechanisms of Genetic Exchange **No. of Lectures: 12**

- 3.1 Transformation** - Discovery, mechanism of natural competence
3.2 Conjugation - Discovery, mechanism, Hfr and F' strains
3.3 Interrupted mating technique and time of entry mapping
3.4 Transduction - Generalized transduction, specialized transduction, LFT & HFT lysates
3.5 Mapping by recombination and co-transduction of markers

(Chapters13, 14 and 18, Microbial Genetics by Maloy SR, Cronan JE and Friefelder D, 2nd Ed., Jones and Barlett Publishers, reprint 2004, Pages: 263-278, 279-308 and 377-390).

Unit 4 Phage Genetics **No. of Lectures: 6**

- 4.1** Features of T4 genetics
4.2 Genetic basis of lytic *versus* lysogenic switch of phage lambda

(Chapters 15,16,17 Microbial Genetics by Maloy SR, Cronan JE and Friefelder D, 2nd Ed., Jones and Barlett Publishers, reprint 2004, pages 309-320, 335-350, 351-372).

Unit 5 Transposable elements **No. of Lectures: 10**

- 5.1 Prokaryotic transposable elements** – Insertion Sequences, composite and non-composite transposons
5.2 Replicative and Non replicative transposition
5.3 Mu transposon
5.4 Eukaryotic transposable elements - Yeast (Ty retrotransposon), Drosophila (P elements), Maize (Ac/Ds)

5.5 Uses of transposons and transposition

(Chapter 9, *Principles of Genetics* by Gardner EJ, Simmons MJ, Snustad DP. 8th Ed. Wiley-India, 2008, Pages:231-246).

PRACTICALS

MARKS: 50

1. Preparation of Master and Replica Plates
2. To study the effect of chemical (HNO₂) and physical (UV) mutagens on bacterial cells
3. To study survival curve of bacteria after exposure to ultraviolet (UV) light
4. Demonstration of Bacterial Conjugation
5. Demonstration of Bacterial Transformation

SUGGESTED READING

1. Klug WS, Cummings MR, Spencer, C, Palladino, M (2011). *Concepts of Genetics*, 10th Ed., Benjamin Cummings
2. Krebs J, Goldstein E, Kilpatrick S (2013). *Lewin's Essential Genes*, 3rd Ed., Jones and Bartlett Learning
3. Pierce BA (2011) *Genetics: A Conceptual Approach*, 4th Ed., Macmillan Higher Education
4. Krebs J, Goldstein E, Kilpatrick S (2011). *Lewin's Genes X*, 10th Ed., Jones and Bartlett Learning
5. Watson JD, Baker TA, Bell SP et al. (2008) *Molecular Biology of the Gene*, 6th Ed., Benjamin Cummings
6. Gardner EJ, Simmons MJ, Snustad DP (2008). *Principles of Genetics*. 8th Ed. Wiley-India
7. Russell PJ. (2009). *i Genetics- A Molecular Approach*. 3rd Ed, Benjamin Cummings

ONLINE READING MATERIAL

1. <http://www.amazon.com/Microbial-Genetics-Bartlett-Series-Biology/dp/0867200766>