Subject Code : CCN3P9

Molecular Genetics

Unit I – Nucleic acid as genetic material and mutagenesis

Nucleic acids as genetic information carriers: experimental evidence. – concept of gene – allele, cistron, regilon – origin of mutation– mutagens – physical and chemical agents. Induced mutation types – mechanisms of mutation induction – suppression of mutations – Intergenic and intragenic suppression. Frame shift mutations – reversion – fine structure mapping – rII mutants of T4 – fluctuation test

Unit II – Transformation

Transformation – natural or artificial competence – transformation in *Bacillus*, *E. coli*, *Haemophilus* and *Streptococcus* – mechanism of recombination – genetic mapping.

Unit III - Conjugation

Bacterial conjugation – F plasmid – structure and functions. Origin of Conjugation – Hfr and F' strains. Interrupted and uninterrupted mating – time map and recombination map. Conjugation in *E. coli*, *Pseudomonas, Streptomyces*. Plasmids, F- factors description and their uses in genetic analysis. Colicins and col factors.

Unit IV – Transduction

Transduction – generalized and specialized transduction – λ phage and P1 phage – mechanism of gene transfer through lambda and P1 phages. HFT and LFT lysate. cotransduction – transduction mapping.

Unit V – Gene regulation

Regulation of bacterial gene expression – Operon model – lac, ara, trp and his operons, operon concept, catabolite repression, instability of bacterial RNA, positive and negative regulation, inducers and corepressors. Negative regulation – *E.coli lac* operon; positive regulation – *E. coli ara* operon; regulation by attenuation – *his* and *trp* operons; antitermination – N protein and nut sites in I. Induction and repression mechanism in operons.

References:

Freidberg, E.C., Walker, G.C., Siede, W. (1995). DNA repair and Mutagenesis, ASM Press, Washington D.C.

Lewin, B, (2000). Genes VII. Oxford University Press.

Maloy, S.R., Cronan Jr. Je. Freifelder D (1998). Microbial genetics. Jones and Barlett Publishers.

Malacinski, M. and Freifelder, D. (1998). Essential of Molecular Biology. III Edition. Jone and Barlett Publishers, Boston.

Maloy, S.R., Cronan, J.R. Freifelder, D. (1994). Microbial Genetics, Jones and Bartlett Publishers.

Siger, M. , Berg, P. (1991). Genes and Genomes, University Science Book.

Snustad, D., Simmons, J. and Jenkins, B. (1997). Principles of Genetics. First edition. John Wiley and Sons.

Watson, J.D., Hopkins, N.H., Roberts, J.W., Steitz, J.A. and Weiner, A.M. (1998). Molecular biology of the gene, 4th edition, Benjamin/Cummings publishing company.