

Unit I

Structure and types of chromosomes, centromere, telomere, nucleosome, genome organization, split gene. Types of histones, histone modifications- methylation, acetylation, phosphorylation and their effects on structure and function of chromatin, DNA methylation, repetitive and non-repetitive DNA sequence. Law of DNA constancy, C value paradox and genome size, **karyotype and ideogram.** *E. coli* genome: coiled, supercoiled, folded fibre model.

UNIT II

Mendelian Laws, Contribution of Griffith, Avery, Hershey and Chase towards Genetics. **Bacterial transformation; Host cell restriction; Transduction; complementation; conjugation and transfection,** mechanisms and applications, genetic analysis of virus, bacteria and yeast genomes. Plasmids and Bacteriophages: Plasmids, F-factors - description and their uses in genetic analysis, R plasmids. Lysogeny and lytic cycle in bacteriophages.

UNIT III

Structure of gene, Gene as unit of mutation, molecular basis of spontaneous and induced mutations and their role in evolution. Nature, type and effects of mutations. Mutagenesis – physical and chemical mutagens, base and nucleoside analog, alkylating agents, interrelating agents, ionizing **radiation. Induction and detection of mutation in microorganisms. Site directed mutagenesis and its applications.**

UNIT IV

Genetic recombination in bacteriophages and *E. coli*, synopsis of homologous duplexes, breakages and re-union role of RecA and other recombinases, Genetic Mapping: Complementation analysis, deletion mapping, cis-trans test. Overlapping genes. Transposons. General mechanism of genetic engineering in eukaryotes and prokaryotes. Restriction Mapping, **Genetic Engineering, Transfection of a cloned gene into a eukaryotic cell & its expression**