



The Islamia University of Bahawalpur
Department of Biochemistry & Biotechnology
PhD Biotechnology
Semester: 1st

Paper: Advanced Molecular Biology

Credit Hours: 3

Weekly Division of Syllabus

Week-1	Mendelian inheritance, Segregation at one locus, Segregation at two loci Quantitative inheritance
Week-2	Nucleosomes, Higher order chromatin organization, Chromatin and chromosome function. Nucleosome modification and Gene Expression
Week-3	Normal chromosomes - gross morphology, Special chromosome structures, Molecular aspects of chromosome structure
Week-4	DNA methylation in prokaryotes, DNA methylation in eukaryotes Epigenetic gene regulation by DNA methylation in mammals
Week-5	The concept of the gene, Units of genetic structure and genetic function Gene-cistron relationship in prokaryotes and eukaryotes, Gene structure and architecture
Week-6	Gene expression, Gene regulation, Gene expression in prokaryotes and eukaryotes
Week-7	Conjugation, Transformation, Transduction, An overview of the genetic code, Translation, Special properties of the code
Week-8	Genomes, ploidy and chromosome number, Physico-chemical properties of the genome Gene structure and higher-order genome organization, Repetitive DNA Gene mapping. Genetic mapping
Week-9	Mid Term Examination
Week-10	Mutagenesis and replication fidelity, DNA damage: mutation and killing DNA repair, Direct reversal repair, Excision repair, Mismatch repair, Recombination repair
Week-11	Structural and functional consequences of mutation, Mutant alleles and the molecular basis of phenotype. The distribution of mutations and molecular evolution, Mutations in Genetic Analysis
Week-12	Protein primary structure, Higher order protein structure. Protein modification, Protein families, Global analysis of protein function
Week-13	The components of protein synthesis. The mechanism of protein synthesis. The regulation of protein synthesis

Week-14	Molecular cloning, Strategies for gene isolation, Characterization of cloned DNA, Expression of cloned DNA, Analysis of gene regulation
Week-15	Replication strategy, The cellular replisome and the enzymology of elongation Initiation of replication, Primers and priming, Termination of replication The regulation of replication
Week-16	Maturation of untranslated RNAs End-modification and methylation of mRNA RNA splicing RNA editing Post-processing regulation
Week-17	Transcriptional initiation in prokaryotes -basal and constitutive components Transcriptional initiation in eukaryotes -basal and constitutive components Transcriptional initiation - regulatory components Strategies for transcriptional regulation in bacteria and eukaryotes Transcriptional elongation and termination
Week-18	Final Term Examination

Recommended Books:

- 1- Advanced Molecular Biology By Richard M. Twyman Neurobiology Division, MRC Laboratory of Molecular Biology, Hills Road, Cambridge CB2 2QH, UK
- 2- Human Molecular Genetics by TOM STRACHAN AND ANDREW READ 4th edition (2010) Garland Science Taylor & Francis Group, LLC 711 Third Avenue, 8th Floor New York.
- 3- Essential Cell Biology. By Bruce Alberts 8th Edition; Garland Publishers, New York.
- 4- Molecular Cell Biology. By Lodish et al.,(2017) 9th Edition; Freeman and Company, New York. (available at www.ncbi.nlm.nih.gov)