

**MAHARSHI DAYANAND UNIVERSITY**  
**B. TECH. BIOTECH. 4TH SEM**  
**Molecular Biology**

**Sub. Code: BT-202-F(M)**  
**Periods/week**  
**L:3 T:1**

**MAX. MARKS :150**  
**Sessional:50**  
**External:100**

**Duration of Ext. Exam: 3 Hrs**

**Instructions for setting of paper:** Nine questions are to be set in total. First question will be short answer question covering whole syllabus and will be compulsory to attempt. Next eight questions will comprise of two questions each from the four sections. Student will be required to attempt four questions selecting one from each section. Each question will be of 20 marks.

**SECTION-A**

**DNA:** Introduction, structure, properties: physical and chemical, biological significance of double strand, DNA bending, DNA super coiling, cruciform and ZDNA structure, DNA Triplex, Denaturation and renaturation of DNA-T<sub>m</sub> values and cot curves analysis, C-value paradox, Repetitive and non-repetitive DNA and its relevance to plants and animals, inverted and tandem repeats. Gene, split genes, housekeeping genes.

**Genome organization:** Genome organization in eukaryotes and prokaryotes, euchromatin and heterochromatin, DNA protein interactions, packaging in nucleosomes, Meiosis, mitosis and practical applications.

**SECTION-B**

**DNA Replication:** Origin of replication, DNA polymerase, mechanism of DNA replication in prokaryotes and eukaryotes, DNA replication models, DNA damage, mutations, DNA repair and practical applications.

**Transcription:** Mechanism in prokaryotes and eukaryotes, RNA polymerase, sigma factor, regulation of transcription, transcriptional factors, post transcriptional processing (5' and capping and 3' polyadenylation), Zinc finger motifs, helix loop helix, leucine Zippers. RNA splicing: Intron and exon, splicing mechanism for mRNA, tRNA, spliceosome, lariat formation, Ribozymes, cis splicing and trans splicing, practical application of transcription.

**SECTION-C**

**Translation:** Genetic code, Wobble hypothesis, Component of protein synthesis, ribosomes, tRNA, mRNA, rRNA, mechanism of protein synthesis, regulation of protein synthesis, post translational modification, chaperones, transport and degradation of proteins and practical applications of translation.

**Gene Regulation:** Operon model, Regulation of gene expression in prokaryotes and eukaryotes; Lactose and Tryptophan operon, inducible and repressible systems; positive and negative control.

Applications of gene regulations in diseases, control and evolution.

**SECTION-D**

**Transposons:** The dynamic genome: Mobile genetic elements in prokaryotes-insertion sequences, composite and non-composite transposons, replicative and conservative transposition, retrotransposon, eukaryotic jumping genes and practical applications.

Introduction to stem cells and cellular differentiation; RNA interference, epigenetic regulation of genes (DNA methylation and histone modifications), oncogenes, tumour suppressor genes and apoptosis, oncogenes and cancer.

**List of Text/ Reference Books:**

1. DNA Structure and Function by Richard.
2. Genes by Lewin.
3. Molecular Cell Biology by Alberts and Watson.
4. The Cell-A Molecular Approach by Cooper.
5. Cell and Molecular Biology by Robertis.

**MAHARSHI DAYANAND UNIVERSITY**  
**B. TECH. BIOTECH. 7TH SEM**

**MOLECULAR BIOLOGY LAB**

**Sub. Code: BT-214-F(M)**

**Periods/week**

**L T P**

**3**

**Duration of Ext. Exam: 3 Hrs**

**MAX. MARKS :100**

**Sessional:50**

**External:50**

**LIST OF EXPERIMENTS/PRACTICALS**

1. Isolation of Prokaryotic genomic DNA
2. Isolation of Prokaryotic plasmid DNA
3. Isolation of DNA from Eukaryotes
4. mt-DNA and Y-Chromosome isolation
5. Isolation of DNA from saliva/blood/different tissues/dried blood/hair
6. RNA/s isolation
7. Simultaneous extraction of RNA, DNA and proteins
8. Purification of DNA/RNA/Protein
9. Molecular weight characterization of a given DNA/Protein
10. Electrophoresis/Agrose Gel Extraction/SDS/PAGE of DNA/Protein.
11. Polymerase Chain Reaction/PCR
12. Blotting Techniques
13. RAPID
14. Restriction mapping

**List of References/Suggestive Books.**

1. Molecular Cloning-a laboratory manual by Sambrook and Russell.
2. Cell and Molecular Biology: Concepts and Experiments by Karp.
3. Genomes by Brown.
4. Molecular Cell Biology by Alberts and Watson.

NOTE: A College must offer 70% of the above listed experiment. The remaining 30% experiment may be modified by college according to facilities available.