**Q. Code: 650702**

**Reg. No.** | | | | | | | | | | | | | |

# B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fourth Semester

## BT22404 – GENETICS AND MOLECULAR BIOLOGY

*(Biotechnology)*

**(Regulation 2022)**

**TIME: 3 HOURS** **MAX. MARKS: 100**

| COURSE OUTCOMES | STATEMENT | RBT LEVEL |
|---|---|---|
| **CO 1** | Explain the various postulates of Mendel's Experiments and the principle of gene complementation. | **2** |
| **CO 2** | Relate the principle of recombination and linkage with gene mapping. | **2** |
| **CO 3** | Compare the different types of DNA replication mechanism. | **4** |
| **CO 4** | Identify the steps involved in transcription and translation. | **3** |
| **CO 5** | Infer the relationship between gene regulation and metabolism. | **4** |

**PART- A (20 x 2 = 40 Marks)**

(Answer all Questions)

| | | CO | RBT LEVEL |
|---|---|---|---|
| **1.** | State the law of segregation. | **1** | **2** |
| **2.** | Define alleles. | **1** | **2** |
| **3.** | Describe the reason for the name "lethal alleles" | **1** | **2** |
| **4.** | What is meant by multiple alleles? | **1** | **2** |
| **5.** | Justify that linkage helps in gene mapping. | **2** | **2** |
| **6.** | Compare penetrance and expressivity. | **2** | **2** |
| **7.** | Differentiate aneuploidy and euploidy. | **2** | **2** |
| **8.** | List the types of chromosomal modifications/rearrangements. | **2** | **2** |
| **9.** | Justify there are multiple structural variations in DNA. | **3** | **4** |
| **10.** | Draw the structure of a nucleotide and differentiate it from nitrogenous base. | **3** | **4** |
| **11.** | Compare the prokaryotic and eukaryotic DNA. | **3** | **4** |
| **12.** | Identify the possible sources of mutation and their types. | **3** | **4** |

| | | | |
|---|---|---|---|
| **13.** | What features discriminate a mRNA from tRNA? | **4** | **3** |
| **14.** | While there are 64 possible codons why there are fewer types of amino acids? | **4** | **3** |
| **15.** | State wobble hypothesis. | **4** | **3** |
| **16.** | List 4 antibiotics that inhibit protein synthesis. | **4** | **3** |
| **17.** | What possibly can go wrong in the absence of gene regulation? | **5** | **4** |
| **18.** | Justify that an operon contains multiple genes. | **5** | **4** |
| **19.** | Compare inducible and repressible operon. | **5** | **4** |
| **20.** | Give examples of 2 proteins and justify they are involved in phage life cycle. | **5** | **4** |

**PART- B (5 x 10 = 50 Marks)**

| | | Marks | CO | RBT LEVEL |
|---|---|---|---|---|
| **21. (a)** | Construct a Punnet square to explain the law of independent assortment. | **(10)** | **1** | **2** |
| | **(OR)** | | | |
| **(b)** | Illustrate the concept of complete dominance, incomplete dominance and codominance with suitable examples | **(10)** | **1** | **2** |
| **22. (a)** | Describe the concept of epistasis and its types using suitable case studies. | **(10)** | **2** | **2** |
| | **(OR)** | | | |
| **(b)** | Deletion, duplication, inversion or translocation leads to metabolic disorders or diseases. Justify this statement with suitable case studies. | **(10)** | **2** | **2** |
| **23. (a)** | Draw the structure of DNA and RNA, compare and contrast the structural and functional features. | **(10)** | **3** | **4** |
| | **(OR)** | | | |
| **(b)** | Meselson and Stahl have identified the principle behind DNA replication using an experiment. Describe in detail about the experiment and discuss about the proteins involved in the DNA replication. | **(10)** | **3** | **4** |
| **24. (a)** | Compare the structure and functions of mRNA, tRNA and rRNA. | **(10)** | **4** | **3** |
| | **(OR)** | | | |
| **(b)** | Highlight the importance of splicing and post translational modifications in determining a protein's function. | **(10)** | **4** | **3** |
| **25. (a)** | Prokaryotic DNA has only a small portion as non-coding DNA while the | **(10)** | **5** | **4** |

eukaryotic DNA has a greater proportion. Describe in detail about this, with role of histones in organizing the eukaryotic genome.

**(OR)**

| | | | | |
|---|---|---|---|---|
| **(b)** | Highlight the difference between positive and negative regulation and Compare the Tryptophan and Arabinose operon. | **(10)** | **5** | **4** |

**PART- C (1 x 10 = 10 Marks)**

(Q.No.26 is compulsory)

| | | Marks | CO | RBT LEVEL |
|---|---|---|---|---|
| **26.** | Many of the antibiotics serve as an inhibitor of transcription or translation. Describe about at least two antibiotics which inhibits transcription and translation process and their mechanism of action. | **(10)** | **3** | **3** |

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