



B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Fourth Semester

BIOTECHNOLOGY

U18BT14204: Cell and Molecular Biology

COURSE OUTCOMES

- CO1:** Critically evaluate and comprehend the fundamental concepts of cell and cell membrane structure and functions.
- CO2:** Imbibe the concept of membrane transport and signal transduction in cells.
- CO3:** Critique the concepts of genome organization and replication of prokaryotes and eukaryotes.
- CO4:** Comprehend the process involved in transcription and translation and interpret the consequences of mutation.
- CO5:** Apply the concept of gene activity regulation and DNA repair mechanisms in prokaryotes.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

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| 1. Describe the structure of tRNA with appropriate labels. | CO4 | [K ₂] |
| 2. What is promotor melting? And Explain how it takes place in eukaryotic transcription. | CO4 | [K ₃] |
| 3. Draw a schematic of Lac operon and label appropriate genes | CO5 | [K ₂] |
| 4. Differentiate between quorum sensing and quorum quenching. | CO5 | [K ₄] |
| 5. What are transcriptional inhibitors? Give any two examples. | CO5 | [K ₅] |
| 6. Evaluate the role of centrosome in plant cell. | CO1 | [K ₂] |
| 7. Differentiate between homoglycans and heteroglycans and provide suitable examples. | CO1 | [K ₂] |
| 8. Analyze the role of rho proteins in termination of transcription in prokaryotes. | CO2 | [K ₄] |
| 9. Draw a neat sketch of molecular structure of phospholipid bilayer of the cell. | CO2 | [K ₃] |
| 10. Differentiate between monocistronic and polycistronic mRNA. | CO3 | [K ₄] |

Answer any FIVE Questions:-

PART B (5 x 16 = 80 Marks)

(Answer not more than 400 words)

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| 11. a) Codon degeneracy is a term used to describe the redundancy of the genetic code. Justify how wobble base pairing can help achieve appropriate codons for a specific amino acid. | 8 | CO1 | [K ₂] |
| b) Elaborate with neat sketch on the mechanism of protein synthesis in Eukaryotes. In addition, comment on various translational inhibitors with suitable examples. | 8 | CO1 | [K ₂] |

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| 12. | a) | Structural and regulatory elements are important for expression of genes in operons. Explain in detail on mechanism of gene expression any one of the polycistronic operon. | 8 | CO5 | [K ₃] |
| | b) | Justify the role of acylated homoserine lactones in establishing cell to cell communication during biofilm formation. In addition, briefly explain various steps involved in formation of bacterial biofilms. | 8 | CO2 | [K ₄] |
| 13. | a) | In Eukaryotes, mitosis results in production of two diploid cells, critically analyze various phases of eukaryotic cell cycle and explain the process of cytokinesis with neat sketch. | 8 | CO3 | [K ₂] |
| | b) | Elaborate with neat sketch on the roles of Checkpoint proteins in regulation of cell cycle. | 8 | CO4 | [K ₂] |
| 14. | a) | Discuss in detail on the mechanism of intron removal by auto/self- splicing mechanism. | 8 | CO5 | [K ₄] |
| | b) | Construct a Pre-Initiation Complex (PIC) that was formed during Eukaryotic mRNA synthesis. Briefly discuss the roles of various proteins found in PIC. | 8 | CO6 | [K ₄] |
| 15. | a) | What are Spliceosome complex? Explain with schematic diagram on the role of snRNPs in splicing of pre-mRNA. | 8 | CO2 | [K ₄] |
| | b) | Elaborate in detail on the process of capping and polyadenylation of eukaryotic mRNA. | 8 | CO4 | [K ₆] |
| 16. | a) | Design an experiment to prove DNA as genetic material using the bacterial strain Streptococcus Pneumoniae. | 8 | CO3 | [K ₄] |
| | b) | What is replication fork? Briefly elaborate (with neat sketch) on the process involved in duplication of prokaryotic DNA. | 8 | CO3 | [K ₅] |
