QP Code: P25C015

Reg. No : ....
Name : ....

ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

III SEMESTER (CBCSS - PG) DEGREE EXAMINATIONS, OCTOBER 2025
M. Sc. Microbiology
MBG3C10 : MOLECULAR BIOLOGY
2024 Admission Onwards

Time:3 Hours **Maximum Weightage:30**

Part A

*Short answer type questions: Answer **any four** questions. Weightage **2** for each question.*
(4x2 = 8 Weightage)

1. Discuss the significance of solenoid structure in higher-order chromatin organization and gene regulation.
2. What is the relationship between telomeres and cancer?
3. Compare and contrast Rho-dependent and Rho-independent termination mechanisms in terms of their requirements, sequences involved, and mode of action.
4. What is intein splicing?
5. What is microRNA? Define its role in gene regulation.
6. Differentiate between viral and cellular oncogenes.
7. Analyze the key structural and regulatory differences between prokaryotic and eukaryotic DNA replication.

Part B

*Short essay-type questions: Answer **any four** questions. Weightage **3** for each question.*
(4x3 = 12 Weightage)

8. Explain the mode of action of Topoisomerase I.
9. Illustrate the concept of transposons and their impact on genome stability.
10. Distinguish between the promoters recognized by RNA Polymerase I, II, and III in eukaryotic transcription.
11. Explain why post-translational modifications are important for protein function.
12. Explain how the gal operon is regulated in the presence and absence of galactose.
13. Explain the different classes of genes that are altered frequently in cancer.

Turn Over

14. Evaluate the significance of each step involved in the addition of the 5′ cap to pre-mRNA and explain how this modification contributes to mRNA processing and function.

Part C

Essay-type questions: Answer ***any two*** *questions. Weightage* ***5*** *for each question.*
(2x5 = 10 Weightage)

15. Discuss the structure, function, and significance of the pRb and p53 tumour suppressor proteins in the regulation of the cell cycle and prevention of cancer.
16. Compare and contrast the lac operon regulation in *E. Coli* when grown in a medium with (a) lactose only, (b) glucose only, and (c) both glucose and lactose.
17. Describe the Watson and Crick model of DNA. Include the main structural features and the types of base pairing involved.
18. Apply your understanding on translation in prokaryotes to explain how peptide bonds are formed and translocation of the polypeptide chain occurs.

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