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BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – M.Sc.(BT)-2024

Course Name – Molecular Biology

Course Code - MBT20107

(Semester II)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Identify in Prokaryotes, the ribosomal binding site on mRNA is called
 - a) Hogness sequence
 - b) Shine-Dalgarno sequence
 - c) Pribnow sequence
 - d) TATA box
- (ii) If $L_k < L_{k0}$ then DNA is _____
 - a) Relaxed
 - b) Negatively coiled
 - c) Positively coiled
 - d) $\Delta L_k > 0$
- (iii) DNaseI hypersensitive regions are associated with _____.
 - a) Open chromatin structure
 - b) Histone deacetylation
 - c) Closed chromatin structure
 - d) DNA methylation
- (iv) In prokaryotic DNA replication, the role of DNA polymerase I is to:
 - a) Remove RNA primers and replace them with DNA
 - b) Initiate replication at the origin
 - c) Synthesize the leading strand
 - d) Seal Okazaki fragments
- (v) The 1st step of proof reading during protein synthesis is carried out by
 - a) Helicase
 - b) SSB protein
 - c) RNA polymerase
 - d) the aminoacyl-tRNA synthetase enzyme
- (vi) Define the purpose of 5'-capping in eukaryotic mRNA maturation.
 - a) Protects mRNA from degradation
 - b) Assists in splicing
 - c) Initiates transcription
 - d) Prevents translation
- (vii) Illustrate the difference between prokaryotic and eukaryotic mRNA processing.
 - a) Prokaryotic mRNA lacks modifications
 - b) Eukaryotic mRNA is unprocessed

- c) Both require a sigma factor
 (viii) Identify the type of RNA involved in spliceosome function.
 a) mRNA
 b) snRNA
 c) rRNA
 d) tRNA
- (ix) Identify the role of AMP in the aminoacylation reaction.
 a) It is an intermediate product before amino acid transfer to tRNA
 b) It degrades tRNA
 c) It binds to ribosomes
 d) It prevents peptide bond formation
- (x) The high frequency of TP53 mutations in human cancers suggests that p53 plays a crucial role in:
 a) Preventing malignant transformation by inducing apoptosis and cell cycle arrest
 b) Enhancing angiogenesis to promote tumor survival
 c) Stimulating oncogene activation in normal cells
 d) Increasing genetic instability through DNA repair inhibition
- (xi) Assess the molecular mechanism of START checkpoint activation in yeast.
 a) Activation of histone acetylation
 b) Inhibition of cyclin-dependent kinase inhibitors
 c) Phosphorylation of retinoblastoma (Rb) protein by Cdk
 d) Degradation of cyclin B
- (xii) Determine the consequence of mitotic spindle checkpoint failure.
 a) Chromosomal instability and aneuploidy
 b) Enhanced DNA repair efficiency
 c) Suppression of mitotic exit
 d) Activation of apoptosis in S phase
- (xiii) Analyze the significance of DNase protection assays in identifying lac operon regulatory sequences.
 a) Detects the presence of ribosomal binding sites
 b) Maps protein-binding regions on DNA
 c) Identifies the location of mRNA degradation sites
 d) Determines chromatin remodeling patterns
- (xiv) Evaluate the role of the CAP–cAMP complex in lac operon regulation.
 a) Represses transcription by preventing RNA polymerase binding
 b) Enhances transcription by facilitating RNA polymerase recruitment
 c) Cleaves lactose into glucose and galactose
 d) Inhibits translation of lacZ mRNA
- (xv) Determine the molecular consequence of a mutation disrupting the CAP binding site.
 a) Increased cAMP production
 b) Decreased affinity of RNA polymerase for the promoter
 c) Loss of lactose uptake ability
 d) Constitutive repression of the operon

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Explain why histones have a net positive charge. (3)
 3. Discuss the function of molecular chaperones in protein folding and stability. (3)
 4. Describe the differences between prokaryotic and eukaryotic transcription. (3)
 5. Predict how the genetic code present in mitochondria is different from the universal genetic code? (3)
 6. Illustrate the function of DNA helicase and SSB protein in DNA replication. (3)
- OR**
- Explain why does the lagging strand require multiple primers. (3)

Group-C
(Long Answer Type Questions)

5 x 6=30

7. Predicts the consequence of excessive apoptosis in neurodegenerative diseases. (5)
8. Write the components of DNA Polymerase holoenzyme along with their function. (5)
9. Illustrate the Mechanism of mismatch repair. (5)
10. Justify the importance of hydrogen bond and di-sulphide bond in protein stability (5)
11. Explain the function of TATA box binding protein in eukaryotic transcription. (5)
12. Distinguish between 'σ' and 'θ' model of DNA Replication. (5)

OR

Compare and contrast two different cell death process. (5)

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