Registration number:
Date and session:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU -27
B.Sc Biochemistry–V SEMESTER
SEMESTER EXAMINATION: OCTOBER 2023
(Examination conducted in November /December 2023)
BCH 5123: Biomolecules - 2
(For current batch students only)

Time- 2 hr **Max Marks-60**

This question paper contains 2 printed page and 4 parts

PART A

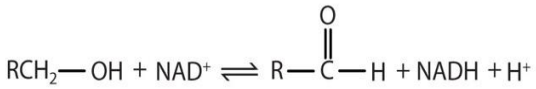
Answer any ELEVEN of the following: **11 X 1 marks = 11 marks**

1. State an example of maternal inheritance.
2. Name any non-B DNA structure.
3. Provide an example of an organism the defies the central dogma.
4. Why is the mitochondrial genome circular?
5. What are STOP codons?
6. State one merit of Bt-cotton.
7. Why is DNA ligase used in genetic engineering?
8. Provide an example of a signaling ligand.
9. What are ribozymes?
10. What is the substrate used for protein adenylation?
11. State the purpose of an LDH-isozyme blood test.
12. Codon-anticodon interaction involves several interactions. Name one of them.
13. What enzymes are responsible for protein phosphorylation?

PART B

Answer any NINE of the following: **9 X 2 marks = 18 marks**

14. Why is RNA more labile compared to DNA?
15. How many molecules of ATP are produced from the breakdown of a sixteen carbon fatty acid and from glucose?
16. The genetic code is degenerate. Explain.
17. How is amplification achieved in signaling systems?
18. Consider the figure in question 34. What would lane 2 in the gel show if the mode of replication was conservative?
19. To which class does an enzyme catalyzing the following reaction belong? Justify.



20. How does the Vmax and Km change during non-competitive inhibition?
21. State two conditions which will result in high creatine kinase in the serum?
22. Using an example explain positive feedback regulation in enzymes.
23. Why don't steroid hormones have membrane-bound receptors?

24. Explain any one direct proof in support of chromosomal theory of inheritance.

PART C

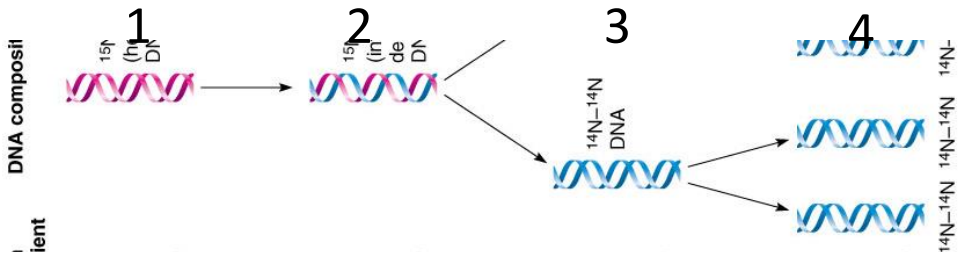
Answer any SEVEN of the following: **7 X 3 marks = 21 marks**

25. Taq DNA polymerase is known to be error-prone. What do you think is missing from this enzyme? Justify.
26. Provide three features of an expression vector with examples.
27. Cholesterol has a crucial role in membrane fluidity. Briefly describe its role in a) high temperature b) low temperature.
28. Provide a schematic for a bacterial ribosome actively translating an mRNA.
29. What are lipid rafts and how do they facilitate compartmentalization on the plasma membrane?
30. State the end-replication problem. How is it overcome?
31. Two enzymes (E1 and E2) have same catalytic efficiencies (10 s^{-1} mM^{-1}) but different Km (5 and 2 mM, respectively). Which one has a higher K_{cat}?
32. Draw the structure of the lac operon and highlight the importance of the Lac operator.
33. Describe the effect of pH on enzymatic activity. Why do different enzymes have different pH optima?

PART D

Answer any TWO of the following: **2 X 5 marks = 10 marks**

34. Carefully study the results of an experiment performed on *Bacillus* to replicate the Meselson-Stahl experiment. What stage of replication do each of the four lanes represent? Draw a schematic diagram of the DNA structure in lane 2. (4+1 marks)



35. Cyclic AMP is a second messenger. Illustrate the signaling pathway that leads to its production in the cell. How is this signaling system terminated? (3+2 marks)

36. Gopi has been poisoned using methanol, which is broken down to formaldehyde by alcohol dehydrogenase in the liver. Ethanol is commonly used as an antidote. Using a Lineweaver-Burke plot, describe how ethanol might work. What will happen to the Vmax of alcohol dehydrogenase for methanol if provided with a mixture of ethanol and methanol? (3+2 marks)