ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE 560027
B.Sc. BIOTECHNOLOGY, III SEMESTER
SEMESTER EXAMINATION, OCTOBER 2019
BT318: MOLECULAR BIOLOGY AND BIOPHYSICS

TIME: 2 ½ hours **Max marks: 70**

This question paper has **TWO printed pages** and **THREE parts**.

I. Answer **any TEN** of the following questions. **10 X 2 =20 marks**

1. If a start codon was missing from a gene, how would that affect transcription, and how would it affect translation?
2. Write a brief note on the Sigma factor.
3. Eukaryotic mRNA is often circular in nature. Comment.
4. Compare functions of the Trp repressor and the Lac repressor proteins?
5. What promotes the binding between the mRNA and the small ribosomal subunit?
6. What do you understand by 'Fidelity' of the Polymerase enzyme? Compare the fidelity of RNA Polymerase with that of DNA polymerase.
7. Which components of NER are responsible for removing the damaged DNA?
8. Write a brief note on the RNA-induced silencing complex.
9. What are the advantages of phase contrast microscopy? Given an example.
10. To separate which biological material do we need ultracentrifugation? Why?
11. Explain terms of the Bragg's equation for determining the distance between atoms of a crystal with a diagram.
12. Imagine you have separated a mixture of amino acids isolated from a patient's blood using paper chromatography and stained it with Ninhydrin. Surprisingly, you find only 5 spots (there are 20 amino acids). Can you explain the observation? What will you do to separate all 20 amino acids?

II. Answer **any FIVE** of the following questions. **5 X 6 = 30 marks**

13. Describe the genetic code. Explain using appropriate examples, why the genetic code is referred to as 'Degenerate' and 'Universal'.
14. With illustrations, describe transcriptional regulation of the lac operon.
15. Describe the process of polyadenylation.
16. Discuss the post translational modifications of proteins.
17. Describe the different conformations of DNA?
18. Briefly explain the differences between column chromatography and TLC, with the advantages of each. How will you separate a protein that binds to the polyA tail of mRNA (e.g. PABP) from a mixture of other proteins? Explain using diagrams.
19. Explain two biological applications of UV spectroscopy in detail, with the underlying principle and diagrams as appropriate.

III. Answer the following: **2 X 10 = 20 marks**

20. a. What is the common advantage of electron microscopy (EM) over light microscopy? What is the physical principle behind this advantage? What is a common disadvantage of EM over light microscopy? Briefly explain the differences between TEM and SEM with diagrams. Describe one application each of TEM and SEM.

OR

b. Briefly describe four applications of radioactivity in biology with specific examples and a special emphasis on why radioactive isotopes are used for each purpose.

21. a. Describe the structure of the prokaryotic RNA Polymerase. Explain the different stages of transcription initiation in prokaryotes.

OR

b. Individuals with Xeroderma pigmentosum have a1000-fold greater risk of developing skin cancer. Mutations in which genes/pathway result in this condition? Describe the role of this pathway. Using a flowchart, describe the homologous pathway in prokaryotes.