



ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27
B.Sc. Biotechnology - III SEMESTER
SEMESTER EXAMINATION: NOVEMBER 2020
BT318 – MOLECULAR BIOLOGY AND BIOPHYSICS

Time- 2 1/2 hrs

Max Marks-70

This paper contains TWO printed pages and THREE sections

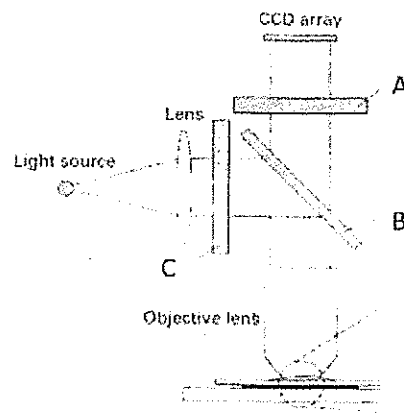
I. Answer any TEN of the following**2x10=20 marks**

1. What are molecular chaperone proteins and what are their roles?
2. There is a loss of function mutation in the Operator sequence of the lac operon of *E. coli* and both lactose and glucose are present in the medium. Draw a diagram and explain how transcription of the lac operon genes is affected.
3. If a terminator was removed from a gene, how would this affect transcription? Where would transcription end?
4. What are the functions of the 7-Methyl Guanosine cap added to the 5' end of eukaryotic mRNAs?
5. Write a brief note comparing prokaryotic and eukaryotic promoters.
6. A mutation in which of the following regions of a eukaryotic gene is least likely to affect gene function? Justify your answer.
 - a. Promoter sequence
 - b. Coding region
 - c. Splice junction
 - d. Intergenic region.
7. What is the function of the Topoisomerase?
8. Briefly describe how eukaryotic genomes are packaged.
9. What is a Svedberg unit? How is it helpful in analysing macromolecules?
10. What is resolution in a microscope? What are the factors affecting it?
11. What factors determine the hazard potential for a radioactive material? What does a Sievert represent?
12. Write a short note on how chromophores in spectroscopy can act as reporters to probe their immediate environment.

II. Answer any FIVE of the following**6x5=30 marks**

13. How is the *trp* operon regulated by the process of attenuation?
14. What are the different types of mutagens? Give examples for each.
15. Compare and contrast the different conformations of DNA.
16. What are theoretical plates? Describe its importance in chromatography with appropriate illustrations and a mathematical equation.
17. Explain Bragg's law with a neat diagram. If an X-ray of 120 picometer incident on two consecutive layers of a peptide crystal separated by 1.2 Angstrom produced a constructive interference, what is the glancing angle?

18. Which microscope is being illustrated here? Label and describe the function of components A, B and C. Additionally, indicate the path of 'wavelengths' of light with a ray diagram.



19. Write a note on the factors affecting sedimentation. Describe the order in which the following cellular components would sediment under differential centrifugation: mitochondria, ribosomes, microsomes, nucleus. Mention the conversion formula for RPM to RCF.

III. Answer ANY TWO of the following

10x2=20 marks

20. Describe the structure of the bacterial RNA Polymerase and how this enzyme initiates transcription in prokaryotes.
21. Compare and contrast the molecular mechanisms of prokaryotic and eukaryotic translation initiation and termination.
22. A. Describe the origins of replication in *E. coli* and *S. cerevisiae*.
B. Draw a neat diagram of a replication fork and correctly label all the different components of an active replication fork.

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