**ST JOSEPH’S COLLEGE (AUTONOMOUS), BENGALURU -27**

Registration Number:

Date & session: 02-12-2022, 9:00-11:30 am

**M.Sc. BIOTECHNOLOGY – III SEMESTER**

**SEMESTER EXAMINATION: OCTOBER 2022**

**(Examination conducted in December 2022)**

**BT9122 –MULTIOMICS TECHNOLOGIES AND SYSTEMS BIOLOGY**

**Time: 2.5 Hours Max Marks: 70**

**This paper contains ONE printed page and THREE parts**

**PART A**

 **Answer any TEN questions: 10 x 2 = 20 marks**

1. What is the GEO database?
2. What is Metagenomics?
3. Define de novo and Reference transcriptome assemblies.
4. What is ATAC Sequencing? State any one application.
5. What is a miRNA? Mention one of its biological functions.
6. What is Ingel proteomics? Add a note on cell map proteomics.
7. What is untargeted metabolomics?
8. What is a heat map and mention one of its applications.
9. Describe metabolic engineering with an example.
10. What is the Microbiome?
11. What are FACS? In which of the omics technologies is it useful?
12. What is the major difference between Clustering and Classification of data?

**PART B**

**Answer any FIVE questions: 6 x 5 = 30 marks**

1. Describe a)KEGG b)AraCyc.
2. What is a cancer gene panel? How is it useful in treatment of cancer?
3. Design an experiment/strategy of how a single cell omics approach can be used to aid drug discovery.
4. A researcher wants to identify the epigenomic methylation patterns. Which method of

 NGS would you suggest to get the necessary data?

1. What is Targeted proteomics? Describe an application based on stress biology.
2. Describe RNA based vaccines against virus infections.
3. What is Metabolite engineering? Explain with an example.

**PART C**

**Answer the following questions 10 x 2 = 20 marks**

1. a) A research student wants to analyze metabolites from CD4 and CD8 lymphocytes. Describe an Omics-based strategy to perform the above experiment.

**OR**

b) Describe applications of Omics technologies in Toxicology, Nutrition, Health and medicine, Environment, Microbiome analysis, and Agriculture, with suitable examples.

1. a) Explain all the steps involved in Bottom-up or Top-down proteomics. Write down few of these approach applications.

**OR**

b) Design an experiment to analyze the effects of heavy metal stress on a zebrafish model using the various approaches of omics to analyze from genome to pathways.