



ST JOSEPH'S UNIVERSITY, BENGALURU -27  
M.Sc. Biotechnology- I SEMESTER  
SEMESTER EXAMINATION: OCTOBER 2023  
(Examination conducted in November/December 2023)  
**BT 7122: BIOCHEMISTRY AND ANALYTICAL TECHNIQUES**  
(For current batch students only)

Registration Number:

Date & session:

Time: 2 hours

Max Marks: 50

This paper contains **TWO** printed pages and **THREE** parts

**Instructions:**

- Draw diagrams wherever necessary and label them correctly.
- Draw the diagrams and graphs using a ballpoint pen.
- Use a graph sheet to plot the data.

**PART-A**

Answer any **SEVEN** of the following:

2m x 7 = 14 marks

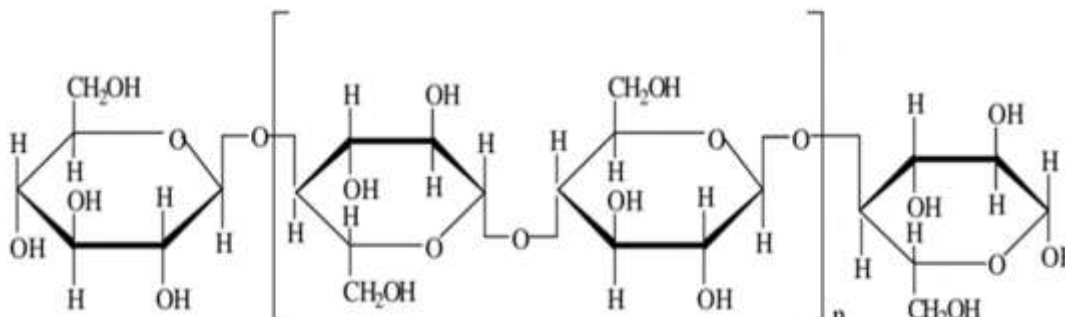
1. State the flexible bonds of a peptide backbone.
2. Why do cis-unsaturated fatty acids have a low melting point?
3. State the importance of PRPP synthase.
4. Define the glycosidic bonds found in lactose and sucrose.
5. What are the contributions of serine and histidine in the mechanism of chymotrypsin action?
6. What is buffer capacity? State its importance for the analysis of biomolecules?
7. Mention any two strategies how you can improve peak resolution in chromatography.
8. Mention any two properties of a material to be used for gradient creation in centrifugation.
9. Does the Geiger-Müller counter measure radioactivity, based on excitation or ionization? State two applications of radio-labeling in biology.

**PART B**

Answer any **FOUR** of the following:

5m x 4 = 20 marks

10. State the bioenergetics of complete beta oxidation of palmitate.
11. With the help of a suitable diagram, explain the process of protein folding via the Gro-EL/Gro-ES complex.
12. Identify the following molecule and write a note on its detailed structure and function.



13. Answer the following:
- How is separation of biomolecules different in flow-cytometry and centrifugation? Support your answer using examples. (2 marks)
  - Using diagrams, briefly explain cell-attached and whole-cell variants of patch-clamp technique. (3 marks)
14. State any four factors that impact biomolecule separation using electrophoresis (2 Marks). The following table provides information with regards to distance moved by proteins in an SDS-PAGE gel. A series of marker proteins and their relative molecular weights ( $M_r$ ) along with the distance moved (in mm) are given below. Calculate the relative molecular weight of the unknown protein (X). (3 marks).

Protein	Relative molecular weight ( $M_r$ )	Distance moved (mm)
Transferrin	78000	6
Bovine serum albumin	66000	12
Ovalbumin	45000	32
Glyceraldehyde-3-phosphate dehydrogenase	36000	38
Trypsinogen	24000	54
b-Lactoglobulin	18400	69
Cytochrome c	12400	86
Unknown protein (X)	-	45

15. Why is sputtering required for biological samples before their analysis using scanning electron microscope? Explain the different modes used to scan the sample in an atomic force microscope. What is the significance of the force-distance curve? (1+2+2 marks)

### PART C

Answer any TWO of the following:

**8m x 2 = 16 marks**

16. With the help of a suitable diagram, describe the structural conformations of hemoglobin that govern binding and release of oxygen.
17. Draw and explain the electron-spray and MALDI ionization mechanisms used in mass-spectroscopy. Comment on how mass-spectroscopy along with chromatography can improve biomolecule analysis.
18. Answer the following:
- Explain competitive inhibition with a representative LB plot. (4 marks)
  - How does understanding of molecular transitions assist in fluorescence microscopy? How is this knowledge translated into image refining in confocal microscopy? (4 marks)