

U.G. 6th Semester Examination - 2022

Molecular Biology and Biotechnology

[HONOURS]

Course Code : MBBT-601-T-CC-R-13

(Bio-Analytical Tools)

Full Marks : 40

Time : $2\frac{1}{2}$ Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer any **five** : 2×5=10
- a) What is buffer capacity of a buffer? What is the pH range of a buffer solution?
 - b) Why is the resolving power of an electron microscope higher than light microscope?
 - c) Comment on the antimicrobial properties of nanoparticles.
 - d) Write down the differences between SEM and TEM.
 - e) Protein A and B having a molecular weight of 16,500D and 35,400D move 1.3cm and

4.6cm, respectively, when electrophoresed through a SDS-PAGE gel. What is the molecular weight of protein C, which moves 2.8cm in the same SDS-PAGE gel?

- f) What is the maximum relative centrifugal force applied when red blood cells are sedimented at 1000 rpm in a rotor having maximum radius equal of 10cm?
- g) The R_f values of substances A and B are 0.34 and 0.68 when chromatographed on paper using ethanol as a solvent. What is the ratio of the distance moved after 3 hours, assuming that neither substance has run off the paper?
- h) Define the terms- i) Chromatogram ii) Retardation factor.

2. Answer any **two**: 5×2=10
- a) Explain components of Electron microscope with diagram.
 - b) Justify- 'Isoelectric focusing is ideal for separation of amphoteric substances.' Differentiate between native PAGE and SDS-PAGE.
 - c) Write a note on Density gradient centrifugation and its' applications.

[Turn Over]

- d) If you were given specimens of (i) eucaryotic cell in anaphase stage of mitosis (ii) microtubule in cell (iii) active, motile, unstained bacteria (iv) nanoparticles (v) DNA, which microscopy techniques would be the most effective in visualizing these specimens?

- d) What is a biosensor? Write down working principle and applications of biosensor. Briefly describe about carbon nanotubes. List the challenges faced by Nanotechnology.

1+2+2+3+2

3. Answer any **two**: $10 \times 2 = 20$

- a) Discuss the role of Beer-Lambert's law in the study of macromolecules using UV-VIS spectrophotometer. Describe the components and applications of Spectrofluorometer. The molar absorption coefficient of benzene is $100 \text{M}^{-1} \text{cm}^{-1}$ at 260 nm. What concentration would give an absorption of 1.0 in a 1-cm cell at 260nm? $3+2+2+3$
- b) Write short notes on Ion exchange chromatography and affinity chromatography. $5+5$
- c) Describe the electrophoretic methods for separation of DNA. How pulse field gel electroporesis differs from conventional agarose gel electrophoresis? Describe the process of transfer and blocking in western blotting. $4+2+4$
