

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)

CLASS: B.TECH.  
BRANCH: BIOTECHNOLOGY

SEMESTER : V  
SESSION : MO/2025

SUBJECT: BE301 BIO-ANALYTICAL TECHNIQUES

TIME: 3 Hours

FULL MARKS: 50

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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		CO	BL
Q.1(a)	Explain the basic principle of centrifugation.	[5] 2	4
Q.1(b)	Explain the different types of centrifugations with their applications.	[5] 2	3
Q.2(a)	Explain the instrumentation of the agarose gel electrophoresis setup with a neat and labelled diagram.	[5] 2	3
Q.2(b)	Calculate the electric field for a given potential difference and length of 100V and 10cm. Compute the electrophoretic mobility assuming a net charge of $3.204 \times 10^{-19}$ C and a friction coefficient of 1.	[5] 1	5
Q.3(a)	Describe, using basic principles of column chromatography, how retention time, retention volume, and retardation factor change as the distribution ratio of a solute is varied.	[5] 3	4
Q.3(b)	Calculate retention time, number of theoretical plates, and height equivalent to a theoretical plate. Considering a compound gives a peak at 8.0 minutes, the mobile phase has a dead time of 2.0 minutes, the width of the peak at its base is 0.40 minutes and the length of the column is 25 cm.	[5] 5	5
Q.4(a)	Describe the major components of a UV-Vis spectrophotometer.	[5] 4	4
Q.4(b)	A dye exhibits $\epsilon = 15,000 \text{ L mol}^{-1} \text{ cm}^{-1}$ at 510 nm. With a 1 cm cuvette, an unknown gives $A = 0.750$ . Calculate the concentration. Further, interpret the change in concentration with pathlengths of 0.2 cm and 5 cm, respectively.	[5] 4	5
Q.5(a)	Explain the principle and instrumentation of mass spectroscopy.	[5] 4	3
Q.5(b)	Describe the instrumentation of differential scanning calorimetry with applications.	[5] 5	3

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