

**Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)**



M.Tech. (First Semester – Regular/Supplementary) Examinations, January – 2026
24MBTPE11021 – Analytical Techniques in Biotechnology
(Biotechnology)

Time: 3 hrs

Maximum: 60 Marks

Answer ALL questions

(The figures in the right-hand margin indicate marks)

PART – A

(2 x 5 = 10 Marks)

Q.1. Answer **ALL** questions

	CO #	Blooms Level
a. State the Abbe equation for resolution and mention its significance..	CO1	K1
b. State the Beer–Lambert law and mention one limitation of the law.	CO2	K1
c. What is meant by gel exclusion chromatography?	CO3	K3
d. Define isopycnic centrifugation	CO5	K2
e. State the principle of immunoelectrophoresis.	CO6	K1

PART – B

(10 x 5 = 50 Marks)

Answer ALL the questions

	Marks	CO #	Blooms Level
2. a. Explain the concepts of magnification and resolution in light microscopy.	5	CO1	K2
b. Describe the working principle and optical components of a phase-contrast microscope.	5	CO2	K4
(OR)			
c. Discuss the principle and instrumentation of fluorescence microscopy.	5	CO4	K2
d. Explain the principle of operation and instrumentation of a Scanning Electron Microscope (SEM).	5	CO5	K4
3.a. Describe the principle and instrumentation of UV–Visible spectroscopy with a neat labelled diagram.	5	CO3	K4
b. Elucidate the principle of fluorescence spectrophotometry and discuss factors affecting fluorescence intensity.	5	CO1	K3
(OR)			
c. Explain the principle and working of Electrospray Ionization (ESI) in mass spectrometry.	5	CO2	K4
d. Write on the basic principle and applications of IR and NMR spectroscopy.	5	CO3	K2
4.a. Explain the principle and classification of chromatographic techniques based on separation mechanisms.	5	CO1	K2
b. Explain partition chromatography with highlighting its principle.	5	CO4	K1
(OR)			
c. Discuss the procedure and applications of paper chromatography.	5	CO6	K2
d. Describe thin-layer chromatography (TLC) and its applications.	5	CO5	K2
5.a. Describe Relative Centrifugal Force (RCF) and explain how it is calculated.	5	CO2	K2
b. Discuss the sedimentation coefficient, including factors affecting its value and its significance in molecular biology.	5	CO3	K3

(OR)

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| c. Classify types of centrifuges and describe their applications in biological sciences. | 5 | CO2 | K4 |
| d. Describe the principle and applications of differential centrifugation. | 5 | CO1 | K2 |
| 6.a. Explain the procedure and applications of agarose gel electrophoresis. | 5 | CO4 | K3 |
| b. Describe the technique of two-dimensional electrophoresis and its significance in proteomics. | 5 | CO3 | K4 |

(OR)

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| c. Describe the steps and applications of polymerase chain reaction (PCR). | 5 | CO5 | K3 |
| d. Describe the measurement of radioactivity using Geiger–Muller counter. | 5 | CO6 | K2 |

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