22BTU519N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(Fifth Semester)

Branch - **BIOTECHNOLOGY**

ANALYTICAL TECHNIQUES

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Which of the following is an example of a physiological buffer system? a) Carbonic acid-bicarbonate system b) Acetic acid-acetate system c) Phosphate buffer system d) Citrate buffer system	K1	CO1
	2	What is the purpose of a pH meter? a) To measure conductivity b) To determine the concentration of a solution c) To measure the hydrogen ion concentration d) To separate molecules	K1	CO1
2	3	The principle of Beer-Lambert's law states that absorbance is directly proportional to _____. a) Molarity and temperature b) Concentration and path length c) Wavelength and frequency d) pH and volume	K2	CO2
	4	The technique that uses the absorption of ultraviolet or visible light to determine the concentration of a substance is known as _____. a) Titration b) Electrophoresis c) Spectrophotometry d) Centrifugation	K1	CO2
3	5	What is the primary principle of sedimentation used in centrifugation? a) Partition coefficient b) Density difference c) Charge separation d) Solvent extraction	K1	CO3
	6	Which of the following is a type of preparative centrifugation? a) Differential centrifugation b) Analytical centrifugation c) Gel filtration d) Thin layer chromatography	K2	CO3
4	7	What is the basic principle of gas chromatography? a) Separation based on molecular size b) Separation based on charge c) Separation based on a substance's volatility and interaction with the stationary phase d) Separation based on density	K1	CO4
	8	In chromatography, the stationary phase is typically: a) A moving liquid or gas b) A solid or a liquid supported on a solid c) A vacuum d) A gel matrix	K2	CO4
5	9	Which of the following is a key component of a mass spectrometer? a) Spectrophotometer b) Mass analyzer c) Geiger-Muller tube d) pH meter	K1	CO5
	10	Which unit is used to measure radioactivity? a) Volts b) Watts c) Becquerel d) Joules	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Explain the principle and applications of a pH meter	K4	CO1
		(OR)		
	11.b.	Explain the types and uses of buffers in biological systems		
2	12.a.	Describe the principles of Beer-Lambert's law and its application in colorimetry	K2	CO2
		(OR)		
	12.b.	Explain the basic concepts of fluorescence and circular dichroism spectroscopy.		
3	13.a.	Describe the basic principles of sedimentation and the care and safety aspects of centrifuges.	K4	CO3
		(OR)		
	13.b.	Write a detailed note on electrophoresis and its different types		
4	14.a.	Explain the principles and applications of High-Performance Liquid Chromatography (HPLC).	K3	CO4
		(OR)		
	14.b.	Discuss the principles and applications of Ion-exchange and Affinity chromatography.		
5	15.a.	Explain the principles of radioactive detection using a GM counter and a Scintillation counter.	K3	CO5
		(OR)		
	15.b.	Describe the principles of a mass spectrometer, including its main components		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Describe the principle and applications of different types of biosensors, focusing on their use in glucose estimation	K4	CO1
2	17	Explain the principles and applications of Ultraviolet and visible spectroscopy. Differentiate between atomic spectroscopy and light scattering	K4	CO2
3	18	Elaborate on the different types of centrifugation, including preparative and analytical, and their applications in separating cells and biomolecules	K4	CO3
4	19	Explain the principle, performance parameters, and applications of various types of chromatography, including Adsorption, Partition, and Molecular exclusion	K4	CO4
5	20	Discuss the uses of radioisotopes in biological research. Explain the laboratory hazards and safety standards associated with handling them	K4	CO5

Z-Z-Z END