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22MBU413N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2025
(Fourth Semester)

Branch- **MICROBIOLOGY**

BIOINSTRUMENTATION

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	Beer–Lambert's law relates absorbance to: a) Both concentration and path length b) Concentration of solution only c) Path length only d) Temperature of solution	K1	CO1
	2	Why is KCl used in the reference electrode of a pH meter? a) To increase acidity b) To measure conductivity c) To maintain constant ionic strength and stable potential d) To act as a buffer	K2	CO1
2	3	The main advantage of analytical centrifugation over preparative centrifugation is: a) Faster rotation speed b) Lower cost of equipment c) Use of disposable tubes d) Ability to study molecular properties during centrifugation	K1	CO3
	4	Why is differential centrifugation widely used in cell biology? a) To separate cellular components based on size and density b) To purify DNA only c) To increase solubility of proteins d) To measure enzyme activity	K2	CO3
3	5	In adsorption chromatography, the stationary phase is usually: a) Liquid b) Solid adsorbent c) Gas d) Solvent	K1	CO3
	6	Why does the more polar compound usually elute later in normal-phase column chromatography? a) It dissolves better in the mobile phase b) It degrades during separation c) It is less visible under UV light d) It has stronger interactions with the polar stationary phase	K2	CO2
4	7	The visible arcs (precipitin lines) in immunoelectrophoresis represent: a) Protein–antibody complexes b) DNA binding c) Lipid precipitation d) Carbohydrate breakdown	K1	CO2
	8	Why do DNA fragments always migrate towards the positive electrode (anode)? a) DNA is positively charged b) DNA binds to buffer ions c) DNA is negatively charged due to phosphate groups d) DNA interacts with agarose dye	K2	CO2
5	9	Which of the following is not a type of radioactive decay? a) Evaporation b) Alpha decay c) Beta decay d) Gamma emission	K1	CO4

Cont...

	10	Why is it important to understand quenching in fluorescence studies? a) It helps in correcting pH errors b) It improves the resolution of electrophoresis c) It helps in determining molecular interactions and environments d) It increases solvent evaporation rate	K2	CO4

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.	Discuss the applications of UV–Visible spectrophotometer.	K2	
		(OR)		
	11.b.	Explain the principle of electrochemical biosensors with suitable examples.		
2	12.a.	Apply the principle of ultracentrifugation to determine the molecular weight of proteins using analytical ultracentrifugation.	K3	CO1
		(OR)		
	12.b.	How is preparative centrifugation applied in separating different cell organelles?		
3	13.a.	Apply the principle of GLC to explain how environmental pollutants can be detected.	K3	CO2
		(OR)		
	13.b.	How can ion-exchange chromatography be applied to separate amino acids from a mixture?		
4	14.a.	Compare agarose gel and polyacrylamide gel in terms of separation.	K4	CO3
		(OR)		
	14.b.	Analyze how antigen–antibody interaction determines the band formation in immunoelectrophoresis.		
5	15.a.	A researcher observes false counts in a GM counter. Analyze the reasons and suggest solutions.	K4	CO4
		(OR)		
	15.b.	Compare the advantages and limitations of solid vs. liquid scintillation counting for measuring low-level radioactivity.		

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	Compare pH meter vs. pH indicator paper in terms of accuracy and reliability.	K4	CO1
2	17	How buoyant density determines the separation of molecules in density gradient centrifugation.	K4	CO2
3	18	Analyze how the choice of stationary phase (polar vs. non-polar) affects the separation of compounds in HPLC.	K4	CO3
4	19	Examine how various experimental conditions affect the outcome of gel electrophoresis and explain their effects.	K4	CO3
5	20	Analyze the safety concerns and precautions while using radioisotopes in biological laboratories.	K4	CO4

Z-Z-Z END