2315

Avinashilingam Institute for Home Science and Higher Education for Women

Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD (now MoE)
Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC
Coimbatore-641043, Tamil Nadu, India

Bachelor's Degree Examination - May 2025
II Semester

Class : I UG / 2023 Batch **Time : 3 Hours**
Major : Biochemistry and Biotechnology **Max. Marks : 100**

23BBTC02 Bioanalytical Tools

Course Outcomes :

CO1: Understand the theoretical basis for the practical experiments.
CO2: Recognize the importance of buffer systems in pH maintenance.
CO3: Appreciate the principle, operation, and applications of various techniques for analysing biomolecules.
CO4: Design suitable techniques for the separation of biomolecules.
CO5: Interpret the results of analytical techniques.

Part A **10 x 1 = 10**
Choose the Correct Answer

1. Which of the following best describes a buffer solution? CO1K1
   a. A solution that changes pH drastically when an acid or base is added
   b. A solution that resists changes in pH upon addition of small amounts of acid or base
   c. A solution that contains only a strong acid and its conjugate base
   d. A solution that contains a strong base and water

2. What is the role of a rotor in a centrifuge? CO1K1
   a. To generate heat during centrifugation
   b. To adjust the pH of the sample
   c. To hold and spin the sample tubes at high-speed
   d. To filter particles from the sample

3. Which of the following is the stationary phase in paper chromatography? CO2K1
   a. Liquid solvent b. Filter paper
   c. Glass beads d. Gas molecules

4. Which type of chromatography is commonly used for the separation of proteins? CO2K1
   a. Gas chromatography b. Ion-exchange chromatography
   c. Paper chromatography d. Thin-layer chromatography

5. Which law governs the relationship between absorbance and concentration in spectrophotometry? CO3K1
   a. Beer-Lambert Law b. Dalton's Law
   c. Henry's Law d. Boyle's Law

6. Nephelometry is based on the measurement of: CO3K1
   a. Electrical conductivity of a sample
   b. Change in temperature of a solution
   c. Light absorbed by a solution
   d. Light scattered by suspended particles

7. In SDS-PAGE electrophoresis, what is the role of SDS (sodium dodecyl sulfate)? CO4K1
   a. To provide a negative charge to proteins for uniform migration
   b. To stain proteins for visualization
   c. To break down RNA molecules
   d. To enhance fluorescence detection

8. What type of radiation is emitted in alpha decay? CO4K1
   a. Electrons b. X-rays
   c. Helium nuclei d. Positron

9. Infrared (IR) spectroscopy is primarily used to identify: CO5K1
   a. Atomic structure b. Nuclear radiation
   c. Functional groups in organic compounds d. Molecular formula

10. Which of the following medical imaging techniques uses ionizing radiation? CO5K1
    a. Ultrasound b. X-ray
    c. MRI d. Infrared spectroscopy

Part B — 5 x 6 = 30

Answer ALL questions

Each answer should not exceed 400 words or two pages

11.a.	Explain the derivation of Henderson-Hasselbach equation and extend on its applications.	CO1K3
	(or)	
11.b.	Describe principle of sedimentation and summarize on desktop centrifuges.	CO1K2
12.a.	Compare ascending, descending and circular paper chromatography.	CO2K2
	(or)	
12.b.	How will you use affinity chromatography to separate an enzyme.	CO2K3
13.a.	Restate the definition of fluorescence, phosphorescence, chemiluminescence and bioluminescence.	CO3K2
	(or)	
13.b.	Write the principle and applications of turbidometry and fluorimetry.	CO3K3
14.a.	Classify the various types of electrophoresis and describe their applications.	CO4K2
	(or)	
14.b.	Report on radiation hazards and precautions to be taken in handling radioactive isotopes.	CO4K3
15.a.	Discuss on the application of Raman spectra and X-ray crystallography in predicting the structure of a compound.	CO5K2
	(or)	
15.b.	Explain the principles of CAT scan, PET scan and X-ray.	CO5K3

Part C — 5 x 12 = 60

Answer ALL questions

Each answer should not exceed 800 words or four pages

16.a.	Explain how will you determine the pH using hydrogen electrode and glass electrode.	CO1K3
	(or)	
16.b.	Compare differential and density gradient centrifugation with regard to principle, mechanism and applications.	CO1K4
17.a.	Examine the principle, procedure and applications of Thin Layer Chromatography (TLC).	CO2K3
	(or)	
17.b.	Deduce the principle behind ion-exchange chromatography, outline on different types of resins used and explain how will you separate amino acids using the same.	CO2K4
18.a.	Illustrate the working principle and applications of colorimetry and UV-Visible spectrometry.	CO3K3
	(or)	
18.b.	Analyse the principle, instrumentation and uses of atomic absorption spectroscopy.	CO3 K4
19.a.	Examine the principle, methodology and role of agarose gel electrophoresis and SDS-PAGE in molecular biology.	CO4K3
	(or)	
19.b.	Outline the important stable and radioactive isotopes used in biochemical research and explain the measurement of radioactivity by autoradiography.	CO4K4
20.a.	Evaluate the role of Mass spectrometry and NMR spectroscopy in determining the structure of a molecule.	CO5K3
	(or)	
20.b.	Analyse the principle and applications of MRI, Electrocardiogram and Electroencephalogram in imaging intact biological structures.	CO5K4

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