Name: Enrolment No:	

UPES

End Sem examination, December 2024

Course: Bioanalytical Techniques — **Semester : V**

Program: B.Tech. Biotechnology — **Duration : 3 Hours**

Course Code: HSBT3004 — **Max. Marks: 100**

Instructions:

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	Cos
Q 1	The Svedberg unit (S) is used to measure: a) Centrifugal speed b) Sedimentation rate c) Density of a solution d) Centrifuge rotor radius	1.5	CO1
Q 2	What is the principle behind density gradient centrifugation? a) Particles are separated based on electrical charge b) Particles are separated based on their size only c) Particles are separated by moving through a gradient of increasing density d) Particles are separated by light absorption	1.5	CO1
Q 3	Recall the function of beam splitter in dual beam spectrophotometer.	1.5	CO1
Q 4	State the function of monochromator.	1.5	CO1
Q 5	Define singlet state.	1.5	CO1
Q 6	Recall The name of any fluorophore and quencher.	1.5	CO1
Q 7	Beer's law states that absorbance is directly proportional to the thickness of the absorbing material (True/False).	1.5	CO1
Q 8	Energy (E) is directly proportional to the wavelength (λ) (True/False). Explain	1.5	CO1
Q 9	The shift of an absorption maximum to a longer wavelength is called hypsochromic or red shift (True/False)	1.5	CO1
Q 10	In affinity chromatography method, molecule of interest is separated on the basis of specific biological interactions (True/False).	1.5	CO1

Q 11	**Identify the type of chromatography and label A, B, and C:** 	**1.5**	**CO2**
Q 12	**List the names of different types of rotors.**	**1.5**	**CO2**
Q 13	**The stationary phase in gel filtration chromatography consists of:** **a) Porous beads** **b) Solid glass particles** **c) Charged ions** **d) Magnetic particles**	**1.5**	**CO2**
Q 14	**Which of the following amino acid residue is modified during ICAT analysis?** **a) Tyrosine b) Glycine c) Serine d) Cysteine**	**1.5**	**CO2**
Q 15	**Which chromatographic technique is employed to purify labeled peptide fragments:** **a) Cation exchange b) Gel filtration c) Hydrophobic interaction chromatography d) Affinity chromatography**	**1.5**	**CO2**
Q 16	**The void volume (V_0) in gel filtration chromatography refers to:** **a) The volume of solvent outside the pores of the beads** **b) The total volume of the column** **c) The volume occupied by the gel beads** **d) The volume of solvent inside the pores of the beads**	**1.5**	**CO2**
Q 17	**Enlist different methods of ionization used in Mass spectrometry.**	**1.5**	**CO3**
Q 18	**Define the term molecular ion.**	**1.5**	**CO3**
Q 19	**During affinity chromatography, how are specifically bound molecules typically eluted from the column?** **a) By changing the temperature** **b) By increasing the ionic strength or altering the pH** **c) By using size-exclusion techniques** **d) By evaporating the solvent**	**1.5**	**CO3**
Q 20	**What is the primary principle behind fluorescence spectroscopy?** **a) Absorption of light and heat emission** **b) Absorption of light and emission of light at a longer wavelength**	**1.5**	**CO3**

	c) Light scattering by molecules **d) Change in molecular mass upon excitation**		
Section B **(4Qx5M=20 Marks)**			
Q		**5**	**CO**
Q1	**Describe the principle of gel filtration chromatography.**	**5**	**CO1**
Q2	**Differentiate between internal conversion (IC) and intersystem crossing (ISC)**	**5**	**CO1**
Q3	**Discuss the principle of electron spray ionization (ESI).**	**5**	**CO2**
Q4	**Differentiate between differential and density gradient centrifugation.**	**5**	**CO3**
Section C **(2Qx15M=30 Marks)**			
Q			**CO**
Q1	**Discuss the principle of Ion exchange chromatography. Differentiate between cation exchange and anion exchange chromatography. A protein with a pI of 5 and if it is placed in a buffer solution of pH-7 which type of ion exchanger you will use to purify the protein. Explain**	**5+5+5**	**CO3**
Q2	**(a) Define enthalpy and entropy of a reaction. (b) Explain the principle of SPR (with diagram). (c)What is SPR sensorgram (explain with figure)**	**5+5+5**	**CO4**
Section D **(2Qx10M=20 Marks)**			
Q			
Q1	**(a) Describe the principle of isothermal calorimetry (with diagram) and (b) its various applications.**	**7+3**	**CO2**
Q2	**Describe fluorescence energy transfer (FRET). Discuss how FRET can be used for protein-protein or protein-RNA interactions.** **Or** **Describe the principle of mass spectroscopy (with diagram). Discuss the MALDI-TOF in detail for protein identification.**	**5+5**	**CO4**