Reg. No. | | | | | | | | | | | | |

M.E. / M. TECH DEGREE EXAMINATIONS, MAY 2023

Second Semester

BY22202 - ADVANCED BIOSEPARATION TECHNOLOGY

(Biotechnology)

(Regulation 2022)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
1	Understand of the physicochemical properties of biotechnological products and economics of bioseparation techniques.	2
2	Gain the knowledge on equipment selection and design of mechanical separation process for recovery of biotechnological products.	3
3	Identify and optimize the suitable bioproduct isolation process at laboratory and pilot scale.	4
4	Thoroughly understand the chromatographic separation methods and equipment selection.	4
5	Have complete knowledge of stability of biotechnology products and should be capable of formulation and stabilization for enhanced shelf-life. Apply principles of various unit operations used in bioseparation processes and enhance problem solving techniques.	3

PART - A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Elucidate the importance of bioseparation in bioprocess industry?	1	2
2.	Illustrate whether the characteristics of biomolecule will affect the downstream processing.	1	2
3.	Why flocculation is used in bioseparation? Name any two flocculants.	1	2
4.	Outline the spectrum of separations used in biotechnology.	1	2
5.	Which type of cell lysis method will use pH 10.5-12.5 to disrupt the cells? Give its principle.	2	2
6.	Why filtration is preferred over centrifugation for the separation of cell mass and culture filtrate?	2	2
7.	Justify the importance of filter aids in filtration and list any two filter aids.	2	2
8.	Why RCF is preferred over RPM in centrifugation? Write the formula used to convert RCF to RPM.	2	2
9.	Which membrane process is used for the concentration of colorants that operates between 10-20 bar? Brief its principle with any two biotechnological applications.	3	2

10.	Which type of membrane module is preferred for the processing of fermentation broth? Justify.	3	3
11.	Compare dialysis and reverse osmosis.	3	2
12.	Discuss the significance of backward extraction in Reverse Micellar Extraction.	3	2
13.	Assume that the crude culture filtrate of *Aspergillus carbonarius* contains enzymes of different molecular mass and same charge. Which type of chromatography could be used for the purification of above enzymes?	4	3
14.	Describe the importance of retention time and volume in chromatographic separation.	4	2
15.	Outline the parameters to be considered for selecting chromatographic separation.	4	2
16.	Which type of chromatographic separation technique can be used to analyze wide variety of drug compounds such as antibiotics, prostaglandins, steroids, taxol, vitamins, barbiturates, non-steroidal anti-inflammatory agents, etc? and explain its principle.	4	3
17.	List out the undesirable effects of drying.	5	3
18.	Why freeze drying is preferred over spray drying for final polishing process of biomolecules?	5	3
19.	Illustrate the importance of supersaturation coefficient in crystallization.	5	2
20.	List the steps involved in the purification of Interferon.	5	2

PART - B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21.(a)	Elaborate the characteristics of fermentation broth and its importance in selecting appropriate bioseparation technique.	(10)	1	3
	(OR)			
(b)	Illustrate the characteristics of biomolecules and its importance in selecting appropriate bioseparation method.	(10)	1	3
22.(a)	Elucidate the importance of cell lysis in purification industry and explain the various mechanical and non-mechanical methods used for cell lysis with neat sketch.	(10)	2	3
	(OR)			
(b)	Outline the importance of different types industrial centrifuges used for the separation of biomass and culture filtrate.	(10)	2	3
23.(a)	Consider that the crude culture extract contains pectinase and other impurities. Which type of extraction method could be used for the separation of pectinase from impurities in a biocompatible environment? Explain the various biphasic systems used in the above extraction method in detail.	(10)	3	4

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(OR)

(b)	Illustrate the bioseparation methods used for the concentration and fractionation of biomolecules using the hydrophobic patches available on the surface of biomolecules in a single-step process.	**(10)**	**3**	**4**
24.(a)	Assume crude culture broth of *Aspergillus niger* contains enzymes of same molecular mass with different charges. Which type of chromatographic separation method could be used for the purification of above enzymes ? Justify in detail with a neat sketch.	**(10)**	**4**	**4**

(OR)

(b)	Elaborate the chromatographic separation process used for the separation of biomolecules based on the hydrophobicity.	**(10)**	**4**	**4**
25.(a)	Illustrate the various process steps involved in crystallization of biomolecules as a finishing operation in downstream processing in detail.	**(10)**	**5**	**4**

(OR)

(b)	Why encapsulation of biomolecules is important? Which type of drying is used for the encapsulation of biomolecules and explain the process steps involved in detail.	**(10)**	**5**	**4**

PART - C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	A biopharmaceutical company produces a recombinant streptokinase for its therapeutic applications. Elaborate the various steps involved in the purification of above enzyme with a neat sketch.	**(10)**	**5**	**5**

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