

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- April 2019

B.Tech VI Semester

COURSE CODE: 16B11BT611

MAX. MARKS: 25

COURSE NAME: Downstream Processing

COURSE CREDITS: 04

MAX. TIME: 1.5 Hr.

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

1. Why the minimum number of steps in a downstream process for the product recovery is desirable? [2] [CO1]
2. a) How the electrodialysis is better than other methods for desalination in food and pharmaceutical industries? [1] [CO2]
 b) How can you inhibit the fouling of membrane? [2] [CO2]
 c) Elaborate the significance of breakthrough curve in adsorption. [2] [CO3]
3. Select and arrange the unit operations in the form of flow chart from out of the following steps (minimum number) to purify α -amylase enzyme secreted by *Bacillus subtilis* in the production medium. The steps may include: Mechanical Cell lysis, Lysozyme induced cell lysis, Centrifugation, Filtration, Chromatography, Salt induced precipitation, organic acid based precipitation, Dialysis. Justify for choosing each unit operation. [3] [CO2, 6]
4. Whether the following statements are True or False. Justify for your answer. [4] [CO3]
 - a) For liquid-liquid extraction, both the solvents should be miscible.
 - b) Counter current liquid-liquid extraction is most efficient as compared to that of co-current.
 - c) Selectivity of the solvent should be higher for the better extraction.
 - d) Organic solvents are unsuitable for isolation of proteins and other sensitive biopolymers.
5. Explain in what conditions you will prefer [3] [CO4, 5]
 - a) Adsorption over the Liquid-liquid extraction
 - b) Centrifugation over filtration
 - c) Ion Exchange chromatography over gel filtration chromatography

6. a) Two hormones A and B are separated by using Sephacryl resin packed gel-chromatography column. The column is 5 cm in diameter and 0.3 m high; the void volume is 0.19 L. The water regain value of the gel is $3 \times 10^{-3} \text{ m}^3 \text{ kg}^{-1}$ dry Sephacryl; the density of wet gel is $1.25 \times 10^3 \text{ kg m}^{-3}$. The partition coefficient for hormone A is 0.38; the partition coefficient for hormone B is 0.15. If the eluant flow rate is 0.7 l h^{-1} , what is the retention time for each hormone? [3] [CO4, 5]
- b) Which hormone has higher molecular weight and justify for your answer? [1]

7. You have a mixture of five different proteins with the following information: [CO4, 6]

Protein	pI	Molecular Weight	Other properties
A	6	200 kDa	
B	6	100 kDa	
C	9	200 kDa	
D	6.1	100 kDa	Lowest Hydrophobicity
E	8	50 kDa	

Design a chromatography experiment with minimum number of steps to purify each protein from the given mixture. Also draw the chromatogram of each chromatography. [4]