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Total No. of Questions : 18

B.Tech. (BT) (2012 to 2017) (Sem.–7)

DOWNSTREAM PROCESSING

Subject Code : BTBT-702

M.Code : 71844

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt ANY FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt ANY TWO questions.**

SECTION-A

Write briefly :

1. What is mean by downstream processing in industrial bioprocessing? Mention the primary unit operations of downstream processing.
2. Write down four detergents used in cell disruption process.
3. What are the basic differences between the sonication and the french press process?
4. What is concentration polarization?
5. What is the influence of the pH in ion exchange chromatography?
6. What is the fundamental difference between the affinity chromatography and size exclusion chromatography?
7. Give an example where liquid-liquid extraction is an essential.
8. P1 protein is expressed inside the cell and the P2 protein is secreted extracellularly. What are the different processes may be introduced to separate P1 and P2? Which is relatively easier to separate?
9. Define Flocculation.
10. What types of metabolites are Ethanol and Penicillin? What growth phases production of these two are involved?

SECTION-B

11. Penicillin is extracted from a fermentation broth using isoamylacetate as the organic solvent in a continuous countercurrent cascade extraction unit. For the particular process the relation between the degree of extraction (X_n/X_o) and the extraction factor (E) is

$$\frac{X_n}{X_o} = \frac{1}{E^n + 1},$$ where, n is the number of stages.

The flow rates of organic (L) and aqueous (H) phases are 10 L/min and 100 L/min respectively. The distribution coefficient of penicillin between organic and aqueous phases at pH = 3 is K_D (=Y_L/X_H) = 50. If the penicillin concentration in the feed stream is 20 g/L, determine the number of stages required to reduce the penicillin concentration to 0.1 g/L in the effluent of the extraction unit.

12. Write a short note on centrifugation.
13. Discuss salting out with an example.
14. Write down the application of ion exchange chromatography.
15. What are the operating principles of Dynomill and French Press?

SECTION-C

16. In a cross-flow ultrafiltration system used for filtration of proteins form a fermentation broth, gel resistance increases with protein concentration according to the following equation.

$$R_G = 0.5 + 0.01(C), \text{ where C is in mg/L}$$

Pressure at the entrance of the system is P_i=6 atm and the pressure at the exit is P_o=2 atm. The shell side of the filter is open to the atmosphere, resulting in P_f = 1 atm. The membrane resistance is R_M = 0.5 atm/(mg/m^2 h), and the protein concentration in the broth is C=100 mg/L. Determine :

a) The pressure drop across the membrane.
b) Filtration flux (J)
c) Rejection coefficient of the membrane for effluent protein concentration of C_f = 5 mg/L

17. Describe in details :
    a) Ultrafiltration
    b) Dialysis
    c) Reverse osmosis
18. Describe the recovery processes in details :
    a) Lactic acid production
    b) Penicillin production

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.