



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech(BT)/SEM-6/BT-602/2012**

**2012**

**BIO-SEPARATION TECHNOLOGY**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) Filtration rate depends on

- a) pressure difference      b) area of filter
- c) viscosity of medium      d) all of these.

ii) The separation of intracellular metabolite from bacterial cell is done by

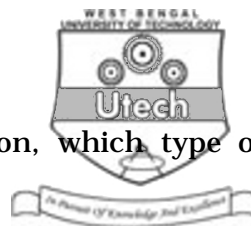
- a) Filtration      b) Sonication
- c) Centrifugation      d) Adsorption.



- iii) Centrifugation rate does not depend on
- a) Density difference
  - b) Viscosity
  - c) Diameter of particle
  - d) None of these.
- iv) Molecular weight of a protein can be determined by
- a) size exclusion chromatography
  - b) ion-exchange chromatography
  - c) pseudo-affinity chromatography
  - d) affinity chromatography.
- v) Non-mechanical methods of cell disruption include
- a) Heat shock
  - b) French press
  - c) Bead mill
  - d) Homogenizer.
- vi) Which one of the following is membrane mediated separation process ?
- a) Affinity chromatography
  - b) Pervaporation
  - c) Gel filtration
  - d) Precipitation.



- vii) In affinity chromatography if the reactive group on the matrix is OH group then coupling agent is
- a) Bisepoxide
  - b) Dichlorotriazine
  - c) Tricyclic chloride
  - d) Cyanogen Bromide.
- viii) In reverse osmosis, the deposition of solute molecules on membrane surface results in large resistance for solvent flow. This phenomenon is known as
- a) Reflection coefficient
  - b) Rejection coefficient
  - c) Breakthrough point
  - d) Concentration polarization.
- ix) The most common exchange resin used in aqueous two phase extraction is
- a) Polyvinyl difluoride
  - b) Polyethylene glycol
  - c) Polysulfone
  - d) Polytetrafluoroethylene.



x) In rate-zonal centrifugation separation, which type of particle characteristics is taken ?

- a) Size
- b) Density
- c) Charge
- d) Volume.

xi) The optimum length of spacer arm in affinity chromatography is

- a) 4-6 carbon atom
- b) 6-10 carbon atom
- c) 10-16 carbon atom
- d) 12-16 carbon atom.

xii) The method used to determine the relative molecular mass of protein is

- a) Ion exchange chromatography
- b) Gel filtration chromatography
- c) Affinity chromatography
- d) Chromatofocusing.



**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Write down the principle of Liquid Liquid extraction technique. Define the distribution coefficient and its importance in Liquid Liquid extraction.  $2 + 3$
3. What is dialysis ? How dialysis is used for isolation and purification of protein ?  $2 + 3$
4. Write short notes on any *one* of the following :
  - a) Size exclusion chromatography
  - b) SDS-PAGE
  - c) Pseudoaffinity chromatography.
5. Discuss about the membrane fouling and concentration polarization during membrane based bioseparation.
6. Discuss the downstream processing steps in the intracellular enzyme from the fermentation broth.



**GROUP - C**

**( Long Answer Type Questions )**

Answer any *three* of the following.

3 × 15 = 45

7. a) What are ion-exchangers ? Classify them.
  - b) Write the basic principle of ion exchange chromatography.
  - c) Write about the application of ion exchange chromatography.
  - d) What is isoelectric precipitation ? What are the advantages of it ?
8. a) Mention different parameters influencing the degree of cell disruption and rate of product release.
  - b) The following data were obtained in a constant pressure filtration unit for filtration of a Yeast suspension :

Time ( <i>t</i> ) Min	4	20	48	76	120
Volume ( <i>V</i> ) L	115	365	680	850	1130

Characteristics of filter are as follows  $A = 0.28 \text{ m}^2$ ,  
 $C = 1920 \text{ kg/m}^3$ ,  $\mu = 2.9 \times 10^{-3} \text{ kg/m-second}$ ,  
 $\alpha = 4\text{m/kg}$  :

- i) Determine the pressure drop across the filter.
- ii) Determine the size of the filter for the same pressure drop to process 4000 lit of cell suspension is 20 minutes.
- iii) Determine the filter medium resistance (  $R_m$  ).

5 + 10



9. Penicillin is extracted from fermentation broth using Isoamyl acetate as organic solvent in continuous counter current cascade extraction unit. The flow rate of organic and aqueous phase are 10 lit/min and 100 lit/min respectively. The distribution coefficient of penicillin between organic and aqueous phase at pH-3 is 50. If the penicillin concentration in feed stream 20 g/l; determine the no. of stage required to reduce the penicillin concentration 0.1 g/l in the extraction unit.
10. Give a complete flow diagram of isolation and purification of insulin or penicillin or erythromycin in a commercial plant. Briefly describe the major operations involved in this process.
11. Explain the following terms and their significances in column chromatography : 6 × 2 + 3
  - a) Partition coefficient
  - b) Retention time
  - c) Retention volume
  - d) Capacity factor
  - e) Relative retention
  - f) Resolution
  - g) Plate height and number of theoretical plates.

