

**BIOSEPARATION TECHNOLOGY
(BIOT 2211)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

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

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) SDS-PAGE uses
 - (a) Anionic detergent
 - (b) cationic detergent
 - (c) non-ionic detergent
 - (d) no detergent
 - (ii) Filtration rate depends on
 - (a) pressure difference
 - (b) area of filter
 - (c) viscosity of medium
 - (d) all of these
 - (iii) Liquid-liquid extraction depends on
 - (a) Distribution coefficient
 - (b) volatility
 - (c) solubility
 - (d) partition coefficient
 - (iv) Electrophoresis is used for the separation
 - (a) Charged bio-molecule
 - (b) neutral bio-molecule
 - (c) organic molecule
 - (d) inorganic molecule
 - (v) Cell disruption in homogenizer is based on
 - (a) Applied voltage
 - (b) operating pressure
 - (c) salt concentration
 - (d) osmotic pressure
 - (vi) Which of the following is not an adsorbent?
 - (a) Carbon
 - (b) Polymers and resins
 - (c) Clay
 - (d) Dry sponge

- (vii) In gel filtration chromatographic separation, bio-molecules are separated based on what property of bio-molecules ?
(a) Size (b) charge
(c) hydrophobic interaction (d) metal ion affinity.
- (viii) Ultrafiltration cannot be used for
(a) Fractionation of protein (b) desalting
(c) selective removal of solvents (d) harvesting for cells
- (ix) 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
- (x) Which of the following isotherm is applicable to physical adsorption?
(a) Langmuir (b) BET
(c) Kisluik (d) None of these

Group – B

2. (a) Define concentration polarization and polarization modulus. How is polarization modulus mathematically related to filtration flux?
(b) If bacterial cell debris has $G t = 54 \times 10^6$ sec, what centrifuge speed is needed to effect a full sedimentation in two hours? (centrifuge having bowl diameter of 10 cm)

(4 + 2) + 6 = 12

3. (a) What are the different methods of cell lysis? Discuss in detail.
(b) In Streptomyces filtration from an erythromycin broth using a test filter, we find the following data:

Filtration time, sec	5	10	20	30
Volume of filtrate, L	0.040	0.055	0.080	0.095

The filter leaf has a total area of 0.009m^2 and the filtrate has a viscosity of 1.1 cP. The pressure drop is 0.51m of mercury and the feed contains 0.015 kg dry cake per liter. Determine the specific cake resistance α and the medium resistance R_M .

6 + 6 = 12

Group – C

4. (a) Define (i) Transmembrane pressure drop (ii) Sedimentation coefficient.
- (b) It is desired to use a cross flow filtration system to desalt 1000 lit of a protein solution containing NaCl. The system is capable of operating at a transmembrane flux of 30 lit / (m²hr). Determine the time needed and the volume of water required in a cross flow filtration unit with a membrane area of 100 m² ,to remove 99.95 % of the salt.

(3 + 3) + 6 = 12

5. (a) Discuss two important applications of solvent extraction in industry.
- (b) A 0.02 molar feed solution containing a macromolecular solute is to be concentrated to 0.1 molar concentration by batch ultrafiltration at 25°C. The solute rejection is 95% and the effect of concentration polarization can be ignored for simplicity. If the upstream pressure is 3.5 atm (gauge) and the downstream pressure is essentially atmospheric, calculate the effective pressure driving force at the beginning and at the end of the process. Also estimate the fractional reduction in the solvent flux at the end of the process.

6 + 6 = 12

Group – D

6. (a) Define dialysis. How it is used for protein purification?
- (b) What do you understand by the term 'chromatography' ? Explain the principle of any two types of chromatography techniques.

6 + (2 + 4) = 12

7. (a) Define adsorption equilibria. What are the assumptions of Langmuir adsorption isotherm?
- (b) Discuss the principle and application of HPLC and GC.

4 + (4 + 4) = 12

Group – E

8. (a) Define (i) humidity (ii) bound water (iii) unbound water
(b) Explain difference between Dry Bulb Temperature and Wet Bulb Temperature? Which one is higher?

$(2 \times 3) + (5 + 1) = 12$

9. (a) What are the mechanisms and methods of precipitate formation?
(b) Write down the major steps in the process of crystallization?

$6 + 6 = 12$

Department & Section	Submission Link
BT (REGULAR)	https://classroom.google.com/c/MzM5ODk1MTU3MDcx/a/MzcxNjc1ODQxOTUz/details
BT (BACKLOG)	https://classroom.google.com/c/MzM5ODk1MTU3MDcx/a/Mzc0MjY0MzQ4OTc0/details