Register Number: ……..

M.TECH DEGREE EXAMINATIONS APRIL 2012

Second Semester

BIOTECHNOLOGY

BTY506: Bioseparation Technology

Time: Three Hours **Maximum Marks: 100**

Answer All Questions:-

PART A (10 x 2 = 20 Marks)

1. Mention the unit operations involved in isolation of proteins.
2. Calculate the overall yield for the purification sequence of 10 steps having 2 % yield loss.
3. It is customary to prepare hemoglobin by the osmotic lysis of RBC. What is the Vant Hoff's pressure drop across the membrane of RBC that is isotonic (0.303 M) on inside and submerged in 0.01 (w/v) % NaCl solution? What is expected out come?
4. Give the diagrammatic representation of gram positive and gram negative bacteria.
5. Why carbon dioxide is widely used as extractants in super critical extractors?
6. List any TWO ways to enhance the permeate flux in microfiltration.
7. Define retention time
8. Why is the spacer arms needed in affinity chromatography?
9. Define sulfitolysis
10. Why is eutectic point more important during lyophilization?

PART B (5 x 16 = 80 Marks)

11.a) Discuss in detail about the purification of various biomolecules using HPLC

(OR)

b) (i) Explain the guidelines followed for the purification of a recombinant protein

(ii) Classify the bioproducts and also explain the various unit operation involve to purify the proteins

12. a) Yeast cells are recovered from a fermentation broth by using a tubular centrifuge. Sixty percent (60%) of the cells are recovered at a flow rate of 12 l/min with a rotational speed of 4000 rpm. Recovery is inversely proportional to flow rate.

(a) To increase the recovery of cells to 95% at the same flow rate, what should be the rpm of the centrifuge? (8)

(b) At a constant rpm of 4000 rpm, what should be the flow rate to result in 95% cell recovery? (8)

(OR)

b) What are the different methods available for Cell disruption? Explain in detail with diagram.

13.a) (i) Water containing 6.8 mg/L of a steroid is extracted with initially pure methylene dichloride. The equilibrium constant for the steroid is 170 and the ratio of water to solvent is 82. What is the concentration in the organic phase after the extraction? What fraction of the steroid has been removed?

(ii) Write notes on various precipitation techniques involved in bioseparation

(OR)

b) (i) Discuss in detail about the theory and applications of aqueous two phase extraction used in protein separation. (6)

(ii) Also give any four applications of Super critical extraction in bioseparation (2)

(iii) A protein solution (concentration = 4.4 g/1) is being ultrafiltered using a spiral wound membrane module, which totally retains the protein. At a certain transmembrane pressure the permeate flux is 1.3×10^{-5} m/s. The diffusivity of the protein is 9.5×10^{-11} m^2/s while the wall concentration at this operating condition is estimated to be 10 g/1. Predict the thickness of the boundary layer. If the permeate flux is increased to 2.6×10^{-5} m/s while maintaining the same hydrodynamic conditions within the membrane module, what is the new wall concentration? (8)

14.a) (i) Discuss in detail about the purification of proteins based on charges. (12)

(ii) What are the advantages of bioaffinity chromatographic techniques? (4)

(OR)

b) (i) How is the molecular weight of a protein determined by gel size exclusion chromatography? (8)

(ii) Describe the practice of Hydrophobic interaction chromatography. (8)

15.a) (i) Why is formulation a necessary step in finishing operation? (4)

(ii) Write a note on freeze drying and its advantages. (6)

(iii) Discuss the theory of Crystallization (6)

(OR)

b) With a neat flow chart, explain the various steps involve in purification of any two high value low volume products