B.TECH. DEGREE EXAMINATIONS: NOV/DEC 2012

Seventh Semester

BIO TECHNOLOGY

BTY122: Downstream Processing

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

Answer All Questions:-

PART A (10 x 1 = 10 Marks)

1. _____ is often used in the preparation of biochemicals from animal tissue homogenates.

    a) Ethane   b) Potassium   c) Acetone   d) Citric acid

2. Filtration leaf test results indicate that the filtration rate of a protein product is 100 dry lbs/(ft^2 hr). What size production filter would be required to obtain 100 dry lbs of filter cake/hr?

    a) 1.54 ft^2 b) 3.08 ft^2 b) 65 ft^2 d) 65 lbs/ ft^2.hr

3. The stage wise operation of adsorption is called

    a) Contact filtration   b) Conventional adsorption

    c) Affinity adsorption   d) Ion exchange

4. The disk centrifuge is the type of centrifuge used most often for bioseparations due to its_____.

    a) Continuous operation   b) Lesser cost

    c) Higher speed   d) Ease in operation

5. Which of the following is not the physical method for the cell rupturing?

    a) Milling   b) Homogenization   c) Ultrasonication   d) Enzymatic digestion

6. In antibiotic manufacturing processes, the fermentation time ranges from

    a) 2-3 weeks   b) 1-2 weeks   c) 4-5 weeks   d) 2-4 weeks

7. _____ refers to a process needed to put the bioproduct in its final form for use.

    a) Polishing   b) Washout   c) Nucleation   d) Finishing

8. The purity of a solute collected between two times t_1 and t_2 during chromatographic separation can be calculated as

    a) Amount of solute eluted - Amount of impurity eluted

    b) Amount of solute eluted / Amount of impurity eluted

    c) Amount of solvent eluted + Amount of impurity eluted

    d) Amount of solvent eluted / Amount of impurity eluted

9. Chromatography is based on the

   a) Different rate of movement of the solute in the column

   b) Separation of one solute from other constituents by being captured on the adsorbent

   c) Different rate of movement of the solvent in the column

   d) Same rate of movement of the solvent in the column

10. The rate of crystal growth is given _____.

   a) Delta L law   b) Newtonian law   c) Raoult's law   d) Henry's law

PART B (10x2 = 20 Marks)

11. What is a biogenic substance?

12. List out the different stages of downstream processing.

13. What is the function of filter media?

14. What are the different types of centrifuge?

15. Define partitioning coefficient

16. Differentiate eluate and eluent.

17. What is salting out?

18. Define supersaturation coefficient.

19. What is supercritical drying?

20. How will you calculate the resolution factor in a chromatographic column?

PART C (5x14 = 70 Marks)

21. a) Enumerate the various biomolecules in biological system and explain in detail. How do biomolecules differ from other chemicals?

(OR)

   b) Explain in detail about the cell disruption methods.

22. a) It is desired to use a cross filtration system to desalt 1000 liters of a protein solution containing NaCl. The system is capable of operating at a trans membrane flux of 30 liters $m^{-2}h^{-1}$. To improve 99.99% of the salt, determine the time required and the volume of water required using a crossflow filtration unit with a membrane area of 100 m^2.

(OR)

b) Using a test filter, we find the following data for the broth containing antibiotic erythromycin. The filter leaf has a total area of 0.1 ft^2 and filtrate has a viscosity of 1.1 cp. The pressure drop is 20 in Hg and the feed contains 0.05 kg dry cake/liter. Determine the specific cake resistance (α) and medium resistance (R_m).

Filtrate Time (sec)	5	10	20	30
Volume of filtrate (lit)	0.04	0.055	0.08	0.095

23. a) (i) Explain in detail about the aqueous two phase extraction. (7)

   (ii) Write a note on applicability of liquid –liquid extraction in biotechnology. (7)

(OR)

   b) (i) In a industrial process 1 liter of 2 M KCl was mixed with 1 liter of 8 M $NaNO_3$. How much of KNO_3 will precipitate? Approximate solubility products useful in this problem are: KCl is 10, KNO_3 is 1.7, NaCl is 35, $NaNO_3$ is 100. Each is given in $(mol/liter)^2$ each implies an ideal solution, which is a significant approximation. (7)

   (ii) Explain about reverse micelle extraction. (7)

24. a) 10 g of BSA is eluted from an 80 liters sephadex column which has a void fraction of 0.4. The concentration in the column peaks after 470 liters are eluted, this maximum concentration is 1.8% of that originality in the column. Estimate (i) The equilibrium constant for binding the BSA to the sephadex. (ii) The number of stages in the column. (ii) The concentration profile of the column.

(OR)

   b) Write short notes on
   (i) Affinity chromatography. (7)
   (ii) Ion exchange chromatography. (7)

25. a) (i) Write the principle and process of crystallization. Discuss how it is different from precipitation. (7)

   (ii) Write a note on crystal growth. (7)

(OR)

b) (i) Wet biological solids contained in a tray are dried by blowing air with 2 % relative humidity and at 60ºC and atmospheric pressure across the tray. For the constant drying rate period, estimate the temperature at the surface of the solids and the maximum molar flux of water. (10)

(ii) Write a note on lyophilisation. (4)

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