

5/2016

B.E-VII Sem- Biotech.
Bioseparation & downstream
Processing

(16)

BE/VII/CBGS/BT/BADP
QP Code : 31277

(3 HOURS)

(MAX. MARKS : 80)

Note:

1. Question No. 1 is compulsory.
2. Attempt any three questions out of remaining five questions.
3. Assume suitable data wherever necessary.
4. Figures to right indicate full marks.

Q.1 Answer the following (Any four)

- a. Why there is a need for cell disruption? List the cell disruption methods. Explain any one method in detail.
- b. Explain precipitation of protein by adding salt.
- c. Discuss flocculation and sedimentation.
- d. Explain minimum liquid- gas ratio for absorption.
- e. Explain the effect of temperature and pressure on binodal curve.

20

Q.2 a. What are the stages of down stream processing? Explain in brief.

06

b. Gas containing 2% by volume solute A is fed to an absorption tower at a rate of $0.35 \text{ m}^3/\text{s}$ at 299K and 106.658 kPa pressure and 95% of original solute is removed by absorbing it in solvent B. Solvent containing 0.005 mole fraction of solute enters the tower at top and exit liquid stream from absorption tower contains 0.12 mole A per mole B. Find out the flow rate of liquid solvent entering the absorption tower on solute free basis.

10

c. Explain selective pH denaturation of unwanted proteins.

04

Q.3 a. Vegetable oil seeds containing 100 gm insoluble solid and 10 gm oil are contacted with

12

200 gm of organic solvent in single stage leaching operation. The solvent used is fresh. Determine the amount of oil left in the oil seeds after the leaching. The equilibrium data can be expressed as, $N = -4Y + 8$.

Where, $N = \frac{\text{gm insoluble}}{\text{gm solvent} + \text{gm oil}}$ and $Y = \frac{\text{gm oil}}{\text{gm solvent} + \text{gm oil}}$ in solvent phase.

The tie line data are;

Y	0.26	0.28	0.31	0.34
X	0.02	0.04	0.06	0.08

b. Write a note on i) Ultrasonication ii) High pressure homogenizer

08

[P.T.O.]

12016

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- Q.4 a. What is the criteria for selection bioseparation technique? 05
- b. A broth of 2 lit. of viscosity 2.8cP containing 5.2 % of compressible biomass was filtered on a filter of 10 cm diameter at a pressure drop of 1.6 bar. The filtration time was 16 min. The cake was found to have compressibility of 0.4. Calculate the time required to filter 2500 lit. of the broth on filter press of area 2.5 m² at a pressure drop of 2.8 bar. Assume the resistance of the filter medium to be negligible. 10
- c. What are the methods of pretreatment of fermentation broth? Explain in brief. 05
- Q.5 a. A pyridine- water solution containing 50% pyridine is to be continuously and counter currently extracted at a rate of 2.25 kg/s with chlorobenzene to reduce pyridine concentration to 2% in final raffinate. Using rectangular coordinate plot of x v/s y and x,y v/s wt. fraction of chlorobenzene, determine the number of theoretical stages required if 2.3 kg/s of solvent is used. 15

Equilibrium tie line data in wt% is

Pyridine	Chlorobenzene	Water	Pyridine	Chlorobenzene	Water
0	99.95	0.05	0	0.08	99.92
11.05	88.28	0.07	5.02	0.16	94.82
18.95	79.90	1.15	11.05	0.24	88.71
24.10	74.23	1.62	18.90	0.38	80.72
28.60	69.15	2.25	25.5	0.58	73.92
31.55	65.58	2.87	36.15	1.85	62.05
35.05	61.00	3.95	44.95	4.18	50.87
40.60	53.00	6.40	53.20	8.90	37.90
49.00	37.80	13.20	49.00	37.80	13.20

- b. Explain a super critical fluid extraction. 05
- Q.6 Write a note on (any four) 20
- a. Disc bowl centrifuge
- b. Absorption factor and stripping factor
- c. Reversed micellar extraction
- d. Single stage liquid liquid extraction for immiscible solvents
- e. Protein precipitation by adding ionic polyelectrolyte