Code No: 07A42301   R07   Set No. 2

II B.Tech II Semester Examinations,November 2010
MASS TRANSFER AND SEPARATION
Bio-Technology

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. Define Mass transfer? Explain mass transfer process with few examples.   [16]

2. Discuss about general case for gas-phase mass transfer in a binary mixture.   [16]

3. Write short notes on:

   (a) simple distillation

   (b) steam distillation.   [8+8]

4. Can absorption be accompanied by a temperature change? Why? What is the difference between physical absorption and chemical (reactive) absorption?   [16]

5. A polyethylene film 0.00015 m thick is being considered for use in packaging a pharmaceutical product at 30^0C. If the partial pressure of oxygen outside the package is 0.21 atm and inside it is 0.01 atm, calculate the diffusion flux of oxygen at steady state. Assume that the resistance to diffusion outside the film and inside are negligible compared to the resistance of the film.
   $P_M = 4.17 (10^{-12})$ m^3 solute/ (s.m^2.atm/m).   [16]

6. Describe the equipment used for steady state and unsteady state adsorption operation.   [16]

7. A stream of waste water containing 2% benzoic acid is to be extracted with benzene at a rate of 2000kg/hr in order to remove 98% of the solute. If water and benzene are assumed to be mutually immiscible and the distribution coefficient is K= 1.707 at the given temperature. Calculate the amount of solvent required if the separation of 98% is done in a five stage counter current unit.   [16]

8. A hollow fiber membrane separator with an $02/N_2$, selectivity of 6.0 is operated at feed and permeate pressures of 5.0 and 1.0 atm

   (a) What is the maximum oxygen concentration that could be obtained if only a small amount of permeate is produced

   (b) if the permeate is compressed to 5 atm and sent to a similar membrane unit what oxygen concentration could be obtained.   [8+8]

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Code No: 07A42301 | **R07** | **Set No. 4**

II B.Tech II Semester Examinations,November 2010
MASS TRANSFER AND SEPARATION
Bio-Technology

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

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1. For mass transfer across a phase interface, what is the difference between the film, penetration, and surface-renewal theories, particularly with respect to the dependence on diffusivity? [16]

2. Explain in detail about the process flow of a fractionating tower containing sieve trays with neat diagram and write in detail about reboiler and condenser? [16]

3. Write short notes on:

   (a) Properties of solvent for Absorption

   (b) Minimum Liquid Gas ratio for absorbers. [8+8]

4. Differentiate between physical adsorption and chemical adsorption also the advantages and disadvantages with examples? [16]

5. Differentiate between(with neat diagrams)

   (a) osmosis

   (b) reverse osmosis [8+8]

6. Molecular diffusion occurs by any of the four driving forces or potentials? Which one is the most common. Can molecular diffusion occur in solids, liquids, and gases. [16]

7. Write short note on :

   (a) fixed bed leaching

   (b) Moving bed leaching with neat diagrams. [16]

8. Write short notes on:

   (a) Sherwood number

   (b) Stanton number

   (c) Schmidt number

   (d) Reynolds number. [4+4+4+4]

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Code No: 07A42301 $\boxed{\textbf{R07}}$ $\boxed{\textbf{Set No. 1}}$

II B.Tech II Semester Examinations,November 2010
MASS TRANSFER AND SEPARATION
Bio-Technology

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Give any five industrial Extraction processes.

   (b) Explain the Salient applications of liquid extraction in Biotechnology. [8+8]

2. Explain in detail about the adsorption phenomena in immobilized enzyme systems with examples in biological systems with neat diagrams? [16]

3. Write short note on:

   (a) phase rule

   (b) equilibrium

   (c) Henry's Law [5+5+6]

4. Give the natural examples of Absorption in daily life. Explain the desirable properties of solvent for Absorption. [16]

5. Discuss briefly the following:

   (a) Mass transfer resistances

   (b) What is the Sherwood number? How is it analogous to the Nusselt number? [8+8]

6. What are the three basic mechanisms of mass transfer,when separating chemicals in commercial equipment, which mechanism is preferred? Why? [16]

7. Reverse osmosis is used to produce pure water from sea water that has a salt concentration of 35,000ppm and an osmotic pressure of 0.7 atm per 1000 ppm .The inlet pressure is 70atm gauge and 40% feed is recovered as potable water. If the feed pump efficiency is 80% and only the pump work is considered what is the thermodynamic efficiency of the process? [16]

8. Calculate the rate of diffusion of acetic acid (A) across a film of non diffusing water (B) Solution 1 mm thick at 17^0C when the concentration on opposite sides of the film are, respectively, 9 and 3 wt % acid. The diffusivity of acetic acid in the solution is 0.95×10^{-9} m^2/s. [16]

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$\boxed{\textbf{R07}}$ $\boxed{\textbf{Set No. 3}}$

II B.Tech II Semester Examinations,November 2010
MASS TRANSFER AND SEPARATION
Bio-Technology

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) What is the definition of the Reynolds number and what is its physical meaning?

   (b) Give the limits of the Reynolds number for laminar and turbulent flow. [8+8]

2. Write short note on following

   (a) Effect of process flow patterns on separation in asymmetric membranes

   (b) Effect of pressure drop on separation in asymmetric membranes [8+8]

3. Write short notes on:

   (a) Surface stretch theory

   (b) Film theory. [8+8]

4. Explain the set up involved in counter current extraction with reflux, with neat Diagram. [16]

5. What is the effect of nature of solvent on the gas solubility? Discuss the effect of volatility and viscosity of solvent on the absorption operation. [16]

6. Explain Steady State Molecular Diffusion in Fluids at rest and in Laminar Flow. [16]

7. An ethanol water mixture containing 36% by weight of ethanol is differentially distilled at 1 atm pressure and the mixture is reduced to a maximum ethanol concentration of 6 mol% Determine the composition of the distillate.
   The VLE data: [16]

Mol frac of ethanol in liquid(X)	0.18	0.16	0.14	0.12	0.10
Mole fraction of ethanol in vapor(Y)	0.517	0.502	0.485	0.464	0.438

8. Experiments on decolorisation of oil yielded the following equilibrium relation ship, $Y=0.5\ X^{0.5}$,
   Y= gms of colour removed per gm of adsorbent,
   X= colour in the oil, gms of colour/1000gm of colour free oil
   100 kg of oil containing 1 part of colour to 3 parts of oil is agitated with 25 kg of the adsorbent calculate the percent of colour removed if all 25 kg of adsorbent is used in one step. [16]

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