Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS / B.TECH (CHE) / SEM-7 / CHE-704E / 2010-11

2010-11

ADVANCED SEPARATION PROCESS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

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

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) How does solute rejection change with rise in pressure ?

a) Decreases b) Increases

c) Remain same d) None of these.

ii) Which of the following is not a colligative property ?

a) Depression of freezing point

b) Osmotic pressure

c) Lowering of vapor pressure

d) None of these.

iii) Solutions having same osmotic pressure are called

a) Isotonic solutions b) Dilute solutions

c) Saturated solutions d) Ideal solutions.

iv) Which type of membrane is used in dialysis ?

a) Porous b) Micro porous

c) Non-porous d) None of these.

v) In reverse osmosis the effect of temperature is

a) Significant b) Negligible

c) Very large d) Very small.

vi) In membrane process, flux is proportional to pressure as

a) Inversely b) Directly

c) Square d) Square-root.

vii) O_2 is transported by haemoglobin in human body, it is a

a) Coupled transport b) Facilitated transport

c) Passive diffusion d) None of these.

viii) Which of the following types of membrane module is having maximum packing density (m^2 / m^3) ?

a) Plate and frame b) Spiral wound

c) Tubular d) Hollow fibre.

ix) The types of cellulose acetate membrane is

a) Isotropic b) Anisotropic

c) Both (a) and (b) d) Neither (a) nor (b).

x) At 'Concentration Polarization' layer, the concentration of bulk solution

a) increases b) decreases

c) remain same d) none of these

xi) It waste water treatment, membrane separation process is a

a) Primary treatment b) Secondary treatment

c) Tertiary treatment d) All of these

xii) In desalination of water, the process used is

a) Ultra-filtration b) Micro-filtration

c) Reverse osmosis d) Pervaporation.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Why is nanofiltration also known as loose RO ?

3. Deduce equation for mass transport of pervaporation for a pure liquid (ideal case).

4. Write short notes on the following :

(i) Membrane module (ii) Isotropic membranes.

5. How do you identify O/W/O or W/O/W emulsion liquid membrane ?

6. What is dialysis ? Name the impurities of blood that can be removed by dialysis.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. What is liquid membrane ? Explain different types of liquid membrane with example. Derive flux expression for facilitated transport liquid membrane. Give a flow diagram for the emulsion liquid membrane. 2 + 5 + 5 + 3

8. What is ultra-filtration ? Explain 'Concentration Polarization' for UF system with a neat sketch. Briefly explain two applications of UF system in industry. What are the limitations of UF system ? 2 + 5 + 5 + 3

9. An RO module is to be designed for production of 1000 cm^3/day of portable water containing 200 ppm salt from brackish water containing 34 g salt per litre. An asymmetric cellulose acetate membrane with an inherent salt rejection ability of 98% is to be used. The water permeation coefficient is 0·035 m^3/m^2. day.Atm. The recovery of feed water should be 45% and an operating pressure of 50 atm. gauge is suggested. The permeate side may be assumed to be in atmospheric pressure. If spiral wound modules of 5 m^2 effective membrane area each is used, how many modules in parallel are required ? The osmotic pressure of 5% brine (linear in salt concentration) is 39·5 atm. 15

10. a) What is the advantage of chromatographic separation ?

    b) What are the applications of gas separation processes ?

    c) Write down different types of gas separation arrangement. 5 + 5 + 5

11. What do you mean by chromatographic separation ? Briefly discuss about the types of chromatography. 3 + 12

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