

V SEMESTER B.TECH BIOTECHNOLOGY, END SEMESTER ONLINE EXAMINATION (MS TEAMS), 28th December, 2021 (9:20-10:40 AM) SUBJECT: SEPARATION PROCESSES [BIO3154] Max Marks 20; Answer all the questions

1A. A binary liquid mixture, α as constant (α =2.0), of A-B (60 mole % A) is flashed at 1 atm such that the composition of vapour in equilibrium with liquid is found to be 70 mole% A. Estimate the corresponding liquid composition, the fraction of feed vapourized. **DO NOT USE GRAPH.** [3]

1B. Write briefly about desirable characteristics of an Ideal Detector in HPLC [2]

1C. The equilibrium adsorption of acetone vapour on an activated carbon at 30°C is given by $Y=2.123 X^2$ where

$\mathbf{v} = gm$ acetone adsorbed	V = gm of acetone
gm of Carbon	gm of dry air

A one litre flask contains air and acetone vapour at 1 std.atm total pressure, 30°C & acetone (with a partial pressure at 35% of vapour pressure). After 2g of fresh activated carbon has been introduced into the flask, the flask is sealed Neglect adsorption of air. The vapour pressure of acetone at 30°C is 283mm Hg. Mol wt of acetone is 58. Compute,

i) Final partial pressure of acetone, mm Hg

ii) Concentration of the adsorbate in the solid phase (gm/gm)

DO NOT USE GRAPH [5]

2A. In order to determine the optimum flow rate of mobile phase for a 50 cm column containing $30 \,\mu\text{m}$ particles of stationary phase, trial experiments were conducted using a solute at different flow rates of the eluent. The date obtaining for three different linear velocities of the eluent are as follows:

S.No.	u (cm/min.)	t_{R} (min.)	Wb (min.)
1	10	7.5	0.4
2	30	2.5	0.13
3	50	1.5	0.09

Determine the optimum flow rate of the mobile phase for the column and calculate the number of theoretical plates for optimum conditions of flow, based on Van Deemter principles. $n=16(t_R/w_b)^2$ [4]

2B.Define and explain the following terms with the help of diagrams for drying [3]

- i. Bound moisture
- ii. Unbound moisture

- iii. Free moisture
- iv. Critical Moisture

2C. A saturated solution of KCl containing 1000 g of dissolved solids is cooled from 90°C to 30°C. Determine the yield of crystals when solubility of KCl at 90°C is 53 parts per 100 parts of water and at 30°C is 34.5 parts per 100 parts of water [3]