

1st Periodical Test (19 October 2021)
Mass Transfer-1

Class- BE (Chemical & Food Tech.), 5th Semester
Note Attempt all questions.

Time Duration-1 hour
M. Marks-25

- Q1. Define Fick's law. Give the classification of mass transfer operations and their industrial importance. (6)
- Q2. Mass transfer is occurring from a sphere of naphthalene having a radius of 10 mm. The sphere is in a large volume of still air at 52.6 °C and 1 atm abs pressure. The vapor pressure of naphthalene at 52.6 °C is 1.0 mm Hg. The diffusivity of naphthalene in air at 0 °C is $5.16 \times 10^{-6} \text{ m}^2/\text{s}$. Calculate the rate of evaporation of naphthalene from the surface in $\text{kg mol/m}^2 \text{ s}$. (6)
- Q3. In an experimental study of absorption of ammonia by water in a wetted wall column, the overall gas phase mass transfer coefficient, K_G was estimated as $2.72 \times 10^{-4} \text{ kmol/m}^2 \text{ s atm}$. At one point in the column the gas contained 10 mol% ammonia and the liquid phase concentration was $6.42 \times 10^{-2} \text{ kmol NH}_3/\text{m}^3$ of solution. Temperature is 293K and the total pressure is 1 atm. 85% of the resistance to mass transfer lies in the gas phase. If Henry's law constant is $9.35 \times 10^{-3} \text{ atm.m}^3/\text{kmol}$, calculate the individual film coefficient and the interfacial composition. (6)
- Q4. Define an ideal stage and explain with the help of material balances how you find the number of ideal stages for counter current cascade of stages. (7)