

B.E.CHEMICAL 5th SEMESTER(Third Year)

Ist Sessional (19.10.21)

Mass Transfer I

Max Marks : 25

Time : 1.0 hrs

NOTE : Attempt ALL. Assume missing data if any.

I What is the importance of mass transfer. Name some important mass transfer processes and explain any one in detail. (8)

II A test tube ,17 mm in diameter and 15 cm tall, half full of ethyl acetate (A) has been kept open to air (B) in the laboratory. What is the diffusion flux of the ester at the beginning if pseudo-steady state condition prevails? How long will it take for the level to drop down to 7.8 cm measured from bottom of the test tube? The temperature is 25⁰ C and the ambient pressure is 1.013 bar. Given: the vapor pressure of ethyl acetate at 25⁰ C =0.1266 bar, its diffusivity in air at given condition is $D_{AB}= 0.08786 \text{ cm}^2/\text{s}$ and the density of the liquid is 910 kg/m^3 . Write two applications of molecular diffusion. (7)

III What is meant by Knudsen diffusion . Explain its dependence on the pore radius of the solids . (5)

IV How does the liquid phase diffusivity of a solute depend upon the total pressure and temperature. Explain your answer on qualitative explanations. (5)