國　立　清　華　大　學　命　題　紙

97 學年度＿＿＿＿＿生命科學院＿＿＿＿＿系（所）＿＿＿丙＿＿＿組碩士班入學考試

科目＿輸送現象及單元操作＿科目代碼＿0404＿共＿1＿頁第＿1＿頁 *請在【答案卷卡】內作答

1. (30%) For the mass transfer coefficient k of gas A around a spherical particle made of solid A in a stagnant stream, show that the Sherwood number

$$Sh = kD/c\mathcal{D}$$ is equal to 2.

where D is the diameter of the particle, c is the molar concentration of gas, $\mathcal{D}$ is the diffusivity of Gas A in the gas phase. Gas A is vaporized from the particle surface.

2. (30%) Gas A is diffusing from point 1 (where it has a partial pressure of p_{A1}) to point 2, and reacts as: A→2B. Gas B diffuses back. Assume the reaction is fast, so that the partial pressure of A at point 2 is zero. Derive the expression for N_A at steady state under constant total pressure of P in terms of partial pressure, p_{A1}, diffusivity (D_{AB}) and the distant between points 1 and 2 (L).

3. (40%) Briefly discuss the following terms or questions:
   A. Which type of cake is easier to filtrate, compressible or incompressible? Explain.
   B. What is critical moisture? How is it used in the derivation of drying rate?
   C. Shell and tube heat exchangers.
   D. What is reflux ratio? How does it affect the operation performance of distillation? How is the value of reflux ratio determined in common design practice?