

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

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

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: $A \rightarrow 2B$. 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 distance 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?