

國立高雄大學 109 學年度研究所碩士班招生考試試題

科目：輸送現象

系所：化學工程及材料工程學系

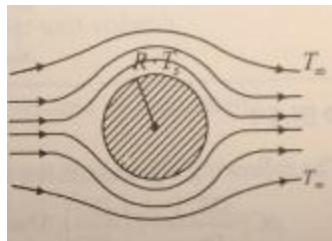
考試時間：100 分鐘

(無組別)

是否使用計算機：是

本科原始成績：100 分

1. Write the definition and physical meaning of the following numbers. And, prove that these are dimensionless groups. (i) Reynold number (Re), (ii) Nusselt number (Nu), (iii) Prandtl number (Pr), (iv) Peclet number (Pe), (v) Grashof number (Gr), (vi) Schmidt number (Sc), and (vii) Lewis number(Le) **(28 分)**
2. Consider a laminar-flow Newtonian fluid with constant density (ρ) and viscosity (μ) is flowing through a gap (L) between two parallel wide plates. Derive the velocity profile in this gap. **(12 分)**
3. Gas A diffuses, dissolves, and reacts with liquid B. The concentration of A is C_{A0} at the free surface. The reaction rate per unit volume $R_A = -k_1 C_A$. Find the steady-state concentration distribution of A in the liquid. Assume constant physical properties in the liquid. k_1 is rate constant. **(20 分)**
4. A heated sphere is surrounded and suspended in a large stationary fluid as shown in the figure. Show that $Nu=2$ for heat transfer from sphere at low Reynold number. Where Nu is Nusselt number. **(20 分)**



5. (a) Write the feed-line equation in the fractional distillation. (Please specify the symbols in the equation). **(10 分)**
(b) Specify the orientation of feed lines in the x-y plots for the following q values: (i) $q>1$, (ii) $q=1$, (iii) $0< q < 1$, (iv) $q=0$, and (v) $q < 0$, where q is the moles of liquid flow in the stripping section for each mole of feed. **(10 分)**