長庚大學107學年度研究所碩士班招生考試試題

系所：生物醫學工程研究所碩士班　　　　　考試科目：輸送現象
　　　生化與生醫工程組

注意：請詳細閱讀下列試題，並請標明題號依試題順序將答案書寫於答案卷上。　　　本試題共 / 頁：第 / 頁

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1. 輸送現象涵蓋動量、熱量、與質量三種傳送，此顯示三者間具有共通的傳送性質。請填寫以下各空欄(數字表示)，以顯示三種傳送間之類比關係。[每欄5%共40%]

	Momentum transfer	Heat transfer	Mass transfer
One-dimensional rate equation	Newton's law of viscosity $\tau_{xy} = \mu dv_x/dy$	Conduction (1)	Ordinary diffusion (2)
Physical property and unit	Kinematic viscosity $(cm^2/sec) = \mu/\rho$, ρ as fluid density	(3)	(4)
Dimensionless group	Coefficient of friction factor flowing over a flat plate $C_f = 2\tau_0/(\rho v_\omega^2)$	(5)	(6)
Colburn analogy	$C_f/2 = j_H = j_D$	(7) $j_H = ?$	(8) $j_D = ?$

2. 在描述對流熱量或質量傳送時，時常會提到薄膜理論(film theory)以及穿透理論(penetration theory)。以一維對流質量傳送(one-dimensional mass transfer)為例，請填寫以下空欄以比較其間差異。[(1)-(4)每欄5%，(5)-(6)每欄10%共40%]

	Film theory	Penetration theory
Assumptions	(1)	(2)
Balance equation, boundary and/or initial conditions	(3)	(4)
Mass transfer coefficient in terms of system parameters	(5)	(6)

3. 在描述兩相間質量傳送時，時常會用到雙阻力理論(two-resistance theory)，以空氣中氧氣(molar fraction of oxygen in bulk gas phase as y_G)傳送到水溶液(molar fraction of oxygen in bulk liquid phase as x_L)為例，請填寫以下空欄以說明此理論。[(1)-(2)每欄5%，(3)欄10%共20%]

Assumptions	(1)
Overall mass transfer coefficient K_x and K_y in terms of individual mass transfer coefficients k_x and k_y as well as the system parameters	(2)
Simplification of (2) if a linear phase equilibrium exists at the gas-liquid interface	(3)