

國立臺北科技大學 111 學年度碩士班招生考試

系所組別：3510 化學工程與生物科技系化學工程碩士班甲組

第二節 化工熱力學與反應工程 試題

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注意事項：

1. 本試題共 4 題，每題 25 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. In a container separated by one partition, one room contains 10 mol idea gas A with 1 atm at 300 K, and the other room contains 5 mol idea gas B with 0.5 atm at 300 K.
 - (a) (20%) Calculate the entropy change after mixing idea gas A and idea gas B when the gases are identical and when the gases are different.
 - (b) (5%) What is the final pressure of the mixture?
2. (25%) Binary liquid mixture contains species A and species B. The excess volume of this system $V^E(\text{m}^3 \cdot \text{mol}) = x_A \cdot x_B(15x_A + 20x_B)$. The molar volume of species A and B are $V_A = 50 \text{ m}^3/\text{mol}$ and $V_B = 80 \text{ m}^3/\text{mol}$. Calculate the partial molar volumes \bar{V}_A and \bar{V}_B when the mixture is composed of 40 mol% A and 60 mol% B.
3. (25%) Derive the rate law using only [A] and [B] for $A \rightarrow B$ on the basis of proposed mechanism (I) and (II) as follows using PSSA.

$$(I) A \xrightleftharpoons[k_A]{k_A} B + C \quad \text{and} \quad (II) A + C \xrightarrow{k_B} 2B$$
4. (a) (10%) Derive rate law for $T + H \rightarrow Q$ using the experimental data in Table. Assume surface reaction is rate-limiting.
 - (b) (15%) Propose adsorption, surface reaction and desorption mechanisms for the rate law in (a), and verify the rate law fits the mechanisms.

Reaction rate (mol/g cat. min)	P_T (atm)	P_H (atm)	P_Q (atm)
0.310	2	15	4
0.065	2	7	8
0.697	45	15	4
0.031	0.2	15	4
0.132	2	7	4
0.658	40	15	4