

# 國立中正大學八十九學年度碩士班招生考試試題

系所別：化學工程學系

科目：化工熱力學與化工動力學

(化工動力學部份共一頁)

1. Aqueous solution of diazobenzene decompose irreversibly according to the reaction:  $C_6H_5N_2Cl(aq) \Rightarrow C_6H_5Cl(aq) + N_2(g)$

In one experiment at 50 °C the initial concentration of was 10g/L and the following amounts of  $N_2$  were liberated:

Reaction time, min	6	9	12	14	18	20	22	24	26
$N_2$ , liberated, $cm^3$	19.3	26.0	32.0	36.0	41.3	43.3	45.0	46.5	48.4

Complete decomposition of the diazo salt liberated 58.3  $cm^3$  of  $N_2$ . Estimate the reaction order and rate constant for the irreversible decomposition reaction. (25 分)

2. If an enzyme-catalyzed reaction proceed by a sequence involving bonding of a reactant to the enzyme, that is,  $R + E \rightleftharpoons RE$ , then followed by the slow irreversible reaction of the resulting intermediate complex. Please derive a rate expression for the reaction. (10 分)

3. 請畫出您曾經作過的動力實驗之草圖,並敘述其實驗步驟及目的。(15 分)

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4. Please describe the physical meanings of the two corrected terms in the Van der Waals equation of state:

$$\left(P + \frac{a}{V^2}\right)(V - b) = RT \quad (14 \text{ 分})$$

5. In a liquid/vapor equilibrium system with several components, the vapor phase is an ideal gas meanwhile the liquid phase is an ideal solution. Please show that the Raoult's law is the criterion of vapor/liquid equilibrium (16 分).

6. The excess Gibbs energy for a binary system is represented by the following equation:

$$G^E/RT = Bx_1x_2$$

where  $B$  is a function of temperature only. For this system, the ratio of pressures of the pure species,  $r$ , is constant over a considerable temperature range. Please determine the range of values of  $B$ , expressed as a function of  $r$ , for which no azeotrope exists on the basis of the assumption that the vapor phase is an ideal gas. (20 分)