

國立臺北科技大學 112 學年度碩士班招生考試

系所組別：3520 化學工程與生物科技系化學工程碩士班乙組

第一節 物理化學 試題

第 1 頁 共 1 頁

注意事項：

1. 本試題共三大題，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。

一、選擇題 (共十分)

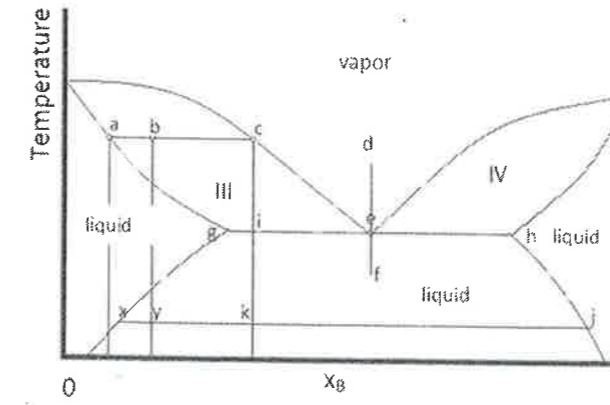
1. () What is the minimum number of components necessary before four phases can be in mutual equilibrium in a system? (1) **2**, (2) **3**, (3) **4**, (4) the system doesn't exist. (5 分)
2. () The mechanism of a composite reaction consists of a fast pre-equilibrium step with forward activation energy 27 kJ/mol and reverse activation energy 35 kJ/mol, followed by an elementary step with forward activation energy 15 kJ/mol. What is the overall activation energy of the composite reaction? (1) + 7 kJ/mol, (2) - 7 kJ/mol, (3) + 47 kJ/mol, (4) - 3 kJ/mol, (5) + 3 kJ/mol (5 分)

二、填充題 (共二十分)

1. The table below contains the concentrations and rates for the reaction $Y + Z \rightarrow X$,
 - (a) What is the form of rate law $v = d[X]/dt$ for this reaction (rate constant K_r)? () (5 分);
 - (b) Please calculate the rate constant K_r . () (5 分)

Experiment No.	[Y] (M)	[Z] (M)	Rate (M/s)
1	0.1	0.1	4.0×10^{-5}
2	0.2	0.1	1.6×10^{-4}
3	0.1	0.2	8.0×10^{-5}
4	0.3	0.4	1.4×10^{-3}

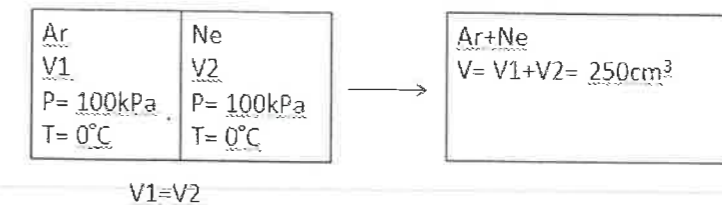
2. Below is a phase diagram of mixture of A and B at different temperatures. Please answer the following questions:



- (a) Which point has 3 phases present? () (5 分)
- (b) At **b**, what is the ratio of liquid:vapor? (:). Please use lines for your answer, ex: $\overline{mn} : \overline{pq}$ (5 分)

三、計算題 (共七十分)

1. The standard enthalpy for propene hydrogenation ($C_3H_6 + H_2 \rightarrow C_3H_8$) is $(-)$ 124 kJ/mol; the standard enthalpy for propane combustion ($C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$) is $(-)$ 2220 kJ/mol; and the standard enthalpy for H_2O formation ($H_2 + 1/2O_2 \rightarrow H_2O$) is $(-)$ 286 kJ/mol. Calculate the standard enthalpy of combustion of propene ($C_3H_6 + 9/2O_2 \rightarrow 3CO_2 + 3H_2O$). (10 分)
2. Two moles of perfect gas expands adiabatically (no heat exchange) from 50 cm^3 to 500 cm^3 as its temperature decreased from 130°C to 25°C . What is the total change of internal energy? (Heat capacity $C_v = 2.5R$, $R = \text{ideal gas constant}$) (10 分)
3. Five moles of perfect gas Ar expands at 20°C from 10 dm^3 to 30 dm^3 reversibly. Calculate the work done by the system. (10 分)
4. A container of volume of 250 cm^3 is divided into two compartments of equal size. In the left compartment there is argon at 100 kPa and 0°C ; in the right compartment there is neon at the same temperature and pressure. Calculate (a) the Gibbs energy of mixing and (b) the entropy of mixing when the partition is removed. Both are perfect gases. (20 分)



5. The rate constant of a reaction is $2.25 \times 10^{-2} \text{ dm}^3/\text{mol}\cdot\text{s}$ at 29°C , and the rate constant is $4.01 \times 10^{-2} \text{ dm}^3/\text{mol}\cdot\text{s}$ at 37°C . Evaluate the Arrhenius parameters (A and E_a) of the reaction. (20 分)