

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

- (1) Explain (a) state function, (b) exact differential and (c) cyclic rule. (10%)
- (2) What is the difference between equilibrium transformation and non-equilibrium transformation? (10%)
- (3) Derived the relationship between V_i, V_f, T_i, T_f for a reversible adiabatic expansion of ideal gas. (10%)
- (4) Please define Joule-Thompson coefficient, and derive $(\partial H / \partial P)_T = -C_p \mu_{j-t}$ (10%)
- (5) Derive the Maxwell relations: $(\frac{\partial P}{\partial T})_V = (\frac{\partial S}{\partial V})_T$ from A (Helmholtz energy) (10%)
- (6) Please define activity and activity coefficient in terms of P_i, P_i^* and x_i (10%)
- (7) Detail the steps in going from the clapeyron equation to the Clausis-Claperon equation. What specific assumptions are made? (10%)
- (8) Why do positive and negative deviation from Raoult's law occur? (10%)
- (9) The following phases are known to exist in a system at constant pressure:
Cordierite ($2\text{MgO} \cdot 2\text{Al}_2\text{O}_3 \cdot 5\text{SiO}_2$)
Mullite ($3\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$)
Forsterite ($2\text{MgO} \cdot \text{SiO}_2$)
Protoenstatite ($\text{MgO} \cdot \text{SiO}_2$)
Periclase (MgO)
 - (a) What are the components of the system?
 - (b) Could all of the above-listed phases coexist at equilibrium? Explain your answer (20%)