

※ 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 how an endothermic reaction can be spontaneous.
- (2) 請判斷當 A 欄狀況成立時，B 欄之參數值為  $>0$ ， $<0$ ，或  $=0$
- | A   | B                |
|---|------------------|
| a. Reversible process   | $\Delta S_{tot}$ |
| b. Equilibrium  | $\Delta S_{tot}$ |
| c. Irreversible process   | $\Delta S_{tot}$ |
| d. $Q(\text{reaction quotient}) > K(\text{equilibrium constant})$ | $\Delta G$       |
| e. $Q(\text{reaction quotient}) < K(\text{equilibrium constant})$ | $\Delta G$       |
- (3) What is the value of the equilibrium constant of a reaction for which  $\Delta G^0 = 0$  ?
- (4) Please explain (a) Exact Differential (b) Clausius Inequality.
- (5) What is: (a) isolate system, (b) extensive property, (c) state function, (d) Hess's law ?
- (6) Please discuss "reversible process" and its relationship with 'equilibrium'.
- (7) What is compression factor ? Please draw a plot for the relationship between compression factor and Pressure for real gas.
- (8) Please derive Gibbs-Duhem equation in detail
- (9) For a solid C in solvent A, Please derive in detail :  $\ln X_c = \Delta_{fus}H/R (1/T^* - 1/T)$  where  $X_c$  = solubility,  $T^*$  = melting point of C
- (10) Please define ideal-dilute solution
- 10 points for each**