

[註：每題 20 分；滿分 100 分]

1. What is the central concept of the second law of thermodynamics?
2. Describe the third law of thermodynamics and its role in the determination of entropy.
3. What is a thermodynamically reversible process? Why is this concept necessary in thermodynamics?
4. Describe the quasi-chemical approach for the thermodynamic study of solid solutions? What are the advantages and disadvantages of this approach?
5. From the e.m.f. measurements at 527°C, the following values of the activity coefficient of cadmium in zinc-cadmium solutions have been obtained:

$$x_{\text{Cd}} : \quad \underline{0.2} \quad \underline{0.3} \quad \underline{0.4} \quad \underline{0.5}$$

$$\gamma_{\text{Cd}} : \quad 2.153 \quad 1.817 \quad 1.544 \quad 1.352$$

- (i) Determine whether the Zn-Cd solution exhibits regular behavior.
- (ii) Calculate the values of molar heat of mixing, molar entropy of mixing and molar free energy of mixing for an equiatomic (1:1) solution of Zn-Cd, assuming regular behavior at 527°C.