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科目：材料熱力學
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國立臺灣大學 111 學年度碩士班招生考試試題

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1. Draw (a) V – T diagram, (b) enthalpy, H – T diagram, (c) chemical potential, μ – T diagram, (d) entropy, S – T diagram, and (e) heat capacity, C_p – T diagram, accompanying first-order transition. **(15 %)**

2. For 1 mol ideal gas, $pV = RT$
a) Draw p – V diagram at T = T_1, $2T_1$, $3T_1$ **(5 %)**
b) Draw V – T diagram at p = p_1, $2p_1$, $3p_1$ **(5 %)**
c) Draw p – T diagram at v = v_1, $2v_1$, $3v_1$ **(5 %)**

3. Please explain why specific heat capacity at constant pressure (C_p) is larger than specific heat capacity at constant volume (C_v)? **(10 %)** For ideal gas, what is $C_p - C_v$? **(5 %)**

4. For van der Waals Equation:

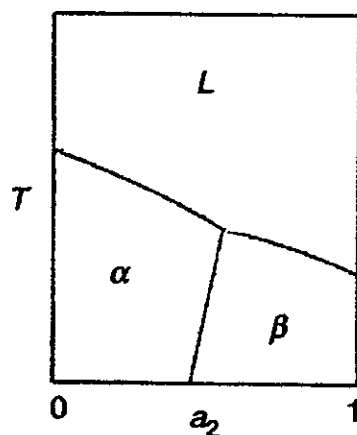$$p = \frac{RT}{V_m - b} - \frac{a}{V_m^2}$$

a) What is the physical meaning of constants a and b? **(10 %)**
b) At critical point, what is T_c, V_c, p_c in terms of a and b **(15 %)**
c) What is critical compression factor, Z_c? **(5 %)**

5. What is the definition of partial molar property **(5%)**? What is the definition of chemical potential? **(5%)** Why the chemical potential is partial molar Gibbs free energy but not partial molar inner energy or partial molar enthalpy? **(5%)**

6. Convert the phase diagram from (T, a_2) space as shown below to (T, X_2) space. **(10 %)**

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