國立聯合大學 106 學年度

暑假轉學生招生考試試題紙

科目：物理化學第 1 頁共 1 頁

1. For thermodynamic systems, please describe the difference between open system, closed system and isolated system.(15 分)
2. 2.00 mol of an ideal gas undergoes isothermal reversible expansion from P = 25.0 bar and V =4.50 L to P = 4.50 bar, Calculate the work of this process. (10 分)
3. 2.00 mol of an ideal gas for which C_V= 20.79 J mol^{-1} K^{-1} expand from P = 25.0 bar and T = 400 K against a constant external pressure of 4.50 bar to P = 5.0 bar and T = 300 K. Calculate the work, the heat, the internal energy change, the enthalpy change and the entropy change of this process. (20 分)
4. At 298.15 K, ΔG°=131.1 kJ $mol^{-1}$for the following reaction.

   $$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$$

   Calculate Kp of the reaction at 298.15 K. (10 分)
5. Write down the van der Waals equation of state. (15 分)
6. An ideal solution is made from 5 mol of benzene(1) and 3.25 mol of toluene(2). At 298 K, the vapor pressure of the pure substances are P_1=96.4 Tor and P_2=28.9 Tor. What is the pressure of system when vapor and liquid reaches equilibrium at 298 K. (15 分)
7. Calculate $E^\circ$for the half-cell reaction $Fe^{3+}(aq) + 3e^- \rightarrow Fe(s)$. You are given the following reduction reactions and E°value:

   $Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$ $E^\circ = +0.771$ V

   $Fe^{2+}(aq) + 2e^- \rightarrow Fe(s)$ $E^\circ = -0.447$ V (15 分)