

# 淡江大學 103 學年度日間部轉學生招生考試試題

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系別：化學工程與材料工程學系三年級 科目：物理化學

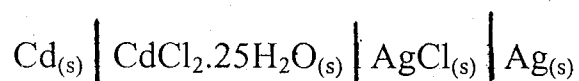
考試日期：7月20日(星期日) 第3節

本試題共 五 大題， 一 頁

**\*\*Twenty points for each of the five problems.\*\***

1. One mole of ideal gas initially at 27°C is compressed adiabatically from 6 dm<sup>3</sup> to 3 dm<sup>3</sup> against constant external pressure of 15 atm. Calculate  $\Delta E$ ,  $\Delta H$ ,  $Q$ , and  $W$  for this process. (Note: The heat capacity at constant volume is 20.91 Jmol<sup>-1</sup>K<sup>-1</sup>. 1 atm = 101.325 kPa, 0°C = 273 K.)
2. Show that entropy change in a binary mixture for isothermal process is maximum when  $x_1 = x_2 = 0.5$ , where  $x_i$  is the mole fraction of component  $i$ .
3. Half-life for disintegration of radium is 1590 years. Calculate the rate constant in s<sup>-1</sup>. Also, how many years will be taken for the disintegration of 80 % ? (Hint: First-order reaction.)

4. Consider the cell



The emf of the cell at 15°C is 0.67531 V and the temperature coefficient of emf is  $-0.00065 \text{ V K}^{-1}$ . Calculate the value of  $\Delta H$  at 15°C and heat flow if the process is carried reversibly.  
[ The cell reaction is:  $\text{Cd}_{(s)} + 2\text{AgCl}_{(s)} \rightarrow \text{CdCl}_2_{(s)} + 2\text{Ag}_{(s)}$  ]

5. (1) Calculate the change of free energy for an isothermal reversible expansion process if the pressure of one mole of ideal gas drops from 100 atm to 20 atm at 25°C.  
(2) Calculate the  $\Delta G$  if the expansion is carried against a constant pressure of 2 atm. Other conditions remain the same as in (1).