

大同大學 90 學年度 轉學考試 試題

考試科目：化學 系別：化學工程系 級別：二年級 第 1 頁，共 1 頁

註：本次考試不可以參考自己的書籍及筆記；不可以使用字典；可以使用計算器

1. Define the following terms: (24%)
(a) electron affinity (b) standard enthalpy of formation (c) Tyndall effect
(d) common-ion effect (e) Le Chatelier's principle (f) hydrolysis
2. State Hess's Law. Why is it important to thermochemistry? (8%)
3. A sample of 1.50 g of Lead(II) nitrate is mixed with 125 mL of 0.100 M sodium sulfate solution.
(a) Write the chemical equation for the reaction that occurs. (b) What is the limiting reactant in the reaction? (c) What are the concentrations of all ions that remain in solution after the reaction is complete? (12%) (molecular mass: Pb: 207.2; Na: 22.990)
4. What is the difference between : (a) a monoprotic acid and a diprotic acid; (b) a weak acid and a strong acid; (c) an acid and a base? (9%)
5. (a) What is meant by the term *covalent bond*? (b) How is the bonding in Cl_2 different from that in NaCl ? (8%)
6. (a) State the kinetic-molecular theory. (b) Explain the Boyle's law, Charles' law by kinetic-molecular theory. (12%)
7. The following mechanism has been proposed for the reaction $2 \text{NO}_{(g)} + \text{Cl}_{2(g)} \rightarrow 2 \text{NOCl}_{(g)}$:
$$\text{NO}_{(g)} + \text{Cl}_{2(g)} \rightarrow \text{NOCl}_{2(g)}$$
$$\text{NOCl}_{2(g)} + \text{NO}_{(g)} \rightarrow 2 \text{NOCl}_{(g)}$$

(a) What would the rate law be if the first step were rate determining? (2%) (b) What would the rate law be if the second step were rate determining? (5%)
8. For the equilibrium $\text{PH}_3\text{BCl}_3(s) = \text{PH}_3(g) + \text{BCl}_3(g)$, $K_p = 0.052$ at 60°C . (a) Calculate K_c . (b) Some solid PH_3BCl_3 is added to a closed 2.00-L vessel at 60°C ; the vessel is then charged with 0.0256 mol of $\text{BCl}_3(g)$, what is the equilibrium concentration of PH_3 ? (10%)
(Gas constant $R = 0.08206 \text{ Liter} \cdot \text{atm} / \text{mol} \cdot \text{K}$)
9. A buffer solution contains 0.13 mol of acetic acid and 0.10 mol of sodium acetate in 1.00 L. (a) What is the pH of this buffer? (b) What is the pH of the buffer after the addition of 0.02 mol of KOH ? (c) What is the pH of the buffer after the addition of 0.02 mol of HNO_3 . (12%)
(CH_3COOH : $K_a = 1.8 \times 10^{-5}$)