大同大學 101 學年度轉學入學考試試題

考試科目:普通化學　　所別:化學工程學系　　

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. Give the symbol, including the correct charge for each of the following ions: (10%)
   (a) sodium ion (b) sulfate ion (c) ammonium ion (d) perchlorate ion (e) hydrogen carbonate ion.

2. Define the following terms: (24%)
   (a) valence electron (b) dynamic equilibrium (c) buffer solution (d) common ion effect (e) standard enthalpy of formation (f) Le Chatelier's principle

3. State Hess's Law. Why is it important to thermochemistry? (8%)

4. 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? (molecular mass: Pb: 207.2; Na: 22.990) (12%)

5. What is the difference between：(a) a monoprotic acid and a diprotic acid; (b) a weak acid and a strong acid; (c) and acid and a base? (12%)

6. (a) State the kinetic-molecular theory. (b) Explain the Boyle's law, Charles' law by kinetic-molecular theory. (12%)

7. 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.
   (CH_3COOH: $K_a = 1.8 \times 10^{-5}$) (12%)

8. The following mechanism has been proposed for the reaction $2\,NO(g) + Cl_2(g) \rightarrow 2\,NOCl(g)$:
   $NO(g) + Cl_2(g) \rightarrow NOCl_2(g)$
   $NOCl_2(g) + NO(g) \rightarrow 2\,NOCl(g)$
   (a) What would the rate law be if the first step were rate determining? (3%)
   (b) What would the rate law be if the second step were rate determining? (7%)