國立交通大學 101 學年度碩士班考試入學試題

科目：普通化學(3193)　　考試日期:101 年 2 月 16 日 第 3 節

系所班別：環境工程研究所　　組別：環工所乙組　　第 1 頁,共 2 頁

【可使用計算機】＊作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符！！

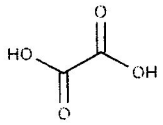
1. Define the following terms and give an example for each of them. (30 %)
(a) Electronegativity
(b) Dipole moment
(c) Coordinate covalent bond
(d) Conjugate acid-base pair
(e) sp^2 hybridization.
(f) Semiconductor
(g) Like-dissolve-like

2. Define and write the expression of K_a, K_b, K_{sp}, and K_f for certain reactions. (10 %)

3. Explain the principle of mass spectrometry for the identification of organic compounds. (10 %)

4. Sodium vapor lamps emit 589-nm yellow light. How much energy is emitted by (a) an excited sodium atom when it generates a photon, (b) 5.00 mg of sodium atoms at this wavelength? (10 %) Plank constant: 6.626×10^{-34} J-s

5. Explain S_N1 and S_N2 mechanism. (5%) Which of the following may function as nucleophiles in a nuncleophilic substitution reaction? (a) NH_3; (b)CO_2; (c) Br^-; (d) SiH_4. (5 %)

6. Which of the following ligands may be polydentate? If the ligand can be polydentate, give the maximum number of places on the ligand that can bind simultaneously to a single metal center. (a) $HN(CH_2CH_2NH_2)_2$; (b) CO_3^{2-}; (c) H_2O; (d) 

. (10 %)

7. Determine the number of valence electrons present in the following metal ions: (a) Ti^{3+}; (b) Fe^{2+}; (c) Mn^{2+}; (d) V^{2+}; (e) Cr^{3+}. (10 %)

8. Calculate the reaction enthalpy for the synthesis of hydrogen chloride gas, $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_g$, from the following data: (10 %)

$NH_{3(g)} + HCl_{(g)} \rightarrow NH_4Cl_{(s)}$　$\Delta H^0 = -176.0$ kJ

$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$　$\Delta H^0 = -92.22$ kJ

$N_{2(g)} + 4H_{2(g)} + Cl_{2(g)} \rightarrow 2NH_4Cl_{(s)}$　$\Delta H^0 = -628.86$ kJ