

國立交通大學 103 學年度碩士班考試入學試題

科目：普通化學(3193)

考試日期：103 年 2 月 14 日 第 3 節

系所班別：環境工程研究所

組別：環工所乙組

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【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. (a) Define radicals. (b) Give the Lewis structure for OH radicals. (c) Why radicals are active? (15%)
2. Phenolphthalein, $pK_a = 9.7$, is frequently used as an indicator in titration. It shows colorless in acidic solution, and turns pink in basic solution. (a) Write a K_a equilibrium expression for the indicator (InH). (b) Write an equation to express the pK_a upon pH. (c) In what pH range Phenolphthalein changes its color? Explain your reason. (15%)
3. (a) Draw the Lewis structures for NO_2^- and NO_3^- , respectively. (5%) (b) Which has greater bond strength? Explain. (5%)
4. Explain the difference between the following pairs of terms. (15%)
 - (a) electronegativity and electron affinity
 - (b) covalent bond and polar covalent bond
 - (c) ionic bond and chelating bond
5. The rate constant (k) is dependent on which of the following (there may be more than one answer)? Explain your answer. (8%)
 - (a) the concentration of the reactant
 - (b) the nature of the reactant
 - (c) the temperature
 - (d) the order of the reaction
6. Define each of the following term and give one example for each term. (a) ligand, (b) bidentate, (c) chelate, (d) complex ion. (16%)
7. The carbonate ion, CO_3^{2-} , can act as either a monodentate or a bidentate ligand. Draw a picture of CO_3^{2-} coordinating to a metal ion as a bidentate and as a monodentate ligand. The carbonate ion can also act as a bridge between two metal ions. Draw a picture of a CO_3^{2-} ion bridging between two metal ions. (6%)
8. Draw the chemical structures for certain organic compounds that are identified as carboxylic acid, ester, ketone, aldehyde, and amine. (10%)
9. Define n-type and p-type semiconductor. (5%)