

國立交通大學 102 學年度碩士班考試入學試題

科目：普通化學(3193)

考試日期：102 年 2 月 3 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. Define the following terms and give examples: (40 %)
 - (a) Fluorescence
 - (b) Ligand
 - (c) Chromatography
 - (d) Buffer solution
 - (e) Buffer capacity
 - (f) Isotope
 - (g) Kinetically controlled reaction
 - (h) Heterogeneous catalysis
 - (i) Lewis acid
 - (j) Coordination number
2. A buffer is made using 45.0 mL of 0.75 M $\text{HC}_3\text{H}_5\text{O}_2$ ($K_a = 1.3 \times 10^{-5}$) and 55.0 mL of 0.70 M $\text{NaC}_3\text{H}_5\text{O}_2$. What volume of 0.10 M NaOH must be added to change the pH of the buffer solution by 2.5 %? (10 %)
3. What are the differences between the single-beam and the double-beam instrument for absorbance measurements? (10 %)
4. Consider three identical flasks filled with different gases. Flask A: CO at 760 torr and 0 °C. Flask B: N_2 at 250 torr and 0 °C. Flask C: H_2 at 100 torr and 0 °C. (a) In which flask will the molecules have the greatest average kinetic energy? What value is the average kinetic energy? $K_B: 1.38 \times 10^{-23} \text{ J/K}$ (5%) (b) Which flask will have the greatest number of collision per second with the wall of the container? Explain your reason. (5%) (c) In which flask will the molecules have the greatest average velocity? Explain your reason. (5%) Atomic masses for C, N, and O are 12, 14, and 16, respectively.
5. Is the following statement true or false? "Reactions with large equilibrium constants are very fast". Explain your answer. (5 %)
6. Explain why salts can be acidic, basic, or neutral, and give examples. (12 %)
7. Explain the differences between the following pairs of terms. (a) electro-negativity and electron affinity. (b) polar covalent bond and ionic bond. (8 %)