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國立臺北科技大學

九十四學年度有機高分子研究所入學考試

分析化學試題

填准考證號碼

注意事項：

1. 本試題共 10 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. Calculate the volume of 0.05M EDTA needed to titrate (10 points)
   (a) 26.37mL of 0.0741M $Mg(NO_3)_2$
   (b)the Ca in a 0.4397g mineral specimen that is 81.4% brushite, $CaHPO_4 \cdot 2H_2O$ (172.09g/mol)

2. What is the pH of a solution that is (10 points)
   (a) 0.055M in acetic acid and 0.011M in sodium acetate?
   ($K_a = 1.75 \times 10^{-5}$ for acetic acid)
   (b) prepared by dissolving 3g of salicylic acid, $C_6H_4(OH)COOH$ (138.12g/mol), in 50 mL of 0.113M NaOH and diluting to 500mL?
   ($K_a = 1.06 \times 10^{-3}$ for salicylic acid)

3. Explain the difference between (10 points)
   (a) constant and proportional error
   (b) mean and median

4. Describe the mechanism of the production of an MNN Auger electron. (10 points)

5. Calculate the resolution (Mass Spectrum) required to resolve peaks for (10 points)
   (a)CH_2N^+ (MW=28.0187) and N_2^+(MW=28.0061)
   (b)$C_2H_4^+$(MW=28.0313) and CO^+(MW=27.9949)

6. Define (a) resonance fluorescence (b) molar absorptivity. (10 points)

7. Calculate the potential required to initiate deposition of copper from a solution that is 0.01M in $CuSO_4$ and contains sufficient H_2SO_4 to give a pH of 4.00 (10 points)

$$O_{2(g)} + 4H^+ + 4e^- \rightleftharpoons 2H_2O \quad E^0 = +1.229V$$
$$Cu^{2+} + 2e^- \rightleftharpoons Cu_{(s)} \quad E^0 = +0.337V$$

8. Define (a) normal phase packing (b) eluent-suppressor column, in liquid chromatography. (10 points)

9. The infrared spectrum of CO shows a vibrational absorption peak at 2170cm^{-1} (10 points)
   (a)What is force constant for the CO bond?
   (b) At what wavenumber would the corresponding peak for ^{14}CO occur?

10. Deduce the structure of compound C_4H_8O from the 300MHz ^1H spectrum and assign all ^1H signals. (10 points)