

國立彰化師範大學103學年度碩士班招生考試試題

系所： 化學系

科目： 無機化學與分析化學

☆☆請在答案紙上作答☆☆

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I. 無機化學(50%)

1. For the allene molecule (molecular formula: C_3H_4 , not cyclic molecule): (a) draw the Lewis structure, (b) Are all hydrogen atoms in the same plane? If not, what is their spatial relationship? Explain. (10%)
2. Draw all geometrical isomers of $Pt(CN)_2Br_2(H_2O)_2$. Which of these isomers has an optical isomer? Draw the various optical isomers. (10%)
3. Draw the Lewis structures and determine the point groups of the following molecules and ions: (a) XeF_4 (b) SF_4 (c) IOF_3 (12%)
4. The complex ion $NiCl_4^{2-}$ has two unpaired electrons, whereas $Ni(CN)_4^{2-}$ is diamagnetic. Propose structures for these two complex ions. Explain. (10%)
5. For the two compounds, $Cr(CO)_5(PF_3)$ and $Cr(CO)_5(PCl_3)$, which would you expect to have (a) the stronger C-O bonds? (b) the higher energy Cr-C stretching bands in the infrared spectrum? Explain. (8%)

II. 分析化學(50%)

1. Draw a Gaussian chromatogram, and show t_r , h , $1/2 h$, w and $w_{1/2}$ on the peak. (15%)
2. Which column is more efficient: plate height (H) = 0.5 mm or 5 mm? (5%)
3. The solubility-product constant for K_2PdCl_6 is 6.0×10^{-6} . What is the K^+ concentration of a solution prepared by mixing 50.0 mL of 0.4 M KCl with 50.0 mL of (a) 0.2 M $PdCl_6^{2-}$? (b) 0.4 M $PdCl_6^{2-}$? (10%)
4. What mass of sodium formate must be added to 300.0 mL of 0.6 M formic acid to produce a buffer solution that has a pH of 3.80? (K_a of HCOOH is 1.80×10^{-4}). (10%)
5. Calculate the ionic strength of a solution that is: (10%)
 - (a) 0.9 M in $(NH_4)_2CrO_4$
 - (b) 0.03 M in $FeCl_3$ and 0.05 M in $FeCl_2$