

# 國立彰化師範大學 97 學年度碩士班招生考試試題

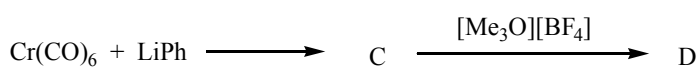
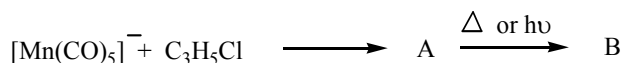
系所： 化學系碩士班

科目： 無機化學與分析化學

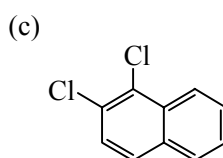
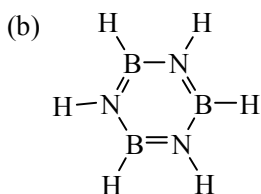
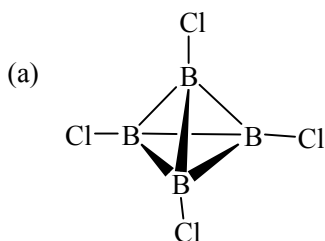
☆☆請在答案紙上作答☆☆

共 2 頁，第 1 頁

1. Describe the metal/NO bonding structure using ionic model and covalent model (10%)
2. Predict the possible products of the following reactions (8%)



3. Determine the point group of the following compounds (9%)



4. Carbon monoxide has larger bond dissociation energy ( $1072 \text{ kJ mol}^{-1}$ ) than molecular dinitrogen ( $945 \text{ kJ mol}^{-1}$ ). Suggest an explanation. (5%)
5. The  $\text{I}_2$  vapor is purple while the  $\text{I}_2$  color changes in different solvent. For example, the  $\text{I}_2$  is purple in hexane, red-violet in benzene, and yellow-brown in methanol. Please give an explanation. (10 %)
6. Please construct the molecular orbitals, give the bond order and the number of unpaired electrons for  $\text{C}_2^+$  and  $\text{O}_2^+$ . (8%)
7. What is the order of elution of the following compounds from a normal-phase packed HPLC column?
  - (a) propionic acid, ethanol, diethyl ether (3%)
  - (b) pentane, 2-pentene, 1-Bromo-2-pentene (3%)
8. Analytes A and B are separated by a reverse-phase partition HPLC column, The retention times are 15.5 and 25.5 min for analytes A and B, respectively, and the retention time is 1.5 min for an unretained species. Calculate (a)  $k$  (retention factor) and (b)  $\alpha$  (selectivity factor) for analytes A and B. (16%)

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9. The ion sources for molecular mass spectrometry include gas phase and desorption phase. Give one example for each phase. (6%)
10. Medicine X in a 1.0 g tablet was dissolved in 0.1 M HCl to give 1.0 L sample solution. The fluorescence intensity for the sample solution at 525 nm gives a reading of 280. A standard solution (0.05 mg/ml) of Medicine X gives a reading of 450 when measured under conditions identical to the sample solution. Calculate the mass of Medicine X in the tablet. (10%)
11. Balance the following equations:
- (a)  $\text{MnO}_4^- + \text{H}_2\text{C}_2\text{O}_4 + \text{H}^+ \leftrightarrow \text{Mn}^{2+} + \text{CO}_{2(\text{g})} + \text{H}_2\text{O}$  (6%)
- (b)  $\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{2+} + \text{H}^+ \leftrightarrow \text{Cr}^{3+} + \text{Fe}^{3+} + \text{H}_2\text{O}$  (6%)