

# 國立臺灣師範大學 108 學年度碩士班招生考試試題

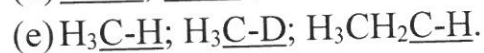
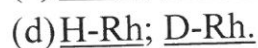
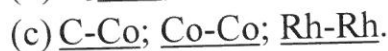
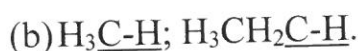
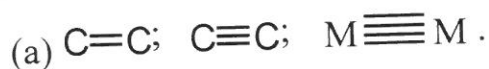
科目：無機化學

適用系所：化學系

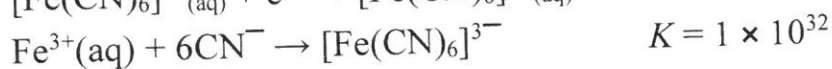
注意：1. 本試題共 2 頁，請依序在答案卷上作答，並標明題號，不必抄題。2. 答案必須寫在指定作答區內，否則依規定扣分。

1. List all five atomic properties. If the property is a value, give one example with value. If the property describe reaction, write down the definition by reaction equation. (15 points)

2. Rearrange the following compounds by increasing bond enthalpy and briefly state your reason. (15 points)



3. Given the following information, calculate the formation constant for  $[\text{Fe}(\text{CN})_6]^{4-}$ . (10 points)



4. Arrange the following orbitals according to increasing in energy: (10 points)

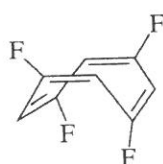
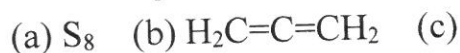
3p, 3d, 2s, 4p, 4s, 4f, 5p, 5d

(a) for H;

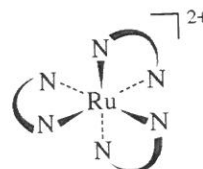
(b) for Gold (Au).

5. Draw the molecular structure of  $\text{Ni}(\text{CO})_4$  and  $(\eta^3\text{-C}_5\text{H}_5)(\eta^5\text{-C}_5\text{H}_5)\text{Fe}(\text{CO})$ . (10 points)

6. Name the point group of the following compounds. (20 points)



(d)



7. Determine the valence electron counts around the transition metal in the following complexes. (a)  $\text{V}(\text{CO})_6$  (b)  $(\eta^3\text{-C}_3\text{H}_5)_2\text{Ni}$  (10 points)

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8. (a) Write down the number of the unpaired electron(s) that  $[\text{Co}(\text{CO})_6](\text{OTf})_2$  possesses, and (b) explain your answer in detail using the molecular orbital diagram of the complex. (10 points)