

淡江大學 99 學年度碩士班招生考試試題

系別：化學學系(化學組)

科目：無機化學

本試題共 1 頁, 1 大題

一.按照題目順序作答 二.詳細說明推論過程 三.每題二十分

1. (a) What is the electronic configuration of Cr ($Z = 24$) and Cr^{2+} ion? Give your reasons. (b) Derive the complete term symbol(s) for a d^2 configuration.
2. (a) Arrange the following substances according to their expected melting point in the order from lowest to highest. ScN, KBr, MgO, NaF, CaO. Give your reasons. (b) Arrange the following molecules, F_2 , Cl_2 , Br_2 and I_2 , in the order of increasing bond strength. Explain your results.
3. (a) Draw the fully labeled molecular orbital energy level diagram for CO and fill in the electrons. (b) HOMO and LUMO of CO can be used to bond to d orbital of Ru(II) ion forming a very strong Ru-C bond. Draw the molecular orbital shape of σ -bond and π -bond between Fe-CO. Assign the nodal plane and note + or - sign on the orbital.
4. (a) Predict the molecular geometries of each of the followings: IF_4^+ , $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{PdCl}_4]^{2-}$, and $[\text{Os}_6(\text{CO})_{18}]$ (b) Give a real example for each of the following reactions: i) β -elimination ii) cyclometallation iii) oxidative addition iv) 1,2-insertion
5. (a) Construct an Orgel diagram and predict the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]\text{Cl}_2$ in water. How many d-d bands would you expect to find for this complex? (b) Describe and give a real example for the inner-sphere and outer-sphere electron transfer reaction in coordination complexes.