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淡江大學 103 學年度碩士班招生考試試題

系列：化學學系

科目：無機化學

考試日期：3月2日(星期日) 第3節

本試題共 五 大題， 壹 頁

按照題目順序作答；每題 20 分；需寫出詳細的推理過程，不可只有答案

1. Predict the geometrical structure and sketch the shapes of the following species: XeF_4 , $\text{Ni}(\text{CO})_4$, $[\text{Cu}(\text{CH}_3\text{CN})_4]^+$, $[\text{Ni}(\text{CN})_4]^{2-}$, $\text{Ru}_6(\text{CO})_{18}$
2. a) Show diagrammatically the splitting of d orbital energy level in a square planar, a tetrahedral and a tetragonal field. b) Predict the UV-Vis spectrum of $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ in an aqueous solution. Explain these observations.
3. a) Give an example and explanation of the inner-sphere electron transfer reaction for a coordination complex. b) Give an example and explanation of the alkyl migration and reductive elimination in organometallic chemistry.
4. a) Assign the point group with symmetry elements for the following molecules: *trans*- $\text{ClHC}=\text{CHCl}$; *cis*- $[\text{CoCl}_2(\text{H}_2\text{O})_4]$. b) Give a molecular orbital description of bonding in H_2O by using the group theory.
5. a) What intramolecular and intermolecular chemical forces exist in molecules and materials? Give your comments. b) Compare the acidity strength in the following couple: H_3PO_4 , and H_3PO_3 ; HI and HBr .

C_{2v}	E	C_2	σ_v	σ_v'
A_1	1	1	1	1
A_2	1	1	-1	-1
B_1	1	-1	1	-1
B_2	1	-1	-1	1