

淡江大學 101 學年度碩士班招生考試試題

系別：化學學系

科目：無機化學

考試日期：2月26日(星期日) 第3節

本試題共五大題，壹頁

1. 按照題目順序作答. 2. 每題 20 分. 3. 需寫出詳細的推理過程，不可只有答案.

1. a) Predict the electronic spectrum of $(\text{NH}_4)\text{V}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ in an aqueous solution. Explain these observations. b) Predict the spin-only magnetic moment of this complex.
2. Show diagrammatically the splitting of d orbital, energy-wise, in (a) square pyramidal (b) tetrahedral and (c) square planar fields. Would the following species to be expected to be a Jahn-Teller distorted structure? (d) $[\text{CoF}_6]^{3-}$ (e) $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$
3. Describe the bonding and characteristics of a) Fischer carbene and b) Schrock carbene. Give a real example and explanation of the following reactions: c) α abstraction d) β elimination e) methyl migration f) oxidative addition.
4. Assign the point group for the following molecules. (a) ferrocene (b) $\text{B}(\text{OH})_3$ (c) *cis*- $[\text{FeCl}_2(\text{H}_2\text{O})_4]$. d) Using the group theory give an MO description of bonding in NH_3 and draw qualitative energy level diagram..
5. Give Lewis structures and sketch the shapes of the following.
a) IF_3 b) NO_2^+ c) SF_4 .
d) What intramolecular and intermolecular chemical forces exist in each species: H_2O , CaO , SiO_2 , CO_2 ? e) List the following in order of increasing boiling point: H_2O , Xe , LiO_2 , CaO , SiO_2 , CO_2 .

C_{3v}	E	$2C_3$	$3\sigma_v$	
A_1	1	1	1	z
A_2	1	1	-1	
E	2	-1	0	(x,y)