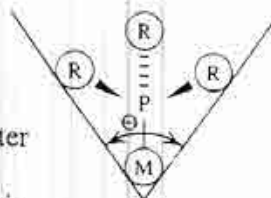


(本試題共 2 頁，第 1 頁)

考生注意：1. 依次序作答，只要標明題號，不必抄題。  
2. 答案必須寫在答案卷上，否則不予計分。  
3. 試題隨卷繳回。

1. 簡答題：(20 分，專有名詞限以英文作答。)

- What is the Pauli Exclusion Principle?
- $\theta$  in the figure on the right is known as the \_\_\_\_\_ angle.
- LFSE stands for \_\_\_\_\_.
- The reverse of **oxidative addition** is the \_\_\_\_\_ reaction.
- Henry Taube called complexes having substitution half-life shorter than 30 sec \_\_\_\_\_ and called those with longer half-life **inert**.
- If a possible transition does not fit selection rules, this transition is said to be \_\_\_\_\_.



2. What is the point group of the following molecules? (10 分)

- $\text{H}_2$
- $\text{CO}_3^{2-}$
- $\text{CCl}_4$
- $\text{CHCl}_3$
- $\text{CH}_2\text{Cl}_2$

3. Identify the number of microstates and the ground state of the (a).  $p^4$  (b).  $f^3$  electronic configuration. (10 分)

4. 試畫出  $\text{O}_2$  的定性 MO 能階圖。 (20 分)

$D_{\infty h}$	$E$	$2C_2$	$\dots$	$\infty C_2$	$I$	$2S_6$	$\dots$	$\infty C_2$		
$\Sigma_g^+$	1	1	$\dots$	1	1	1	$\dots$	1	$R_z$ ( $R_x, R_y$ )	$x^2 + y^2, z^2$
$\Sigma_g^-$	1	1	$\dots$	-1	1	1	$\dots$	-1		
$\Pi_g$	2	$2 \cos \phi$	$\dots$	0	2	$-2 \cos \phi$	$\dots$	0		$(xz, yz)$
$\Delta_g$	2	$2 \cos 2\phi$	$\dots$	0	2	$2 \cos 2\phi$	$\dots$	0		$(x^2 - y^2, xy)$
$\dots$	$\dots$	$\dots$	$\dots$	$\dots$	$\dots$	$\dots$	$\dots$	$\dots$		
$\Sigma_u^+$	1	1	$\dots$	1	-1	-1	$\dots$	-1	$z$ ( $x, y$ )	
$\Sigma_u^-$	1	1	$\dots$	-1	-1	-1	$\dots$	1		
$\Pi_u$	2	$2 \cos \phi$	$\dots$	0	-2	$2 \cos \phi$	$\dots$	0		
$\Delta_u$	2	$2 \cos 2\phi$	$\dots$	0	-2	$-2 \cos 2\phi$	$\dots$	0		
$\Phi_u$	2	$2 \cos 3\phi$	$\dots$	0	-2	$2 \cos 3\phi$	$\dots$	0		
$\dots$	$\dots$	$\dots$	$\dots$	$\dots$	$\dots$	$\dots$	$\dots$	$\dots$		

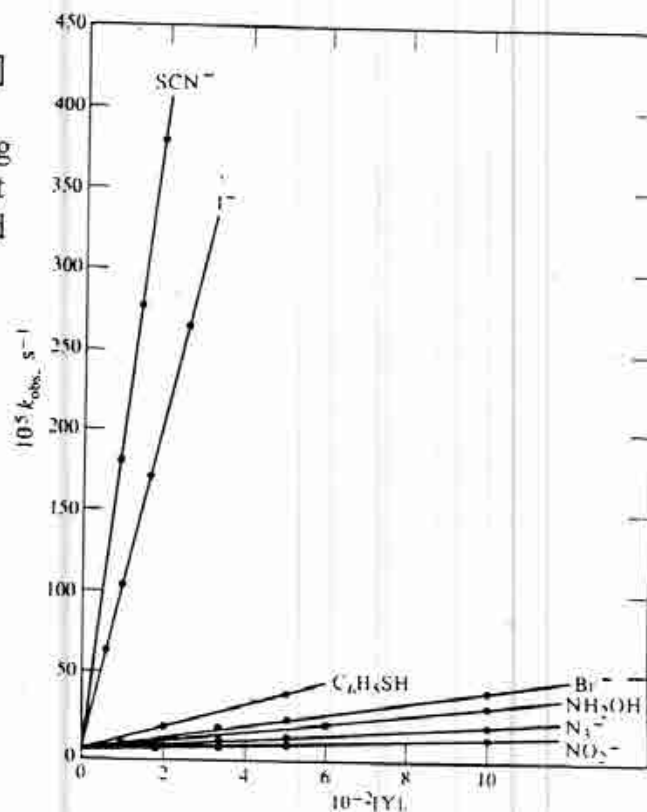
5. Fill out the missing representation. (10 分)

$C_{2v}$	$E$	$C_2$	$\sigma_v(xz)$	$\sigma_v'(yz)$		
$A_1$	1	1	1	1	$z$	$x^2, y^2, z^2$
$A_2$	1	1	-1	-1	$R_z$	$xy$
$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$x, R_y$	$xz$
$B_2$	1	-1	-1	1	$y, R_x$	$yz$

(本試題共 2 頁, 第 2 頁)

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6. Figure on the right shows reaction rates of  $\text{trans-[PtCl}_2\text{Py}_2]$  at  $30^\circ\text{C}$  in methanol as function of  $[\text{Y}]$ , Y represents the incoming nucleophile. This plot shows that  $k_{\text{obs}} = k_1 + k_2 [\text{Y}]$ . What do  $k_1$  and  $k_2$  represent? (10 分)



Rates of reaction of  $\text{trans-[PtCl}_2\text{Py}_2]$  at  $30^\circ\text{C}$  in methanol as a function of concentration of incoming nucleophile.

7. Name the following compounds according to the IUPAC rules: (20 分)

- $[\text{Cr}(\text{NH}_3)_6]\text{Cl}_3$
- $[\text{CrCl}_2(\text{NH}_3)_4]\text{Cl}$
- $\text{K}_2[\text{Co}(\text{N}_3)_4]$
- $\text{Li}[\text{AlH}_4]$  (非 lithium aluminum hydride)
- $[\text{Pd}(\text{PPh}_3)_4]$  (Ph: 苯)