3d'4p'

$l_1 = 2 \quad l_2 = 1$

$(\uparrow - - - - -)\ (\uparrow - -)$

d' p'

$|l_1 - l_2| \leq L \leq l_1 + l_2$

$|2-1| \leq L \leq 2+1$

$1 \leq L \leq 3 \Rightarrow$ P, D, and F terms

$0 \leq S \leq 1$

eg. $\alpha\beta \quad \alpha\alpha$

For S=0: ^1P, ^1D and ^1F

For S=1: ^3P, ^3D and ^3F

---

ns n'p

$l_1 = 0 \quad l_2 = 1$

$(\uparrow)\ (\uparrow - -)$

s' p'

$|l_1 - l_2| \leq L \leq l_1 + L_2$

$|0-1| \leq L \leq 1$

$L = 1 \Rightarrow P$

$0 \leq S \leq 1 \Rightarrow {}^1P$

$\{{}^3P\}$ ← this is lower in energy by Hund's rules

$ns^2 n'd^2$

$(\uparrow\downarrow)\ (\uparrow\uparrow - - -)$

s d $\quad 2 \ 1 \ 0 \ -1 \ -2$

$l_1 = 0 \qquad 2+1 = 3$

$|0-3| \leq L \leq 3$

$L = 3 \Rightarrow F$

$0 \leq S \leq 2(\frac{1}{2})$

For S=0: ^1F

For S=1: $\{{}^3F\}$

$ns^2 nd^3$

$(\uparrow\downarrow)\ (\uparrow\uparrow\uparrow - -)$

s $\quad +2 \ +1 \ 0 \ -1 \ -2$

$l_1 = 0 \qquad 2+1 = 3$

$|0-3| \leq L \leq 3$

$L = 3 \Rightarrow F$

$0 \leq S \leq 3(1/2)$

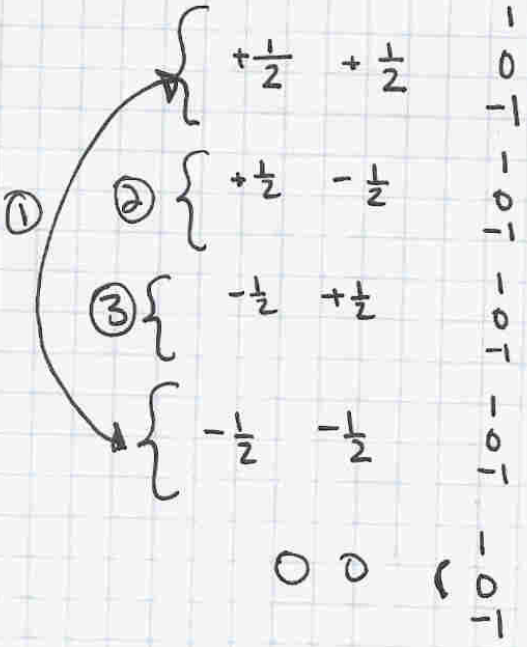
$0 \leq S \leq 3/2 \Rightarrow$

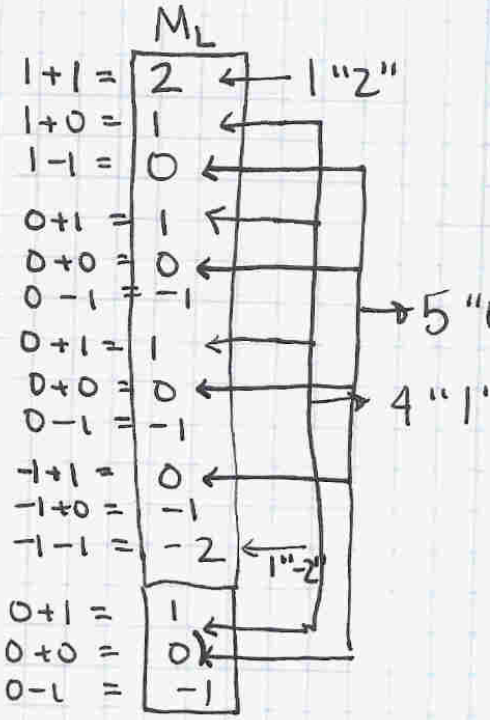
Spin. multip

$2S+1 = \begin{cases} 1 \\ 2 \\ 4 \end{cases}$

Ground State Term Symbol: ^4F

np^2





M_L	-2	-1	0	1	2
#	1	4	5	4	1
) Subtract L=2	0	3	4	3	0
② L=+1	0	2	3	2	0
③ L=1	0	1	2	1	0
④ L=1	0	0	1	0	0

$-(-2,-1,0,1,2)$ ⓪
$-(-1,0,1,2)$ ①
$-(-1,0,1)$ ③
$-(-1,0,1)$ ④

p^1

M_S	M_L
$+\frac{1}{2}$	1
$-\frac{1}{2}$	1
$+\frac{1}{2}$	0
$-\frac{1}{2}$	0
$+\frac{1}{2}$	-1
$-\frac{1}{2}$	-1

~~1 + 0~~

M_L	-1	0	1
freq.	2	2	2
Subtract 2(L=1)	0	0	0

2p

notice that
2 x (3 orbitals in p)
= 6 = # micro-states

np^1

$\uparrow_1 \; \frac{\uparrow}{0} \; \frac{\downarrow}{-1}$

1 ½
√ -½

m_L	m_s	M_L	M_S	M_J
1	+½	1	+½	+3/2
1	-½	1	-½	+½
0	+½	0	+½	+½
0	-½	0	-½	-½
-1	+½	-1	+½	-½
-1	-½	-1	-½	-3/2

$J = L+S = \sum m_l + \sum m_s = \frac{1}{2}, \frac{3}{2}$

$^{2S+1}L_J$

$2(S+1)$ = Spin multiplicity $= 2(\frac{1}{2}+1)$

$S = \sum m_s$

$\therefore \; {}^2P_{1/2} \; \& \; {}^2P_{3/2}$

ground state b/c Hund's Rule #3

np^5 ### 7