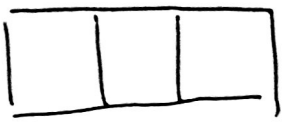
B: ~~2s²~~ 2p¹

↓

$^1S_0$

1

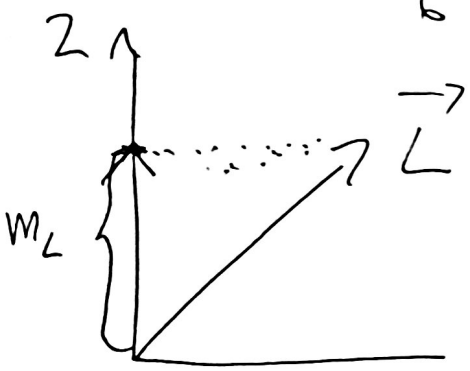


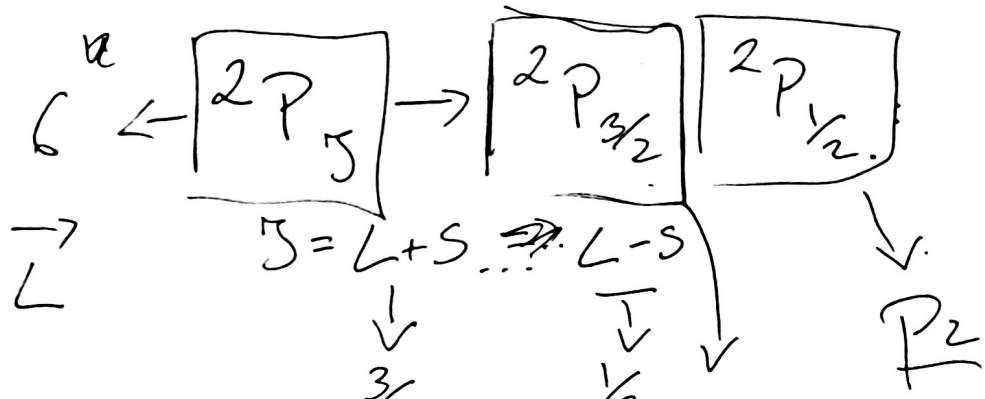
+1 0 −1 m_L

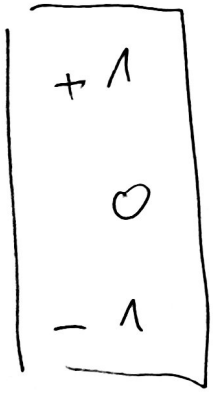
$L = 1 \mapsto P$

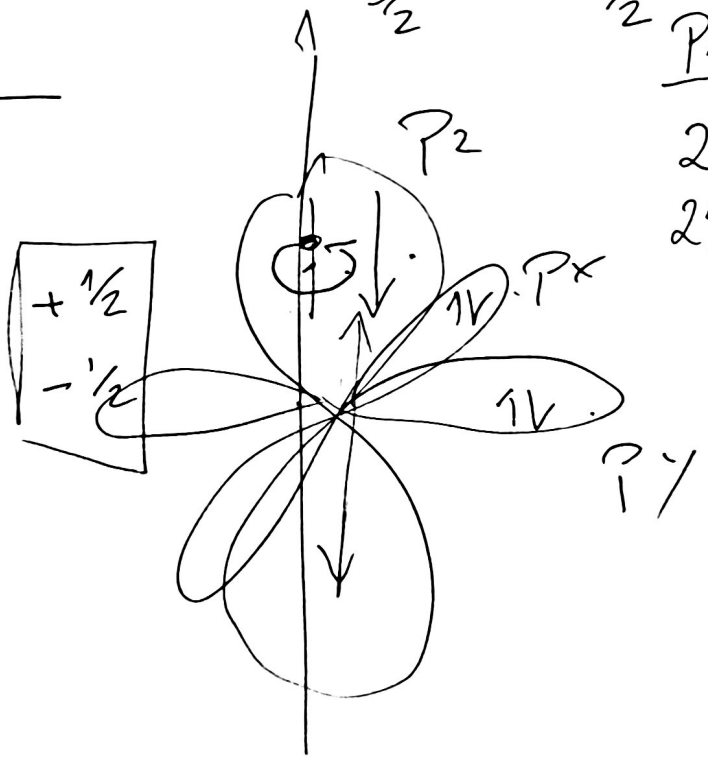
$S = 1/2 \mapsto 2 \cdot 1/2 + 1 = 2$ / Dublett

$m_S = +1/2$ oder $-1/2$









Atomic terms for p^2

(3) $^3P_0$, $^3P_1$, $^3P_2$, (1) $^1D_2$, $^1S_0$

most stable → least stable

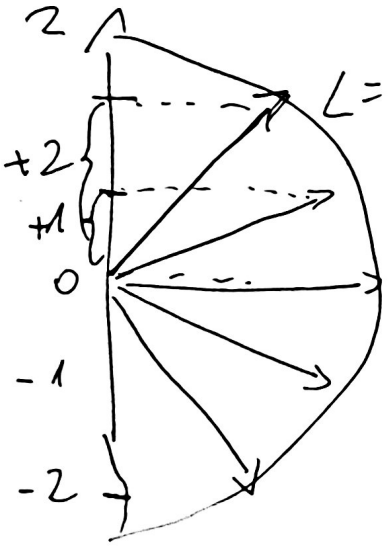
$M_S = 0$, $M_L = 2$ → $S = 0$, $L = 2$ → ^1D

$(2S+1)\cdot(2L+1) = 5$

$M_L = +2, +1, 0, -1, -2$

$L = 2$

$L = 2 \rightarrow \pm M_L \{2, 1, 0, -1, -2\}$



$M_S = +1$, $M_L = +1$ → $S = 1$, $L = 1$ → $^{2S+1}L \Rightarrow {}^3P$

$3 \times 3 = 9$

$S = 1$, $M_S = +1, 0, -1$

$L = 1$, $M_L = +1, 0, -1$ } S

$M_S = +0$, $M_L = 0$ → $L = 0$, $S = 0$ → ^1S

$1 \times 1 = 1$

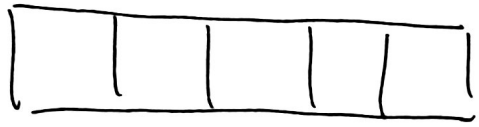
p^2 ^3P, ^1D, ^1S

^1D → $J = 2$

^3P → $J = 0$

$J = L+S \dots L-S \Rightarrow 2, 1, 0$

d^1



$(2L+1)\cdot(2S+1)$

$5 \times 2 = 10$

$S = 1/2$
$L = 2$ $\rightarrow$ $^{2S+1}L \mapsto {}^2D$

$^2D_{5/2}$, $^2D_{3/2}$

(2) (1)

$t_{2g}\ e_g$

$J = 2 + 1/2 = 5/2 \mapsto 6$

$J = 2 - 1/2 = 3/2 \mapsto 4$

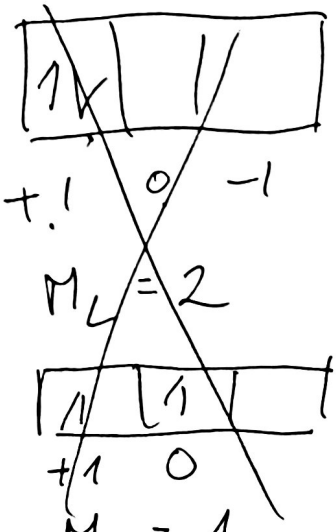
$p^2 \mapsto$ $\frac{6 \cdot 5}{2} = 15$ $\frac{6 \cdot 5 \cdot 4}{6} = 20$

$M_S = 1, 0, -1$

M_L	+1	0	-1
+2	×	$+1^+ +1^-$	×
+1	$1^+ 0^+$	$+1^+ 0^-$ / $+1^- 0^+$	$+1^- 0^-$
0	$+1^+ -1^+$	$+1^+ -1^-$ / $0^+ 0^-$ / $+1^- -1^+$	$+1^- -1^-$
-1	$-1^+ 0^+$	$-1^+ 0^-$ / $-1^- 0^+$	$-1^- 0^-$
-2	×	$-1^+ -1^-$	×

1
4
5
4
1

15
-5
10
-1



Spin

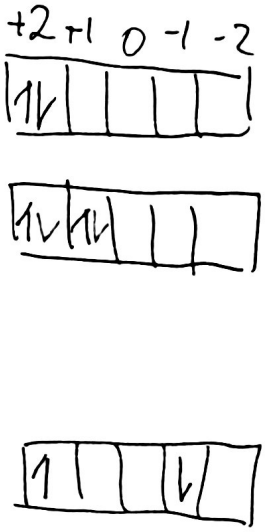
2. if spin is the same ⇒ longest L
3. if S & L are the same → J.

p^2

d^2 +2 +1 0 −1 −2 → $\frac{10 \cdot 9}{2} = 45$

M_S

M_L	+1	0	−1	
+4	×	$+2^+ +2^-$	×	1
+3	$+2^+ +1^+$	$+2^+ +1^-$ $+2^- +1^+$	$+2^- +1^-$	4
+2	$+2^+ 0^+$	$2^+ 0^-$ $2^- 0^+$ $+1^+ +1^-$	$+2^- 0^-$	5
+1	$+1^+ 0^+$ $+2^+ -1^+$	$+1^+ 0^-$ $+1^- 0^+$ $+2^+ -1^-$ $+2^- -1^+$	$+1^- 0^-$ $+2^- -1^-$	8
0	$+2^+ -2^+$ $+1^+ -1^+$	$+2^+ -2^-$ $+2^- -2^+$ $0^+ 0^-$ $+1^+ -1^-$ $+1^- -1^+$ 1	$+2^- -2^-$ $+1^- -1^-$	9
	:	×	×	8
	:	:	:	10
−4				45



$M_S = 0$, $M_L = 2$ → $L = 2$, $S = 0$ → ^1D → 5

$^3F_2$, $^3F_3$, $^3F_4$, $^3P_0$, $^3P_1$, $^3P_2$

$^1G_4$, $^1D_2$, $^1S_0$

^1G ^3F ^3P ^1D ^1S

9 21 9 5 1 → 45

$M_L = 4$, $M_S = 0$ → $L = 4$, $S = 0$ → ^1G

$+4, \ldots, -4$ (9)

$(2L+1)\cdot(2S+1) = 9 \times 1 = 9$ Degeneracy.

$M_L = 3$, $M_S = 1$ → $L = 3$, $S = 1$ → ^3F

$M_S = +1, 0, -1$

$M_L = +3 \ldots -3$

$(2L+1)(2S+1) = 7 \times 3 = 21$

$M_L = +1$, $M_S = +1$ → $L = 1$, $S = 1$ → ^3P → 9

M_S +1, 0, −1

M_L +1, 0, −1