

B: $\cancel{2s^2} 2p^1$

↓

$[^1S_0]$

1

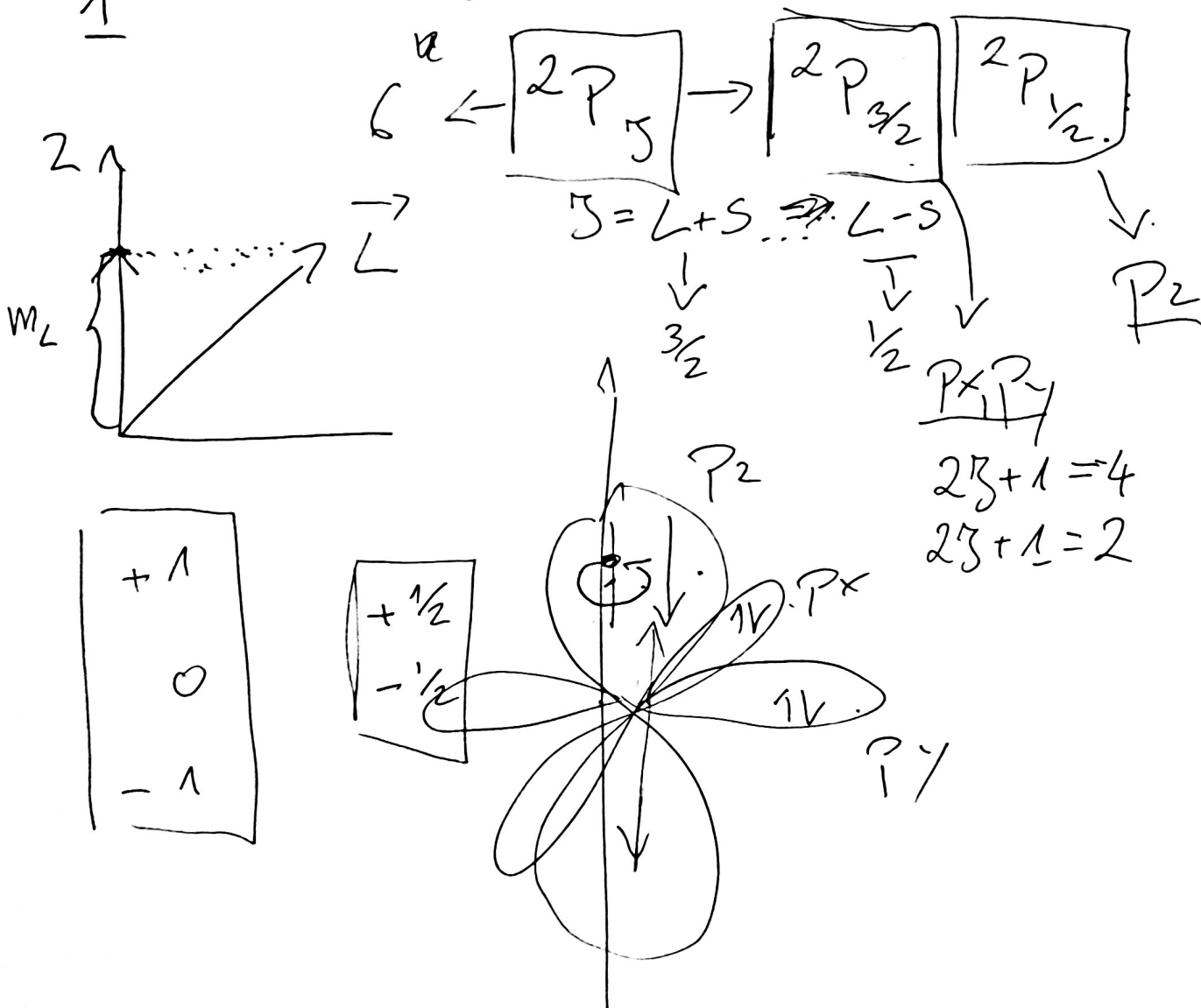
$\begin{array}{|c|c|c|} \hline & & \\ \hline \end{array}$

+1 0 -1 m_L

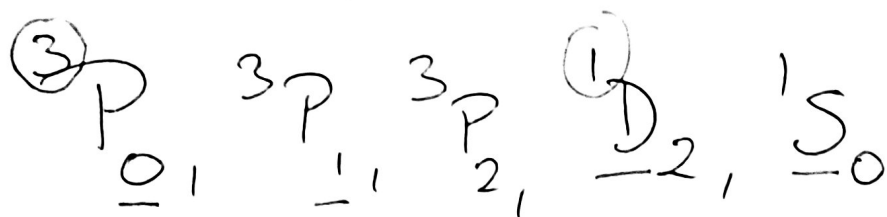
$L = \underline{1} \rightarrow P$

$S = \frac{1}{2} \rightarrow 2 \cdot \frac{1}{2} + 1 = 2 / \text{Doublet}$

$m_S = +\frac{1}{2} \text{ or } -\frac{1}{2}$



Atomic terms for P^2



most stable

least stable

$$\begin{array}{|c|} \hline M_S = 0 \\ \hline M_L = 2 \\ \hline \end{array}$$

$$\begin{array}{|c|} \hline S = 0 \\ \hline L = 2 \\ \hline \end{array}$$

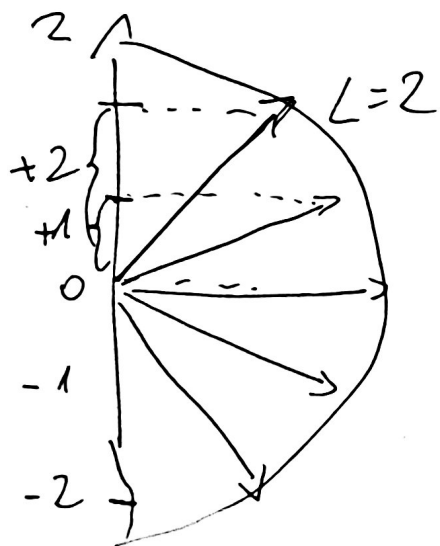


$$(2S+1)(2L+1) = 5$$

$$M_L = \{+2, +1, 0, -1, -2\}$$

$L = 2$

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



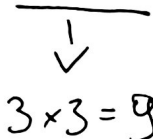
$$M_S = +1$$

$$S = 1$$

$$M_L = +1$$

$$L = 1$$

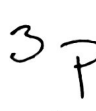
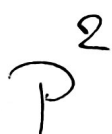
$$2S+1 \Rightarrow 3$$



$$\left. \begin{array}{l} S=1 \\ L=1 \end{array} \right\} \begin{array}{l} M_S = +1, 0, -1 \\ M_L = +1, 0, -1 \end{array}$$

$$\begin{array}{|c|} \hline M_S = +0 \\ \hline M_L = 0 \\ \hline \end{array} \rightarrow \begin{array}{|c|} \hline L = 0 \\ \hline S = 0 \\ \hline \end{array} \rightarrow \underline{1S}$$

$1 \times 1 = 1$



$$L, S \rightarrow L, S = 2$$

$$S = L+S \dots L-S \Rightarrow \underline{3, 2, 1, 0}$$

d'
↓

$+2 \ +1 \ 0 \ -1 \ -2 \ m_L$

--	--	--	--	--

$(2L+1) \cdot (2S+1)$
 $5 \times 2 = 10$

$^2D_{5/2}$ $^2D_{3/2}$
② ①

$S = \frac{1}{2}$
 $L = 2$ \rightarrow $2S+1$ $L \rightarrow$ $\boxed{^2D_5}$

$J = 2 + \frac{1}{2} = \frac{5}{2} \rightarrow 6$
 $J = 2 - \frac{1}{2} = \frac{3}{2} \rightarrow 4$

$t_{2g} \ e_g$

$P^2 \rightarrow$

$\frac{6 \cdot 5}{2} = 15$

$\frac{6 \cdot 5 \cdot 4}{6} = 20$

$M_S = 1, 0, -1$

$\boxed{1 \mid 1}$
 $+1 \ 0 \ -1 \ m_L$

M_L	$+1$	0	-1
$+2$	\times	$+1^+ -1^-$	\times
$+1$	$+1^+ 0^+$	$+1^+ 0^-$ $+1^- 0^+$	$+1^- 0^-$
0	$+1^+ -1^+$	$+1^+ -1^-$ $+1^- -1^+$	$+1^- -1^-$
-1	$-1^+ 0^+$	$-1^+ 0^-$ $-1^- 0^+$	$-1^- 0^-$
-2	\times	$-1^+ -1^-$	\times

$\boxed{1 \mid 1}$
 $+1 \ 0 \ -1$
 $M_L = 2$
 $\boxed{1 \mid 1}$
 $+1 \ 0$
 $M_L = 1$

$\frac{15}{5} = 3$
 $\frac{10}{2} = 5$

2 Spi-

2. if span is the same \Rightarrow longest \angle

3. if $\angle \leq 90^\circ$

3. if S & L are the same $\rightarrow J$.

2
P

$$\underline{d^2}$$
$$\underline{+2 \quad +1 \quad 0 \quad -1 \quad -2}$$
$$\rightarrow \frac{10 \cdot 9}{2} = 45$$

Ms

M_L	+1	0	-1
+4	X	+2 +2	X

$+3$	$+2$	$+2$	$+2$	4
------	----------------------------	----------------------------	----------------------------	-----

$$+2 \quad \begin{array}{|c|c|c|} \hline \cancel{+2^+} \cancel{0^+} & \cancel{2^+} \cancel{0^-} \quad \cancel{2^-} \cancel{0^+} \quad \underline{+1^+ + 1^-} & \cancel{+2^-} \cancel{0^-} \\ \hline \end{array} \quad \text{5}$$

$+1^+ 0^+$	$+1^+ 0^-$ $+1^+ 0^+$	$+1^+ 0^-$
$+2^+ -1^+$	$+2^+ -1^-$ $+2^+ -1^+$	$+2^+ -1^-$

$\begin{array}{c|c|c|c|c} & + & - & + & - \\ \hline + & \cancel{+2} & \cancel{-2} & +2 & -2 \\ - & \cancel{+2} & \cancel{-2} & -2 & +2 \\ \hline + & \cancel{+1} & \cancel{-1} & +1 & -1 \\ - & \cancel{+1} & \cancel{-1} & -1 & +1 \end{array}$

Hand-drawn diagram of a rectangular area. A vertical line on the left and a horizontal line on the top divide the area. The left section contains a vertical line of dots. The right section contains a large 'X' and a smaller 'X' above it. The number '8' is written in the top right corner.

-4

45

$$\left[\begin{matrix} M_S = 0 \\ M_L = 2 \end{matrix} \right] \rightarrow \left[\begin{matrix} L = 2 \\ S = 0 \end{matrix} \right] \rightarrow \text{D} \rightarrow 35$$

$$\begin{matrix} 5 \\ 4 \\ 3 \end{matrix} \rightarrow \begin{matrix} 4 \\ 3 \\ 2 \end{matrix} \rightarrow \begin{matrix} 3 \\ 2 \\ 1 \end{matrix}$$

$$\begin{matrix} 3F_2 & 3F_3 & 3F_4 & 3P_0 & 3P_1 & 3P_2 \end{matrix}$$

$$\begin{matrix} 1G & 3F & 3P & 1D & 1S & 1F & 1D & 1S \end{matrix}$$

$$\left[\begin{matrix} M_L = 4 \\ M_S = 0 \end{matrix} \right] \rightarrow \left[\begin{matrix} L = 4 \\ S = 0 \end{matrix} \right] \rightarrow \begin{matrix} +4, \dots, -4 \\ 9 \end{matrix}$$

$$\left[\begin{matrix} 2L+1 \\ 2S+1 \end{matrix} \right] = 9 \times 1 = 9$$

Degeneracy.

$$\left[\begin{matrix} M_L = 3 \\ M_S = 1 \end{matrix} \right] \rightarrow \left[\begin{matrix} L = 3 \\ S = 1 \end{matrix} \right] \rightarrow 3F$$

$$\begin{matrix} M_S = +1, 0, -1 \\ M_L = +3, \dots, -3 \end{matrix}$$

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

$$\left[\begin{matrix} M_L = +1 \\ M_S = +1 \end{matrix} \right] \rightarrow \left[\begin{matrix} L = 1 \\ S = 1 \end{matrix} \right] \rightarrow 3P \rightarrow 9$$

$$\begin{matrix} M_S = +1, 0, -1 \\ M_L = +1, 0, -1 \end{matrix}$$