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A

Appêndice

Neste appêndice são apresentados as tabelas e equações referentes aos átomos estudados por nesta dissertação. O appêndice está dividido em seções referentes a cada átomo estudado. E cada seção dividida em subseções referentes às tabelas e as equações utilizadas para cada átomo. Por questão de espaço apresentaremos somente as primeiras e últimas versões calculadas para cada elemento químico estudado.

A.1

O átomo de Ne

A.1.1

Tabelas

Tabela A.1: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 1$, ionização simples, com $n_{\text{pos}} = 0$ para o Ne.

$1s$	$2s$	$2p$	
n_1	n_2	n_3	n_{pos}
1	0	0	0
0	1	0	0
0	0	1	0

A.1.2

Equações

Para $(P_1)_{V_1}$ temos

$$\begin{aligned}
 (P_1)_{V_1}(b) &= 2p_{1s}(b)[1 - p_{1s}(b)][1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6 \mathcal{P}(1, 0, 0, 0) \\
 + \quad &2p_{2s}(b)[1 - p_{1s}(b)]^2[1 - p_{2s}(b)][1 - p_{2p}(b)]^6 \mathcal{P}(0, 1, 0, 0) \\
 + \quad &6p_{2p}(b)[1 - p_{1s}(b)]^2[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5 \mathcal{P}(0, 0, 1, 0); \quad (\text{A-1})
 \end{aligned}$$

Tabela A.2: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 2$, ionização dupla, com $n_{\text{pos}} = 0, 1$ para o Ne.

$1s$	$2s$	$2p$	
n_1	n_2	n_3	n_{pos}
2	0	0	0
1	1	0	0
1	0	1	0
1	0	0	1
0	2	0	0
0	1	1	0
0	0	2	0

Tabela A.3: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 3$, ionização tripla, com $n_{\text{pos}} = 0, 1, 2$ para o Ne.

$1s$	$2s$	$2p$	
n_1	n_2	n_3	n_{pos}
2	1	0	0
2	0	1	0
2	0	0	1
1	2	0	0
1	0	2	0
1	0	0	2
1	1	1	0
1	0	1	1
0	2	1	0
0	1	2	0
0	0	3	0

Para $(P_1)_{V_4}$ temos

$$\begin{aligned} (P_1)_{V_4}(b) &= 2p_{1s}(b)\mathcal{P}(1, 0, 0, 0) + 2p_{2s}(b)\mathcal{P}(0, 1, 0, 0) \\ &+ 6p_{2p}(b)\mathcal{P}(0, 0, 1, 0); \end{aligned} \quad (\text{A-2})$$

Para $(P_2)_{V_1}$ temos

$$\begin{aligned} (P_2)_{V_1}(b) &= p_{1s}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6\mathcal{P}(2, 0, 0, 0) \\ &+ 4p_{1s}(b)p_{2s}(b)[1 - p_{1s}(b)][1 - p_{2s}(b)][1 - p_{2p}(b)]^6\mathcal{P}(1, 1, 0, 0) \\ &+ 12p_{1s}(b)p_{2p}(b)[1 - p_{1s}(b)][1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5\mathcal{P}(1, 0, 1, 0) \\ &+ 2p_{1s}(b)[1 - p_{1s}(b)][1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6\mathcal{P}(1, 0, 0, 1) \\ &+ p_{2s}^2(b)[1 - p_{1s}(b)]^2[1 - p_{2p}(b)]^6\mathcal{P}(0, 2, 0, 0) \\ &+ 12p_{2s}(b)p_{2p}(b)[1 - p_{1s}(b)]^2[1 - p_{2s}(b)][1 - p_{2p}(b)]^5\mathcal{P}(0, 1, 1, 0) \\ &+ 2p_{2s}(b)[1 - p_{1s}(b)]^2[1 - p_{2s}(b)][1 - p_{2p}(b)]^6\mathcal{P}(0, 1, 0, 1) \\ &+ 15p_{2p}^2(b)[1 - p_{1s}(b)]^2[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4\mathcal{P}(0, 0, 2, 0) \\ &+ 6p_{2p}(b)[1 - p_{1s}(b)]^2[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5\mathcal{P}(0, 0, 1, 1); \end{aligned} \quad (\text{A-3})$$

Para $(P_2)_{V_4}$ temos

$$\begin{aligned} (P_2)_{V_4}(b) &= p_{1s}^2(b)\mathcal{P}(2, 0, 0, 0) + 4p_{1s}(b)p_{2s}(b)\mathcal{P}(1, 1, 0, 0) \\ &+ 12p_{1s}(b)p_{2p}(b)\mathcal{P}(1, 0, 1, 0) + 2p_{1s}(b)\mathcal{P}(1, 0, 0, 1) \\ &+ p_{2s}^2(b)\mathcal{P}(0, 2, 0, 0) + 12p_{2s}(b)p_{2p}(b)\mathcal{P}(0, 1, 1, 0) \\ &+ 2p_{2s}(b)\mathcal{P}(0, 1, 0, 1) + 15p_{2p}^2(b)\mathcal{P}(0, 0, 2, 0) \\ &+ 6p_{2p}(b)\mathcal{P}(0, 0, 1, 1); \end{aligned} \quad (\text{A-4})$$

Para $(P_3)_{V_1}$ temos

$$\begin{aligned} (P_3)_{V_1}(b) &= 2p_{1s}^2(b)p_{2s}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6\mathcal{P}(2, 1, 0, 0) \\ &+ 6p_{1s}^2(b)p_{2p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5\mathcal{P}(2, 0, 1, 0) \\ &+ p_{1s}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6\mathcal{P}(2, 0, 0, 1) \\ &+ 2p_{1s}(b)p_{2s}^2(b)[1 - p_{1s}(b)][1 - p_{2p}(b)]^6\mathcal{P}(1, 2, 0, 0) \\ &+ 30p_{1s}(b)p_{2p}^2(b)[1 - p_{1s}(b)][1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4\mathcal{P}(1, 0, 2, 0) \\ &+ 2p_{1s}(b)[1 - p_{1s}(b)][1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6\mathcal{P}(1, 0, 0, 2) \\ &+ 24p_{1s}(b)p_{2s}(b)p_{2p}(b)[1 - p_{1s}(b)][1 - p_{2s}(b)][1 - p_{2p}(b)]^5\mathcal{P}(1, 1, 1, 0) \\ &+ 4p_{1s}(b)p_{2s}(b)[1 - p_{1s}(b)][1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6\mathcal{P}(1, 1, 0, 1) \\ &+ 12p_{1s}(b)p_{2p}(b)[1 - p_{1s}(b)][1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5\mathcal{P}(1, 0, 1, 1) \\ &+ 6p_{2s}^2(b)p_{2p}(b)[1 - p_{1s}(b)]^2[1 - p_{2p}(b)]^5\mathcal{P}(0, 2, 1, 0) \end{aligned}$$

$$\begin{aligned}
 & + 30p_{2s}(b)p_{2p}^2(b)[1 - p_{1s}(b)]^2[1 - p_{2s}(b)][1 - p_{2p}(b)]^4\mathcal{P}(0, 1, 2, 0) \\
 & + 20p_{2p}^3(b)[1 - p_{1s}(b)]^2[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^3\mathcal{P}(0, 0, 3, 0); \quad (\text{A-5})
 \end{aligned}$$

Para $(P_3)_{V_4}$ temos

$$\begin{aligned}
 (P_3)_{V_4}(b) & = 2p_{1s}^2(b)p_{2s}(b)\mathcal{P}(2, 1, 0, 0) + 6p_{1s}^2(b)p_{2p}(b)\mathcal{P}(2, 0, 1, 0) \\
 & + p_{1s}^2(b)\mathcal{P}(2, 0, 0, 1) + 2p_{1s}(b)p_{2s}^2(b)\mathcal{P}(1, 2, 0, 0) \\
 & + 30p_{1s}(b)p_{2p}^2(b)\mathcal{P}(1, 0, 2, 0) + 2p_{1s}(b)\mathcal{P}(1, 0, 0, 2) \\
 & + 24p_{1s}(b)p_{2s}(b)p_{2p}(b)\mathcal{P}(1, 1, 1, 0) + 4p_{1s}(b)p_{2s}(b)\mathcal{P}(1, 1, 0, 1) \\
 & + 12p_{1s}(b)p_{2p}(b)\mathcal{P}(1, 0, 1, 1) + 6p_{2s}^2(b)p_{2p}(b)\mathcal{P}(0, 2, 1, 0) \\
 & + 30p_{2s}(b)p_{2p}^2(b)\mathcal{P}(0, 1, 2, 0) + 20p_{2p}^3(b)\mathcal{P}(0, 0, 3, 0); \quad (\text{A-6})
 \end{aligned}$$

A.2

O átomo de Ar

A.2.1

Tabelas

Tabela A.4: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 1$, ionização simples, com $n_{\text{pos}} = 0$ para o Ar.

$2s$	$2p$	$3s$	$3p$	
n_2	n_3	n_4	n_5	n_{pos}
1	0	0	0	0
0	1	0	0	0
0	0	1	0	0
0	0	0	1	0

A.2.2

Equações

Para $(P_1)_{V_1}$ temos

$$\begin{aligned}
 (P_1)_{V_1}(b) & = 6p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(0, 0, 0, 1, 0) \\
 & + 2p_{3s}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(0, 0, 1, 0, 0) \\
 & + 6p_{2p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(0, 1, 0, 0, 0) \\
 & + 2p_{2s}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(1, 0, 0, 0, 0) \quad (\text{A-7})
 \end{aligned}$$

Tabela A.5: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 2$, ionização dupla, com $n_{\text{pos}} = 0, 1$ para o Ar.

$2s$	$2p$	$3s$	$3p$	
n_2	n_3	n_4	n_5	n_{pos}
2	0	0	0	0
0	2	0	0	0
0	0	2	0	0
0	0	0	2	0
1	1	0	0	0
1	0	1	0	0
1	0	0	1	0
1	0	0	0	1
0	1	1	0	0
0	1	0	1	0
0	1	0	0	1
0	0	1	1	0

Para $(P_1)_{V_5}$ temos

$$\begin{aligned} (P_1)_{V_5}(b) &= 6p_{3p}(b)\mathcal{P}(0, 0, 0, 1, 0) + 2p_{3s}(b)\mathcal{P}(0, 0, 1, 0, 0) \\ &+ 6p_{2p}(b)\mathcal{P}(0, 1, 0, 0, 0) + 2p_{2s}(b)\mathcal{P}(1, 0, 0, 0, 0) \end{aligned} \quad (\text{A-8})$$

Para $(P_2)_{V_1}$ temos

$$\begin{aligned} (P_2)_{V_1}(b) &= p_{2s}^2(b)[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(2, 0, 0, 0, 0) \\ &+ 15p_{2p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(0, 2, 0, 0, 0) \\ &+ 1p_{3s}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3p}(b)]^6\mathcal{P}(0, 0, 2, 0, 0) \\ &+ 15p_{3p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(0, 0, 0, 2, 0) \end{aligned}$$

Para $(P_2)_{V_5}$ temos

$$\begin{aligned} (P_2)_{V_5}(b) &= p_{2s}^2(b)\mathcal{P}(2, 0, 0, 0, 0) + 15p_{2p}^2(b)\mathcal{P}(0, 2, 0, 0, 0) \\ &+ 1p_{3s}^2(b)\mathcal{P}(0, 0, 2, 0, 0) + 15p_{3p}^2(b)\mathcal{P}(0, 0, 0, 2, 0) \end{aligned} \quad (\text{A-10})$$

Para $(P_3)_{V_1}$ temos

$$\begin{aligned} (P_3)_{V_1}(b) &= 6p_{2s}^2(b)p_{2p}(b)[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(2, 1, 0, 0, 0) \\ &+ 2p_{2s}^2(b)p_{3s}(b)[1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(2, 0, 1, 0, 0) \end{aligned}$$

Tabela A.6: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 3$, ionização tripla, com $n_{\text{pos}} = 0, 1, 2$ para o Ar.

$2s$	$2p$	$3s$	$3p$	
n_2	n_3	n_4	n_5	n_{pos}
2	1	0	0	0
2	0	1	0	0
2	0	0	1	0
2	0	0	0	1
1	2	0	0	0
1	0	2	0	0
1	0	0	2	0
1	0	0	0	2
1	1	1	0	0
1	1	0	1	0
1	1	0	0	1
1	0	1	1	0
1	0	1	0	1
1	0	0	1	1
0	3	0	0	0
0	2	1	0	0
0	2	0	1	0
0	2	0	0	1
0	1	2	0	0
0	1	0	2	0
0	1	0	0	2
0	1	1	1	0
0	1	1	0	1
0	1	0	1	1
0	0	2	1	0
0	0	1	2	0
0	0	0	3	0

Tabela A.7: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 4$, ionização quádrupla, com $n_{\text{pos}} = 0, 1, 2, 3$ para o Ar.

$2s$	$2p$	$3s$	$3p$		$2s$	$2p$	$3s$	$3p$	
n_2	n_3	n_4	n_5	n_{pos}	n_2	n_3	n_4	n_5	n_{pos}
2	2	0	0	0	0	3	0	1	0
2	0	2	0	0	0	3	0	0	1
2	0	0	2	0	0	2	2	0	0
2	0	0	0	2	0	2	0	2	0
2	1	1	0	0	0	2	0	0	2
2	1	0	1	0	0	2	1	1	0
2	1	0	0	1	0	2	1	0	1
1	3	0	0	0	0	2	0	1	1
1	0	0	3	0	0	1	0	3	0
1	0	0	0	3	0	1	0	0	3
1	2	1	0	0	0	1	2	1	0
1	2	0	1	0	0	1	2	0	1
1	2	0	0	1	0	1	0	2	1
1	0	2	1	0	0	1	1	2	0
1	0	2	0	1	0	1	1	0	2
1	0	0	2	1	0	1	0	1	2
1	1	2	0	0	0	1	1	1	1
1	1	0	2	0	0	0	2	2	0
1	1	0	0	2	0	0	0	4	0
1	0	1	2	0					
1	0	1	0	2					
1	1	1	1	0					
1	1	1	0	1					
1	1	0	1	1					
1	0	1	1	1					
0	4	0	0	0					
0	0	0	4	0					
0	3	1	0	0					

$$\begin{aligned}
& + 6p_{2s}^2(b)p_{3p}(b)[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(2, 0, 0, 1, 0) \\
& + p_{2s}^2(b)[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(2, 0, 0, 0, 1) \\
& + 30p_{2s}(b)p_{2p}^2(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^4[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(1, 2, 0, 0, 0) \\
& + 4p_{2s}(b)p_{3s}^2(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3p}(b)]^6\mathcal{P}(1, 0, 2, 0, 0) \\
& + 30p_{2s}(b)p_{3p}^2(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(1, 0, 0, 2, 0) \\
& + 2p_{2s}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(1, 0, 0, 0, 2) \\
& + 24p_{2s}(b)p_{2p}(b)p_{3s}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^5[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(1, 1, 1, 0, 0) \\
& + 72p_{2s}(b)p_{2p}(b)p_{3p}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(1, 1, 0, 1, 0) \\
& + 12p_{2s}(b)p_{2p}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(1, 1, 0, 0, 1) \\
& + 24p_{2s}(b)p_{3s}(b)p_{3p}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^5\mathcal{P}(1, 0, 1, 1, 0) \\
& + 4p_{2s}(b)p_{3s}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(1, 0, 1, 0, 1) \\
& + 12p_{2s}(b)p_{3p}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(1, 0, 0, 1, 1) \\
& + 20p_{2p}^3(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^3[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(0, 3, 0, 0, 0) \\
& + 30p_{2p}^2(b)p_{3s}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(0, 2, 1, 0, 0) \\
& + 90p_{2p}^2(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4[1 - p_{3s}(b)][1 - p_{3p}(b)]^5\mathcal{P}(0, 2, 0, 1, 0) \\
& + 15p_{2p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(0, 2, 0, 0, 1) \\
& + 6p_{2p}(b)p_{3s}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3p}(b)]^6\mathcal{P}(0, 1, 2, 0, 0) \\
& + 90p_{2p}(b)p_{3p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(0, 1, 0, 2, 0) \\
& + 6p_{2p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(0, 1, 0, 0, 2) \\
& + 72p_{2p}(b)p_{3s}(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)][1 - p_{3p}(b)]^5\mathcal{P}(0, 1, 1, 1, 0) \\
& + 12p_{2p}(b)p_{3s}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(0, 1, 1, 0, 1) \\
& + 36p_{2p}(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(0, 1, 0, 1, 1) \\
& + 6p_{3s}^2(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3p}(b)]^5\mathcal{P}(0, 0, 2, 1, 0) \\
& + p_{3s}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3p}(b)]^6\mathcal{P}(0, 0, 2, 0, 1) \\
& + 30p_{3s}(b)p_{3p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^4\mathcal{P}(0, 0, 1, 2, 0) \\
& + 2p_{3s}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(0, 0, 1, 0, 2) \\
& + 12p_{3s}(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^5\mathcal{P}(0, 0, 1, 1, 1) \\
& + 15p_{3p}^3(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(0, 0, 0, 3, 0) \quad (\text{A-11})
\end{aligned}$$

Para $(P_3)_{V_5}$ temos

$$\begin{aligned}
(P_3)_{V_5}(b) &= 6p_{2s}^2(b)p_{2p}(b)\mathcal{P}(2, 1, 0, 0, 0) + 2p_{2s}^2(b)p_{3s}(b)\mathcal{P}(2, 0, 1, 0, 0) \\
&+ 6p_{2s}^2(b)p_{3p}(b)\mathcal{P}(2, 0, 0, 1, 0) + p_{2s}^2(b)\mathcal{P}(2, 0, 0, 0, 1) \\
&+ 30p_{2s}(b)p_{2p}^2(b)\mathcal{P}(1, 2, 0, 0, 0) + 4p_{2s}(b)p_{3s}^2(b)\mathcal{P}(1, 0, 2, 0, 0)
\end{aligned}$$

$$\begin{aligned}
& + 30p_{2s}(b)p_{3p}^2(b)\mathcal{P}(1, 0, 0, 2, 0) + 2p_{2s}(b)\mathcal{P}(1, 0, 0, 0, 2) \\
& + 24p_{2s}(b)p_{2p}(b)p_{3s}(b)\mathcal{P}(1, 1, 1, 0, 0) + 72p_{2s}(b)p_{2p}(b)p_{3p}(b)\mathcal{P}(1, 1, 0, 1, 0) \\
& + 12p_{2s}(b)p_{2p}(b)\mathcal{P}(1, 1, 0, 0, 1) + 24p_{2s}(b)p_{3s}(b)p_{3p}(b)\mathcal{P}(1, 0, 1, 1, 0) \\
& + 4p_{2s}(b)p_{3s}(b)\mathcal{P}(1, 0, 1, 0, 1) + 12p_{2s}(b)p_{3p}(b)\mathcal{P}(1, 0, 0, 1, 1) \\
& + 20p_{2p}^3(b)\mathcal{P}(0, 3, 0, 0, 0) + 30p_{2p}^2(b)p_{3s}(b)\mathcal{P}(0, 2, 1, 0, 0) \\
& + 90p_{2p}^2(b)p_{3p}(b)\mathcal{P}(0, 2, 0, 1, 0) + 15p_{2p}^2(b)\mathcal{P}(0, 2, 0, 0, 1) \\
& + 6p_{2p}(b)p_{3s}^2(b)\mathcal{P}(0, 1, 2, 0, 0) + 90p_{2p}(b)p_{3p}^2(b)\mathcal{P}(0, 1, 0, 2, 0) \\
& + 6p_{2p}(b)\mathcal{P}(0, 1, 0, 0, 2) + 72p_{2p}(b)p_{3s}(b)p_{3p}(b)\mathcal{P}(0, 1, 1, 1, 0) \\
& + 12p_{2p}(b)p_{3s}(b)\mathcal{P}(0, 1, 1, 0, 1) + 36p_{2p}(b)p_{3p}(b)\mathcal{P}(0, 1, 0, 1, 1) \\
& + 6p_{3s}^2(b)p_{3p}(b)\mathcal{P}(0, 0, 2, 1, 0) + p_{3s}^2(b)\mathcal{P}(0, 0, 2, 0, 1) \\
& + 30p_{3s}(b)p_{3p}^2(b)\mathcal{P}(0, 0, 1, 2, 0) + 2p_{3s}(b)\mathcal{P}(0, 0, 1, 0, 2) \\
& + 12p_{3s}(b)p_{3p}(b)\mathcal{P}(0, 0, 1, 1, 1) + 15p_{3p}^3(b)\mathcal{P}(0, 0, 0, 3, 0) \tag{A-12}
\end{aligned}$$

Para $(P_4)_{V_1}$ temos

$$\begin{aligned}
& (P_4)_{V_1}(b) = 15p_{2s}^2(b)p_{2p}^2(b)[1 - p_{2p}(b)]^4[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(2, 2, 0, 0, 0) \\
& + p_{2s}^2(b)p_{3s}^2(b)[1 - p_{2p}(b)]^6[1 - p_{3p}(b)]^6\mathcal{P}(2, 0, 2, 0, 0) \\
& + 15p_{2s}^2(b)p_{3p}^2(b)[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(2, 0, 0, 2, 0) \\
& + p_{2s}^2(b)[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(2, 0, 0, 0, 2) \\
& + 12p_{2s}^2(b)p_{2p}(b)p_{3s}(b)[1 - p_{2p}(b)]^5[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(2, 1, 1, 0, 0) \\
& + 36p_{2s}^2(b)p_{2p}(b)p_{3p}(b)[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(2, 1, 0, 1, 0) \\
& + 6p_{2s}^2(b)p_{2p}(b)[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(2, 1, 0, 0, 1) \\
& + 40p_{2s}(b)p_{2p}^3(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^3[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(1, 3, 0, 0, 0) \\
& + 40p_{2s}(b)p_{3p}^3(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^3\mathcal{P}(1, 0, 0, 3, 0) \\
& + 2p_{2s}(b)(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(1, 0, 0, 0, 3) \\
& + 60p_{2s}(b)p_{2p}^2(b)p_{3s}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^4[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(1, 2, 1, 0, 0) \\
& + 180p_{2s}(b)p_{2p}^2(b)p_{3p}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^4[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(1, 2, 0, 1, 0) \\
& + 30p_{2s}(b)p_{2p}^2(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^4[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(1, 2, 0, 0, 1) \\
& + 12p_{2s}(b)p_{3s}^2(b)p_{3p}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3p}(b)]^5\mathcal{P}(1, 0, 2, 1, 0) \\
& + 2p_{2s}(b)p_{3s}^2(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3p}(b)]^6\mathcal{P}(1, 0, 2, 0, 1) \\
& + 12p_{2s}(b)p_{3p}^2(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(1, 0, 0, 2, 1) \\
& + 12p_{2s}(b)p_{2p}(b)p_{3s}^2(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^5[1 - p_{3p}(b)]^6\mathcal{P}(1, 1, 2, 0, 0) \\
& + 180p_{2s}(b)p_{2p}(b)p_{3p}^2(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(1, 1, 0, 2, 0) \\
& + 12p_{2s}(b)p_{2p}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(1, 1, 0, 0, 2)
\end{aligned}$$

$$\begin{aligned}
& + 60p_{2s}(b)p_{3s}(b)p_{3p}^2(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^4\mathcal{P}(1, 0, 1, 2, 0) \\
& + 4p_{2s}(b)p_{3s}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(1, 0, 1, 0, 2) \\
& + 144p_{2s}(b)p_{2p}(b)p_{3s}(b)p_{3p}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^5[1 - p_{3s}(b)][1 - p_{3p}(b)]^5\mathcal{P}(1, 1, 1, 1, 0) \\
& + 24p_{2s}(b)p_{2p}(b)p_{3s}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^5[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(1, 1, 1, 0, 1) \\
& + 72p_{2s}(b)p_{2p}(b)p_{3p}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(1, 1, 0, 1, 1) \\
& + 24p_{2s}(b)p_{3s}(b)p_{3p}(b)[1 - p_{2s}(b)][1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^5\mathcal{P}(1, 0, 1, 1, 1) \\
& + 15p_{2p}^4(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^2[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(0, 4, 0, 0, 0) \\
& + 20p_{3p}^4(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^2\mathcal{P}(0, 0, 0, 4, 0) \\
& + 40p_{2p}^3(b)p_{3s}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^3[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(0, 3, 1, 0, 0) \\
& + 120p_{2p}^3(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^3[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(0, 3, 0, 1, 0) \\
& + 20p_{2p}^3(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^3[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(0, 3, 0, 0, 1) \\
& + 15p_{2p}^2(b)p_{3s}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4[1 - p_{3p}(b)]^6\mathcal{P}(0, 2, 2, 0, 0) \\
& + 225p_{2p}^2(b)p_{3p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(0, 2, 0, 2, 0) \\
& + 15p_{2p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(0, 2, 0, 0, 2) \\
& + 180p_{2p}^2(b)p_{3s}(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4[1 - p_{3s}(b)][1 - p_{3p}(b)]^5\mathcal{P}(0, 2, 1, 1, 0) \\
& + 30p_{2p}^2(b)p_{3s}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(0, 2, 1, 0, 1) \\
& + 90p_{2p}^2(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^4[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(0, 2, 0, 1, 1) \\
& + 120p_{2p}(b)p_{3p}^3(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^3\mathcal{P}(0, 1, 0, 3, 0) \\
& + 6p_{2p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6\mathcal{P}(0, 1, 0, 0, 3) \\
& + 36p_{2p}(b)p_{3s}^2(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3p}(b)]^5\mathcal{P}(0, 1, 2, 1, 0) \\
& + 6p_{2p}(b)p_{3s}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3p}(b)]^6\mathcal{P}(0, 1, 2, 0, 1) \\
& + 90p_{2p}(b)p_{3p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(0, 1, 0, 2, 1) \\
& + 180p_{2p}(b)p_{3s}(b)p_{3p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)][1 - p_{3p}(b)]^4\mathcal{P}(0, 1, 1, 2, 0) \\
& + 12p_{2p}(b)p_{3s}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(0, 1, 1, 0, 2) \\
& + 36p_{2p}(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(0, 1, 0, 1, 2) \\
& + 72p_{2p}(b)p_{3s}(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^5[1 - p_{3s}(b)][1 - p_{3p}(b)]^5\mathcal{P}(0, 1, 1, 1, 1) \\
& + 15p_{3s}^2(b)p_{3p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3p}(b)]^4\mathcal{P}(0, 0, 2, 2, 0) \\
& + p_{3s}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3p}(b)]^6\mathcal{P}(0, 0, 2, 0, 2) \\
& + 6p_{3s}^2(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3p}(b)]^5\mathcal{P}(0, 0, 2, 1, 1) \\
& + p_{3s}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^6\mathcal{P}(0, 0, 1, 0, 3) \\
& + 30p_{3s}(b)p_{3p}^2(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^4\mathcal{P}(0, 0, 1, 2, 1) \\
& + 12p_{3s}(b)p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)][1 - p_{3p}(b)]^5\mathcal{P}(0, 0, 1, 1, 2) \\
& + 15p_{3p}^4(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^2\mathcal{P}(0, 0, 0, 4, 0)
\end{aligned}$$

$$\begin{aligned}
 & + 15p_{3p}^3(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(0, 0, 0, 3, 1) \\
 & + 15p_{3p}^3(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4\mathcal{P}(0, 0, 0, 2, 2) \\
 & + 6p_{3p}(b)[1 - p_{2s}(b)]^2[1 - p_{2p}(b)]^6[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5\mathcal{P}(0, 0, 0, 1, 3)
 \end{aligned} \tag{A-13}$$

Para $(P_4)_{V_5}$ temos

$$\begin{aligned}
 (P_4)_{V_1}(b) = & 15p_{2s}^2(b)p_{2p}^2(b)\mathcal{P}(2, 2, 0, 0, 0) + p_{2s}^2(b)p_{3s}^2(b)\mathcal{P}(2, 0, 2, 0, 0) \\
 & + 15p_{2s}^2(b)p_{3p}^2(b)\mathcal{P}(2, 0, 0, 2, 0) + p_{2s}^2(b)\mathcal{P}(2, 0, 0, 0, 2) \\
 & + 12p_{2s}^2(b)p_{2p}(b)p_{3s}(b)\mathcal{P}(2, 1, 1, 0, 0) + 36p_{2s}^2(b)p_{2p}(b)p_{3p}(b)\mathcal{P}(2, 1, 0, 1, 0) \\
 & + 6p_{2s}^2(b)p_{2p}(b)\mathcal{P}(2, 1, 0, 0, 1) + 40p_{2s}(b)p_{2p}^3(b)\mathcal{P}(1, 3, 0, 0, 0) \\
 & + 40p_{2s}(b)p_{3p}^3(b)\mathcal{P}(1, 0, 0, 3, 0) + 2p_{2s}(b)(b)\mathcal{P}(1, 0, 0, 0, 3) \\
 & + 60p_{2s}(b)p_{2p}^2(b)p_{3s}(b)\mathcal{P}(1, 2, 1, 0, 0) + 180p_{2s}(b)p_{2p}^2(b)p_{3p}(b)\mathcal{P}(1, 2, 0, 1, 0) \\
 & + 30p_{2s}(b)p_{2p}^2(b)\mathcal{P}(1, 2, 0, 0, 1) + 12p_{2s}(b)p_{3s}^2(b)p_{3p}(b)\mathcal{P}(1, 0, 2, 1, 0) \\
 & + 2p_{2s}(b)p_{3s}^2(b)\mathcal{P}(1, 0, 2, 0, 1) + 12p_{2s}(b)p_{3p}^2(b)\mathcal{P}(1, 0, 0, 2, 1) \\
 & + 12p_{2s}(b)p_{2p}(b)p_{3s}^2(b)\mathcal{P}(1, 1, 2, 0, 0) + 180p_{2s}(b)p_{2p}(b)p_{3p}^2(b)\mathcal{P}(1, 1, 0, 2, 0) \\
 & + 12p_{2s}(b)p_{2p}(b)\mathcal{P}(1, 1, 0, 0, 2) + 60p_{2s}(b)p_{3s}(b)p_{3p}^2(b)\mathcal{P}(1, 0, 1, 2, 0) \\
 & + 4p_{2s}(b)p_{3s}(b)\mathcal{P}(1, 0, 1, 0, 2) + 144p_{2s}(b)p_{2p}(b)p_{3s}(b)p_{3p}(b)\mathcal{P}(1, 1, 1, 1, 0) \\
 & + 24p_{2s}(b)p_{2p}(b)p_{3s}(b)\mathcal{P}(1, 1, 1, 0, 1) + 72p_{2s}(b)p_{2p}(b)p_{3p}(b)\mathcal{P}(1, 1, 0, 1, 1) \\
 & + 24p_{2s}(b)p_{3s}(b)p_{3p}(b)\mathcal{P}(1, 0, 1, 1, 1) + 15p_{2p}^4(b)\mathcal{P}(0, 4, 0, 0, 0) \\
 & + 20p_{3p}^4(b)\mathcal{P}(0, 0, 0, 4, 0) + 40p_{2p}^3(b)p_{3s}(b)\mathcal{P}(0, 3, 1, 0, 0) \\
 & + 120p_{2p}^3(b)p_{3p}(b)\mathcal{P}(0, 3, 0, 1, 0) + 20p_{2p}^3(b)\mathcal{P}(0, 3, 0, 0, 1) \\
 & + 15p_{2p}^2(b)p_{3s}^2(b)\mathcal{P}(0, 2, 2, 0, 0) + 225p_{2p}^2(b)p_{3p}^2(b)\mathcal{P}(0, 2, 0, 2, 0) \\
 & + 15p_{2p}^2(b)\mathcal{P}(0, 2, 0, 0, 2) + 180p_{2p}^2(b)p_{3s}(b)p_{3p}(b)\mathcal{P}(0, 2, 1, 1, 0) \\
 & + 30p_{2p}^2(b)p_{3s}(b)\mathcal{P}(0, 2, 1, 0, 1) + 90p_{2p}^2(b)p_{3p}(b)\mathcal{P}(0, 2, 0, 1, 1) \\
 & + 120p_{2p}(b)p_{3p}^3(b)\mathcal{P}(0, 1, 0, 3, 0) + 6p_{2p}(b)\mathcal{P}(0, 1, 0, 0, 3) \\
 & + 36p_{2p}(b)p_{3s}^2(b)p_{3p}(b)\mathcal{P}(0, 1, 2, 1, 0) + 6p_{2p}(b)p_{3s}^2(b)\mathcal{P}(0, 1, 2, 0, 1) \\
 & + 90p_{2p}(b)p_{3p}^2(b)\mathcal{P}(0, 1, 0, 2, 1) + 180p_{2p}(b)p_{3s}(b)p_{3p}^2(b)\mathcal{P}(0, 1, 1, 2, 0) \\
 & + 12p_{2p}(b)p_{3s}(b)\mathcal{P}(0, 1, 1, 0, 2) + 36p_{2p}(b)p_{3p}(b)\mathcal{P}(0, 1, 0, 1, 2) \\
 & + 72p_{2p}(b)p_{3s}(b)p_{3p}(b)\mathcal{P}(0, 1, 1, 1, 1) + 15p_{3s}^2(b)p_{3p}^2(b)\mathcal{P}(0, 0, 2, 2, 0) \\
 & + p_{3s}^2(b)\mathcal{P}(0, 0, 2, 0, 2) + 6p_{3s}^2(b)p_{3p}(b)\mathcal{P}(0, 0, 2, 1, 1) \\
 & + p_{3s}(b)\mathcal{P}(0, 0, 1, 0, 3) + 30p_{3s}(b)p_{3p}^2(b)\mathcal{P}(0, 0, 1, 2, 1) \\
 & + 12p_{3s}(b)p_{3p}(b)\mathcal{P}(0, 0, 1, 1, 2) + 15p_{3p}^4(b)\mathcal{P}(0, 0, 0, 4, 0) \\
 & + 15p_{3p}^3(b)\mathcal{P}(0, 0, 0, 3, 1) + 15p_{3p}^3(b)\mathcal{P}(0, 0, 0, 2, 2) \\
 & + 6p_{3p}(b)\mathcal{P}(0, 0, 0, 1, 3)
 \end{aligned} \tag{A-14}$$

A.3

O átomo de Kr

A.3.1

Tabelas

Tabela A.8: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 1$, ionização simples, com $n_{\text{pos}} = 0$ para o Kr.

$3s$	$3p$	$3d$	$4s$	$4p$	
n_4	n_5	n_6	n_7	n_8	n_{pos}
1	0	0	0	0	0
0	1	0	0	0	0
0	0	1	0	0	0
0	0	0	1	0	0
0	0	0	0	1	0

A.3.2

Equações

Para $(P_1)_{V_1}$ temos

$$\begin{aligned}
 (P_1)_{V_1}(b) &= 6p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 0, 0, 1, 0) \\
 &+ 2p_{4s}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 0, 1, 0, 0) \\
 &+ 10p_{3d}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 1, 0, 0, 0) \\
 &+ 6p_{3p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 1, 0, 0, 0, 0) \\
 &+ 2p_{3s}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(1, 0, 0, 0, 0, 0); \quad (\text{A-15})
 \end{aligned}$$

Para $(P_1)_{V_6}$ temos

$$\begin{aligned}
 (P_1)_{V_6}(b) &= 6p_{4p}(b)\mathcal{P}(0, 0, 0, 0, 1, 0) + 2p_{4s}(b)\mathcal{P}(0, 0, 0, 1, 0, 0) \\
 &+ 10p_{3d}(b)\mathcal{P}(0, 0, 1, 0, 0, 0) + 6p_{3p}(b)\mathcal{P}(0, 1, 0, 0, 0, 0) \\
 &+ 2p_{3s}(b)\mathcal{P}(1, 0, 0, 0, 0, 0); \quad (\text{A-16})
 \end{aligned}$$

Para $(P_2)_{V_1}$ temos

Tabela A.9: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 2$, ionização dupla, com $n_{\text{pos}} = 0, 1$ para o Kr.

$3s$	$3p$	$3d$	$4s$	$4p$	
n_4	n_5	n_6	n_7	n_8	n_{pos}
2	0	0	0	0	0
0	2	0	0	0	0
0	0	2	0	0	0
0	0	0	2	0	0
0	0	0	0	2	0
1	1	0	0	0	0
1	0	1	0	0	0
1	0	0	1	0	0
1	0	0	0	1	0
1	0	0	0	0	1
0	1	1	0	0	0
0	1	0	1	0	0
0	1	0	0	1	0
0	1	0	0	0	1
0	0	1	1	0	0
0	0	1	0	1	0
0	0	1	0	0	1
0	0	0	1	1	0

$$\begin{aligned}
(P_2)_{V_1}(b) &= 15p_{4p}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4\mathcal{P}(0, 0, 0, 0, 2, 0) \\
&+ 2p_{4s}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 0, 2, 0, 0) \\
&+ 12p_{4s}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 0, 1, 1, 0) \\
&+ 60p_{3d}(b)p_{3p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 1, 0, 0, 0) \\
&+ 20p_{3d}(b)p_{3s}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 1, 0, 0, 0) \\
&+ 12p_{3s}(b)p_{3p}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 1, 0, 0, 0, 0) \\
&+ 10p_{3d}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 1, 0, 0, 1) \\
&+ 6p_{3p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 0, 0, 0, 1) \\
&+ 2p_{3s}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 0, 0, 0, 1) \\
&+ 20p_{3d}(b)p_{4s}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 1, 1, 0, 0) \\
&+ 60p_{3d}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 1, 0, 1, 0) \quad (\text{A-17})
\end{aligned}$$

Para $(P_2)_{V_6}$ temos

Tabela A.10: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 3$, ionização tripla, com $n_{\text{pos}} = 0, 1, 2$ para o Kr.

$3s$	$3p$	$3d$	$4s$	$4p$		$3s$	$3p$	$3d$	$4s$	$4p$	
n_4	n_5	n_6	n_7	n_8	n_{pos}	n_4	n_5	n_6	n_7	n_8	n_{pos}
2	1	0	0	0	0	0	1	0	2	0	0
2	0	1	0	0	0	0	1	0	0	2	0
2	0	0	1	0	0	0	1	0	0	0	2
2	0	0	0	1	0	0	1	1	1	0	0
2	0	0	0	0	1	0	1	1	0	1	0
1	2	0	0	0	0	0	1	1	0	0	1
1	0	2	0	0	0	0	1	0	1	1	0
1	0	0	2	0	0	0	1	0	1	0	1
1	0	0	0	2	0	0	1	0	0	1	1
1	0	0	0	0	2	0	0	2	1	0	0
1	1	1	0	0	0	0	0	2	0	1	0
1	1	0	1	0	0	0	0	2	0	0	1
1	1	0	0	1	0	0	0	1	2	0	0
1	1	0	0	0	1	0	0	1	0	2	0
1	0	1	1	0	0	0	0	1	0	0	2
1	0	1	0	1	0	0	0	1	1	1	0
1	0	1	0	0	1	0	0	1	1	0	1
1	0	0	1	1	0	0	0	1	0	1	1
1	0	0	1	0	1	0	0	3	0	0	0
1	0	0	0	1	1	0	0	0	2	1	0
0	3	0	0	0	0	0	0	0	2	0	1
0	2	1	0	0	0	0	0	0	1	2	0
0	2	0	1	0	0	0	0	0	0	3	0
0	2	0	0	1	0						
0	2	0	0	0	1						
0	1	2	0	0	0						

Tabela A.11: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 4$, ionização quádrupla, com $n_{\text{pos}} = 0, 1, 2, 3$ para o Kr.

$3s$	$3p$	$3d$	$4s$	$4p$		$3s$	$3p$	$3d$	$4s$	$4p$		$3s$	$3p$	$3d$	$4s$	$4p$	
n_4	n_5	n_6	n_7	n_8	n_{pos}	n_4	n_5	n_6	n_7	n_8	n_{pos}	n_4	n_5	n_6	n_7	n_8	n_{pos}
2	2	0	0	0	0	1	0	0	1	2	0	0	1	0	0	2	1
2	0	2	0	0	0	1	0	0	1	0	2	0	1	1	2	0	0
2	0	0	2	0	0	1	0	0	0	1	2	0	1	1	0	2	0
2	0	0	0	2	0	1	1	1	1	0	0	0	1	1	0	0	2
2	0	0	0	0	2	1	1	1	0	1	0	0	1	0	1	2	0
2	1	1	0	0	0	1	1	1	0	0	1	0	1	0	1	0	2
2	1	0	1	0	0	1	1	0	1	1	0	0	1	0	0	1	2
2	1	0	0	1	0	1	1	0	1	0	1	0	1	1	1	1	0
2	1	0	0	0	1	1	1	0	0	1	1	0	1	1	1	0	1
2	0	1	1	0	0	1	0	1	1	1	0	0	1	1	0	1	1
2	0	1	0	1	0	1	0	1	1	0	1	0	1	0	1	1	1
2	0	1	0	0	1	1	0	1	0	1	1	0	0	4	0	0	0
2	0	0	1	1	0	1	0	0	1	1	1	0	0	3	1	0	0
2	0	0	1	0	1	0	4	0	0	0	0	0	0	3	0	1	0
2	0	0	0	1	1	0	3	1	0	0	0	0	0	3	0	0	1
1	3	0	0	0	0	0	3	0	1	0	0	0	0	2	2	0	0
1	0	3	0	0	0	0	3	0	0	1	0	0	0	2	0	2	0
1	0	0	0	3	0	0	3	0	0	0	1	0	0	2	0	0	2
1	0	0	0	0	3	0	2	2	0	0	0	0	0	2	1	1	0
1	2	1	0	0	0	0	2	0	2	0	0	0	0	2	1	0	1
1	2	0	1	0	0	0	2	0	0	2	0	0	0	2	0	1	1
1	2	0	0	1	0	0	2	0	0	0	2	0	0	1	0	3	0
1	2	0	0	0	1	0	2	1	1	0	0	0	0	1	0	0	3
1	0	2	1	0	0	0	2	1	0	1	0	0	0	1	2	1	0
1	0	2	0	1	0	0	2	1	0	0	1	0	0	1	2	0	1
1	0	2	0	0	1	0	2	0	1	1	0	0	0	1	0	2	1
1	0	0	2	1	0	0	2	0	1	0	1	0	0	1	1	2	0
1	0	0	2	0	1	0	2	0	0	1	1	0	0	1	1	0	2
1	0	0	0	2	1	0	1	3	0	0	0	0	0	1	0	1	2
1	1	2	0	0	0	0	1	0	0	3	0	0	0	1	1	1	1
1	1	0	2	0	0	0	1	0	0	0	3	0	0	0	2	2	0
1	1	0	0	2	0	0	1	2	1	0	0	0	0	0	1	3	0
1	1	0	0	0	2	0	1	2	0	1	0	0	0	0	0	4	0
1	0	1	2	0	0	0	1	2	0	0	1						
1	0	1	0	2	0	0	1	0	2	1	0						
1	0	1	0	0	2	0	1	0	2	0	1						

$$\begin{aligned}
 (P_2)_{V_1}(b) = & 15p_{4p}^2(b)\mathcal{P}(0,0,0,0,2,0) + 2p_{4s}^2(b)\mathcal{P}(0,0,0,2,0,0) \\
 + & 12p_{4s}(b)p_{4p}(b)\mathcal{P}(0,0,0,1,1,0) + 60p_{3d}(b)p_{3p}(b)\mathcal{P}(0,1,1,0,0,0) \\
 + & 20p_{3d}(b)p_{3s}(b)\mathcal{P}(1,0,1,0,0,0) + 12p_{3s}(b)p_{3p}(b)\mathcal{P}(1,1,0,0,0,0) \\
 + & 10p_{3d}(b)\mathcal{P}(0,0,1,0,0,1) + 6p_{3p}(b)\mathcal{P}(0,1,0,0,0,1) \\
 + & 2p_{3s}(b)\mathcal{P}(1,0,0,0,0,1) + 20p_{3d}(b)p_{4s}(b)\mathcal{P}(0,0,1,1,0,0) \\
 + & 60p_{3d}(b)p_{4p}(b)\mathcal{P}(0,0,1,0,1,0); \tag{A-18}
 \end{aligned}$$

Para $(P_3)_{V_1}$ temos

$$\begin{aligned}
 (P_3)_{V_1}(b) = & 6p_{3s}^2(b)p_{3p}(b)[1-p_{3p}(b)]^5[1-p_{3d}(b)]^{10}[1-p_{4s}(b)]^2[1-p_{4p}(b)]^6\mathcal{P}(2,1,0,0,0,0) \\
 + & 10p_{3s}^2(b)p_{3d}(b)[1-p_{3p}(b)]^6[1-p_{3d}(b)]^9[1-p_{4s}(b)]^2[1-p_{4p}(b)]^6\mathcal{P}(2,0,1,0,0,0) \\
 + & 30p_{3s}(b)p_{3p}^2(b)[1-p_{3s}(b)][1-p_{3p}(b)]^4[1-p_{3d}(b)]^{10}[1-p_{4s}(b)]^2[1-p_{4p}(b)]^6\mathcal{P}(1,2,0,0,0,0) \\
 + & 90p_{3s}(b)p_{3d}^2(b)[1-p_{3s}(b)][1-p_{3p}(b)]^6[1-p_{3d}(b)]^9[1-p_{4s}(b)]^2[1-p_{4p}(b)]^6\mathcal{P}(1,0,2,0,0,0) \\
 + & 2p_{3s}(b)[1-p_{3s}(b)][1-p_{3p}(b)]^6[1-p_{3d}(b)]^{10}[1-p_{4s}(b)]^2[1-p_{4p}(b)]^6\mathcal{P}(1,0,0,0,0,2) \\
 + & 120p_{3s}(b)p_{3p}(b)p_{3d}(b)[1-p_{3s}(b)][1-p_{3p}(b)]^5[1-p_{3d}(b)]^9[1-p_{4s}(b)]^2[1-p_{4p}(b)]^6\mathcal{P}(1,1,1,0,0,0) \\
 + & 24p_{3s}(b)p_{3p}(b)p_{4s}(b)[1-p_{3s}(b)][1-p_{3p}(b)]^5[1-p_{3d}(b)]^{10}[1-p_{4s}(b)][1-p_{4p}(b)]^6\mathcal{P}(1,1,0,1,0,0) \\
 + & 72p_{3s}(b)p_{3p}(b)p_{4p}(b)[1-p_{3s}(b)][1-p_{3p}(b)]^5[1-p_{3d}(b)]^{10}[1-p_{4s}^2(b)][1-p_{4p}(b)]^5\mathcal{P}(1,1,0,0,1,0) \\
 + & 40p_{3s}(b)p_{3d}(b)p_{4s}(b)[1-p_{3s}(b)][1-p_{3p}(b)]^6[1-p_{3d}(b)]^9[1-p_{4s}(b)][1-p_{4p}(b)]^6\mathcal{P}(1,0,1,1,0,0) \\
 + & 120p_{3s}(b)p_{3d}(b)p_{4p}(b)[1-p_{3s}(b)][1-p_{3p}(b)]^6[1-p_{3d}(b)]^9[1-p_{4s}^2(b)][1-p_{4p}(b)]^5\mathcal{P}(1,0,1,0,1,0) \\
 + & 4p_{3s}(b)p_{4s}(b)[1-p_{3s}(b)][1-p_{3p}(b)]^6[1-p_{3d}(b)]^{10}[1-p_{4s}(b)][1-p_{4p}(b)]^6\mathcal{P}(1,0,0,1,0,1) \\
 + & 12p_{3s}(b)p_{4p}(b)[1-p_{3s}(b)][1-p_{3p}(b)]^6[1-p_{3d}(b)]^{10}[1-p_{4s}(b)]^2[1-p_{4p}(b)]^5\mathcal{P}(1,0,0,0,1,1) \\
 + & 150p_{3p}^2(b)p_{3d}(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^4[1-p_{3d}(b)]^9[1-p_{4s}(b)]^2[1-p_{4p}(b)]^6\mathcal{P}(0,2,1,0,0,0) \\
 + & 270p_{3p}(b)p_{3d}^2(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^5[1-p_{3d}(b)]^9[1-p_{4s}(b)]^2[1-p_{4p}(b)]^6\mathcal{P}(0,1,2,0,0,0) \\
 + & 6p_{3p}(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^5[1-p_{3d}(b)]^{10}[1-p_{4s}(b)]^2[1-p_{4p}(b)]^6\mathcal{P}(0,1,0,0,0,2) \\
 + & 120p_{3p}(b)p_{3d}(b)p_{4s}(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^5[1-p_{3d}(b)]^9[1-p_{4s}(b)][1-p_{4p}(b)]^6\mathcal{P}(0,1,1,1,0,0) \\
 + & 360p_{3p}(b)p_{3d}(b)p_{4p}(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^5[1-p_{3d}(b)]^9[1-p_{4s}(b)]^2[1-p_{4p}(b)]^5\mathcal{P}(0,1,1,0,1,0) \\
 + & 12p_{3p}(b)p_{4s}(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^5[1-p_{3d}(b)]^{10}[1-p_{4s}(b)][1-p_{4p}(b)]^6\mathcal{P}(0,1,0,1,0,1) \\
 + & 36p_{3p}(b)p_{4p}(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^5[1-p_{3d}(b)]^{10}[1-p_{4s}(b)]^2[1-p_{4p}(b)]^5\mathcal{P}(0,1,0,0,1,1) \\
 + & 90p_{3d}^2(b)p_{4s}(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^6[1-p_{3d}(b)]^8[1-p_{4s}(b)][1-p_{4p}(b)]^6\mathcal{P}(0,0,2,1,0,0) \\
 + & 270p_{3d}^2(b)p_{4p}(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^6[1-p_{3d}(b)]^8[1-p_{4s}(b)]^2[1-p_{4p}(b)]^5\mathcal{P}(0,0,2,0,1,0) \\
 + & 45p_{3d}^2(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^6[1-p_{3d}(b)]^8[1-p_{4s}(b)]^2[1-p_{4p}(b)]^6\mathcal{P}(0,0,2,0,0,1) \\
 + & 10p_{3d}(b)p_{4s}^2(b)[1-p_{3s}(b)]^2[1-p_{3p}(b)]^6[1-p_{3d}(b)]^9[1-p_{4p}(b)]^6\mathcal{P}(0,0,1,2,0,0)
 \end{aligned}$$

$$\begin{aligned}
& + 150p_{3d}(b)p_{4p}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4\mathcal{P}(0, 0, 1, 0, 2, 0) \\
& + 10p_{3d}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 1, 0, 0, 2) \\
& + 120p_{3d}(b)p_{4s}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 1, 1, 1, 0) \\
& + 20p_{3d}(b)p_{4s}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 1, 1, 0, 1) \\
& + 60p_{3d}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 1, 0, 1, 1) \\
& + 6p_{4s}^2(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 0, 2, 1, 0) \\
& + 30p_{4s}(b)p_{4p}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^4\mathcal{P}(0, 0, 0, 1, 2, 0) \\
& + 20p_{4p}^3(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^3\mathcal{P}(0, 0, 0, 0, 3, 0); \quad (\text{A-19})
\end{aligned}$$

Para $(P_3)_{V_6}$ temos

$$\begin{aligned}
& (P_3)_{V_6}(b) = 6p_{3s}^2(b)p_{3p}(b)\mathcal{P}(2, 1, 0, 0, 0, 0) + 10p_{3s}^2(b)p_{3d}(b)\mathcal{P}(2, 0, 1, 0, 0, 0) \\
& + 30p_{3s}(b)p_{3p}^2(b)\mathcal{P}(1, 2, 0, 0, 0, 0) + 90p_{3s}(b)p_{3d}^2(b)\mathcal{P}(1, 0, 2, 0, 0, 0) \\
& + 2p_{3s}(b)\mathcal{P}(1, 0, 0, 0, 0, 2) + 120p_{3s}(b)p_{3p}(b)p_{3d}(b)\mathcal{P}(1, 1, 1, 0, 0, 0) \\
& + 24p_{3s}(b)p_{3p}(b)p_{4s}(b)\mathcal{P}(1, 1, 0, 1, 0, 0) + 72p_{3s}(b)p_{3p}(b)p_{4p}(b)\mathcal{P}(1, 1, 0, 0, 1, 0) \\
& + 40p_{3s}(b)p_{3d}(b)p_{4s}(b)\mathcal{P}(1, 0, 1, 1, 0, 0) + 120p_{3s}(b)p_{3d}(b)p_{4p}(b)\mathcal{P}(1, 0, 1, 0, 1, 0) \\
& + 4p_{3s}(b)p_{4s}(b)\mathcal{P}(1, 0, 0, 1, 0, 1) + 12p_{3s}(b)p_{4p}(b)\mathcal{P}(1, 0, 0, 0, 1, 1) \\
& + 150p_{3p}^2(b)p_{3d}(b)\mathcal{P}(0, 2, 1, 0, 0, 0) + 270p_{3p}(b)p_{3d}^2(b)\mathcal{P}(0, 1, 2, 0, 0, 0) \\
& + 6p_{3p}(b)\mathcal{P}(0, 1, 0, 0, 0, 2) + 120p_{3p}(b)p_{3d}(b)p_{4s}(b)\mathcal{P}(0, 1, 1, 1, 0, 0) \\
& + 360p_{3p}(b)p_{3d}(b)p_{4p}(b)\mathcal{P}(0, 1, 1, 0, 1, 0) + 12p_{3p}(b)p_{4s}(b)\mathcal{P}(0, 1, 0, 1, 0, 1) \\
& + 36p_{3p}(b)p_{4p}(b)\mathcal{P}(0, 1, 0, 0, 1, 1) + 90p_{3d}^2(b)p_{4s}(b)\mathcal{P}(0, 0, 2, 1, 0, 0) \\
& + 270p_{3d}^2(b)p_{4p}(b)\mathcal{P}(0, 0, 2, 0, 1, 0) + 45p_{3d}^2(b)\mathcal{P}(0, 0, 2, 0, 0, 1) \\
& + 10p_{3d}(b)p_{4s}^2(b)\mathcal{P}(0, 0, 1, 2, 0, 0) + 150p_{3d}(b)p_{4p}^2(b)\mathcal{P}(0, 0, 1, 0, 2, 0) \\
& + 10p_{3d}(b)\mathcal{P}(0, 0, 1, 0, 0, 2) + 120p_{3d}(b)p_{4s}(b)p_{4p}(b)\mathcal{P}(0, 0, 1, 1, 1, 0) \\
& + 20p_{3d}(b)p_{4s}(b)\mathcal{P}(0, 0, 1, 1, 0, 1) + 60p_{3d}(b)p_{4p}(b)\mathcal{P}(0, 0, 1, 0, 1, 1) \\
& + 6p_{4s}^2(b)p_{4p}(b)\mathcal{P}(0, 0, 0, 2, 1, 0) + 30p_{4s}(b)p_{4p}^2(b)\mathcal{P}(0, 0, 0, 1, 2, 0) \\
& + 20p_{4p}^3(b)\mathcal{P}(0, 0, 0, 0, 3, 0); \quad (\text{A-20})
\end{aligned}$$

Para $(P_4)_{V_1}$ temos

$$\begin{aligned}
& (P_4)_{V_1}(b) = 15p_{3s}^2(b)p_{3p}^2(b)[1 - p_{3p}(b)]^4[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(2, 2, 0, 0, 0, 0) \\
& + 45p_{3s}^2(b)p_{3d}(b)[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^8[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(2, 0, 2, 0, 0, 0) \\
& + 60p_{3s}^2(b)p_{3p}(b)p_{3d}(b)[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(2, 1, 1, 0, 0, 0) \\
& + 12p_{3s}^2(b)p_{3p}(b)p_{4s}(b)[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(2, 1, 0, 1, 0, 0)
\end{aligned}$$

$$\begin{aligned}
& + 36p_{3s}^2(b)p_{3p}(b)p_{4p}(b)[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(2, 1, 0, 0, 1, 0) \\
& + 20p_{3s}^2(b)p_{3d}(b)p_{4s}(b)[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(2, 0, 1, 1, 0, 0) \\
& + 60p_{3s}^2(b)p_{3d}(b)p_{4p}(b)[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(2, 0, 1, 0, 1, 0) \\
& + 40p_{3s}(b)p_{3p}^3(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^3[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 3, 0, 0, 0, 0) \\
& + 240p_{3s}(b)p_{3d}^3(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^7[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 3, 0, 0, 0) \\
& + 2p_{3s}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 0, 0, 0, 3) \\
& + 300p_{3s}(b)p_{3p}^2(b)p_{3d}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^4[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 2, 1, 0, 0, 0) \\
& + 60p_{3s}(b)p_{3p}^2(b)p_{4s}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^4[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(1, 2, 0, 1, 0, 0) \\
& + 90p_{3s}(b)p_{3p}^2(b)p_{4p}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^4[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(1, 2, 0, 0, 1, 0) \\
& + 30p_{3s}(b)p_{3p}^2(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^4[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 2, 0, 0, 0, 1) \\
& + 180p_{3s}(b)p_{3d}^2(b)p_{4s}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^8[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 2, 1, 0, 0) \\
& + 540p_{3s}(b)p_{3d}^2(b)p_{4p}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^8[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(1, 0, 2, 0, 1, 0) \\
& + 90p_{3s}(b)p_{3d}^2(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^8[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 2, 0, 0, 1) \\
& + 2p_{3s}(b)p_{4s}^2(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 0, 2, 0, 1) \\
& + 30p_{3s}(b)p_{4p}^2(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4\mathcal{P}(1, 0, 0, 0, 2, 1) \\
& + 540p_{3s}(b)p_{3p}(b)p_{3d}^2(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^8[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 1, 2, 0, 0, 0) \\
& + 12p_{3s}(b)p_{3p}(b)p_{4s}^2(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4p}(b)]^6\mathcal{P}(1, 1, 0, 2, 0, 0) \\
& + 180p_{3s}(b)p_{3p}(b)p_{4p}^2(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4\mathcal{P}(1, 1, 0, 0, 2, 0) \\
& + 12p_{3s}(b)p_{3p}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 1, 0, 0, 0, 2) \\
& + 20p_{3s}(b)p_{3d}(b)p_{4s}^2(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 1, 2, 0, 0) \\
& + 300p_{3s}(b)p_{3d}(b)p_{4p}^2(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4\mathcal{P}(1, 0, 1, 0, 2, 0) \\
& + 20p_{3s}(b)p_{3d}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 1, 0, 0, 2) \\
& + 4p_{3s}(b)p_{4s}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 0, 1, 0, 2) \\
& + 12p_{3s}(b)p_{4p}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(1, 0, 0, 0, 1, 2) \\
& + 240p_{3s}(b)p_{3p}(b)p_{3d}(b)p_{4s}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(1, 1, 1, 1, 0, 0) \\
& + 720p_{3s}(b)p_{3p}(b)p_{3d}(b)p_{4p}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(1, 1, 1, 0, 0, 0) \\
& + 120p_{3s}(b)p_{3p}(b)p_{3d}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(1, 1, 1, 0, 0, 1) \\
& + 144p_{3s}(b)p_{3p}(b)p_{4s}(b)p_{4p}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^5\mathcal{P}(1, 1, 0, 1, 0, 0) \\
& + 240p_{3s}(b)p_{3d}(b)p_{4s}(b)p_{4p}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^5\mathcal{P}(1, 0, 1, 1, 0, 0) \\
& + 40p_{3s}(b)p_{3d}(b)p_{4s}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(1, 0, 1, 1, 0, 1) \\
& + 120p_{3s}(b)p_{3d}(b)p_{4p}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(1, 0, 1, 0, 1, 1) \\
& + 24p_{3s}(b)p_{4s}(b)p_{4p}(b)[1 - p_{3s}(b)][1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^5\mathcal{P}(1, 0, 0, 1, 1, 1) \\
& + 200p_{3p}^3(b)p_{3d}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^3[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 3, 1, 0, 0, 0)
\end{aligned}$$

$$\begin{aligned}
& + 675p_{3p}^2(b)p_{3d}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4[1 - p_{3d}(b)]^8[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 2, 2, 0, 0, 0) \\
& + 15p_{3p}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 2, 0, 0, 0, 2) \\
& + 200p_{3p}^2(b)p_{3d}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 2, 1, 0, 0, 1) \\
& + 40p_{3p}^2(b)p_{4s}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(0, 2, 0, 1, 0, 1) \\
& + 120p_{3p}^2(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^4[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 2, 0, 0, 1, 1) \\
& + 720p_{3p}(b)p_{3d}^3(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^7[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 3, 0, 0, 0) \\
& + 6p_{3p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 0, 0, 0, 3) \\
& + 540p_{3p}(b)p_{3d}^2(b)p_{4s}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^8[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 2, 1, 0, 0) \\
& + 1620p_{3p}(b)p_{3d}^2(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^8[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 1, 2, 0, 1, 1) \\
& + 6p_{3p}(b)p_{4s}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 0, 2, 0, 1) \\
& + 90p_{3p}(b)p_{4p}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4\mathcal{P}(0, 1, 0, 0, 2, 1) \\
& + 60p_{3p}(b)p_{3d}(b)p_{4s}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 1, 2, 0, 0) \\
& + 900p_{3p}(b)p_{3d}(b)p_{4p}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4\mathcal{P}(0, 1, 1, 0, 2, 0) \\
& + 60p_{3p}(b)p_{3d}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 1, 0, 0, 2) \\
& + 12p_{3p}(b)p_{4s}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 0, 1, 0, 2) \\
& + 36p_{3p}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 1, 0, 0, 1, 2) \\
& + 720p_{3p}(b)p_{3d}(b)p_{4s}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^5\mathcal{P}(0, 1, 1, 1, 0, 1) \\
& + 120p_{3p}(b)p_{3d}(b)p_{4s}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 1, 1, 0, 1) \\
& + 360p_{3p}(b)p_{3d}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 1, 1, 0, 1, 1) \\
& + 72p_{3p}(b)p_{4s}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^5[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 1, 0, 1, 1, 1) \\
& + 120p_{3d}^3(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^7[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 3, 0, 0, 1) \\
& + 45p_{3d}^2(b)p_{4s}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^8[1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 2, 2, 0, 0) \\
& + 675p_{3d}^2(b)p_{4p}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^8[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4\mathcal{P}(0, 0, 2, 0, 2, 0) \\
& + 45p_{3d}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^8[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 2, 0, 0, 2) \\
& + 540p_{3d}^2(b)p_{4s}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^8[1 - p_{4s}(b)][1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 2, 1, 1, 0) \\
& + 90p_{3d}^2(b)p_{4s}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^8[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 2, 1, 0, 1) \\
& + 270p_{3d}^2(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^8[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 2, 0, 1, 1) \\
& + 200p_{3d}(b)p_{4p}^3(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^3\mathcal{P}(0, 0, 1, 0, 3, 0) \\
& + 10p_{3d}[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^7[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 1, 0, 0, 3) \\
& + 60p_{3d}(b)p_{4s}^2(b)p_{4p}[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 1, 2, 1, 0) \\
& + 10p_{3d}(b)p_{4s}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 1, 2, 0, 1) \\
& + 150p_{3d}(b)p_{4p}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4\mathcal{P}(0, 0, 1, 0, 2, 1) \\
& + 300p_{3d}(b)p_{4s}(b)p_{4p}^2[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 1, 1, 2, 0)
\end{aligned}$$

$$\begin{aligned}
& + 20p_{3d}(b)p_{4s}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(0, 0, 1, 1, 0, 2) \\
& + 60p_{3d}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 1, 0, 1, 2) \\
& + 120p_{3d}(b)p_{4s}(b)p_{4p}(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^9[1 - p_{4s}(b)][1 - p_{4p}(b)]^5\mathcal{P}(0, 0, 1, 1, 1, 1) \\
& + 15p_{4s}^2(b)p_{4p}^2(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4p}(b)]^4\mathcal{P}(0, 0, 0, 2, 2, 0) \\
& + 40p_{4s}(b)p_{4p}^3(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)][1 - p_{4p}(b)]^3\mathcal{P}(0, 0, 0, 1, 3, 0) \\
& + 15p_{4p}^4(b)[1 - p_{3s}(b)]^2[1 - p_{3p}(b)]^6[1 - p_{3d}(b)]^{10}[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^2\mathcal{P}(0, 0, 0, 0, 4, 0);
\end{aligned}$$

Para $(P_4)_{V_6}$ temos

$$\begin{aligned}
(P_4)_{V_6}(b) = & 15p_{3s}^2(b)p_{3p}^2(b)\mathcal{P}(2, 2, 0, 0, 0, 0) + 45p_{3s}^2(b)p_{3d}(b)\mathcal{P}(2, 0, 2, 0, 0, 0) \\
& + 60p_{3s}^2(b)p_{3p}(b)p_{3d}(b)\mathcal{P}(2, 1, 1, 0, 0, 0) + 12p_{3s}^2(b)p_{3p}(b)p_{4s}(b)\mathcal{P}(2, 1, 0, 1, 0, 0) \\
& + 36p_{3s}^2(b)p_{3p}(b)p_{4p}(b)\mathcal{P}(2, 1, 0, 0, 1, 0) + 20p_{3s}^2(b)p_{3d}(b)p_{4s}(b)\mathcal{P}(2, 0, 1, 1, 0, 0) \\
& + 60p_{3s}^2(b)p_{3d}(b)p_{4p}(b)\mathcal{P}(2, 0, 1, 0, 1, 0) + 40p_{3s}(b)p_{3p}^3(b)\mathcal{P}(1, 3, 0, 0, 0, 0) \\
& + 240p_{3s}(b)p_{3d}^3(b)\mathcal{P}(1, 0, 3, 0, 0, 0) + 2p_{3s}(b)\mathcal{P}(1, 0, 0, 0, 0, 3) \\
& + 300p_{3s}(b)p_{3p}^2(b)p_{3d}(b)\mathcal{P}(1, 2, 1, 0, 0, 0) + 60p_{3s}(b)p_{3p}^2(b)p_{4s}(b)\mathcal{P}(1, 2, 0, 1, 0, 0) \\
& + 90p_{3s}(b)p_{3p}^2(b)p_{4p}(b)\mathcal{P}(1, 2, 0, 0, 1, 0) + 30p_{3s}(b)p_{3p}^2(b)\mathcal{P}(1, 2, 0, 0, 0, 1) \\
& + 180p_{3s}(b)p_{3d}^2(b)p_{4s}(b)\mathcal{P}(1, 0, 2, 1, 0, 0) + 540p_{3s}(b)p_{3d}^2(b)p_{4p}(b)\mathcal{P}(1, 0, 2, 0, 1, 0) \\
& + 90p_{3s}(b)p_{3d}^2(b)\mathcal{P}(1, 0, 2, 0, 0, 1) + 2p_{3s}(b)p_{4s}^2(b)\mathcal{P}(1, 0, 0, 2, 0, 1) \\
& + 30p_{3s}(b)p_{4p}^2(b)\mathcal{P}(1, 0, 0, 0, 2, 1) + 540p_{3s}(b)p_{3p}(b)p_{3d}^2(b)\mathcal{P}(1, 1, 2, 0, 0, 0) \\
& + 12p_{3s}(b)p_{3p}(b)p_{4s}^2(b)\mathcal{P}(1, 1, 0, 2, 0, 0) + 180p_{3s}(b)p_{3p}(b)p_{4p}^2(b)\mathcal{P}(1, 1, 0, 0, 2, 0) \\
& + 12p_{3s}(b)p_{3p}(b)\mathcal{P}(1, 1, 0, 0, 0, 2) + 20p_{3s}(b)p_{3d}(b)p_{4s}^2(b)\mathcal{P}(1, 0, 1, 2, 0, 0) \\
& + 300p_{3s}(b)p_{3d}(b)p_{4p}^2(b)\mathcal{P}(1, 0, 1, 0, 2, 0) + 20p_{3s}(b)p_{3d}(b)\mathcal{P}(1, 0, 1, 0, 0, 2) \\
& + 4p_{3s}(b)p_{4s}(b)\mathcal{P}(1, 0, 0, 1, 0, 2) + 12p_{3s}(b)p_{4p}(b)\mathcal{P}(1, 0, 0, 0, 1, 2) \\
& + 240p_{3s}(b)p_{3p}(b)p_{3d}(b)p_{4s}(b)\mathcal{P}(1, 1, 1, 1, 0, 0) + 720p_{3s}(b)p_{3p}(b)p_{3d}(b)p_{4p}(b)\mathcal{P}(1, 1, 1, 0, 1, 0) \\
& + 120p_{3s}(b)p_{3p}(b)p_{3d}(b)\mathcal{P}(1, 1, 1, 0, 0, 1) + 144p_{3s}(b)p_{3p}(b)p_{4s}(b)p_{4p}(b)\mathcal{P}(1, 1, 0, 1, 1, 0) \\
& + 240p_{3s}(b)p_{3d}(b)p_{4s}(b)p_{4p}(b)\mathcal{P}(1, 0, 1, 1, 1, 0) + 40p_{3s}(b)p_{3d}(b)p_{4s}(b)\mathcal{P}(1, 0, 1, 1, 0, 1) \\
& + 120p_{3s}(b)p_{3d}(b)p_{4p}(b)\mathcal{P}(1, 0, 1, 0, 1, 1) + 24p_{3s}(b)p_{4s}(b)p_{4p}(b)\mathcal{P}(1, 0, 0, 1, 1, 1) \\
& + 200p_{3p}^3(b)p_{3d}(b)\mathcal{P}(0, 3, 1, 0, 0, 0) + 675p_{3p}^2(b)p_{3d}^2(b)\mathcal{P}(0, 2, 2, 0, 0, 0) \\
& + 15p_{3p}^2(b)\mathcal{P}(0, 2, 0, 0, 0, 2) + 200p_{3p}^2(b)p_{3d}(b)\mathcal{P}(0, 2, 1, 0, 0, 1) \\
& + 40p_{3p}^2(b)p_{4s}(b)\mathcal{P}(0, 2, 0, 1, 0, 1) + 120p_{3p}^2(b)p_{4p}(b)\mathcal{P}(0, 2, 0, 0, 1, 1) \\
& + 720p_{3p}(b)p_{3d}^3(b)\mathcal{P}(0, 1, 3, 0, 0, 0) + 6p_{3p}(b)\mathcal{P}(0, 1, 0, 0, 0, 3) \\
& + 540p_{3p}(b)p_{3d}^2(b)p_{4s}(b)\mathcal{P}(0, 1, 2, 1, 0, 0) + 1620p_{3p}(b)p_{3d}^2(b)p_{4p}(b)\mathcal{P}(0, 1, 2, 0, 1, 0) \\
& + 6p_{3p}(b)p_{4s}^2(b)\mathcal{P}(0, 1, 0, 2, 0, 1) + 90p_{3p}(b)p_{4p}^2(b)\mathcal{P}(0, 1, 0, 0, 2, 1) \\
& + 60p_{3p}(b)p_{3d}(b)p_{4s}^2(b)\mathcal{P}(0, 1, 1, 2, 0, 0) + 900p_{3p}(b)p_{3d}(b)p_{4p}^2(b)\mathcal{P}(0, 1, 1, 0, 2, 0)
\end{aligned}$$

$$\begin{aligned}
& + 60p_{3p}(b)p_{3d}(b)\mathcal{P}(0, 1, 1, 0, 0, 2) + 12p_{3p}(b)p_{4s}(b)\mathcal{P}(0, 1, 0, 1, 0, 2) \\
& + 36p_{3p}(b)p_{4p}(b)\mathcal{P}(0, 1, 0, 0, 1, 2) + 720p_{3p}(b)p_{3d}(b)p_{4s}(b)p_{4p}(b)\mathcal{P}(0, 1, 1, 1, 1, 0) \\
& + 120p_{3p}(b)p_{3d}(b)p_{4s}(b)\mathcal{P}(0, 1, 1, 1, 0, 1) + 360p_{3p}(b)p_{3d}(b)p_{4p}(b)\mathcal{P}(0, 1, 1, 0, 1, 1) \\
& + 72p_{3p}(b)p_{4s}(b)p_{4p}(b)\mathcal{P}(0, 1, 0, 1, 1, 1) + 120p_{3d}^3(b)\mathcal{P}(0, 0, 3, 0, 0, 1) \\
& + 45p_{3d}^2(b)p_{4s}^2(b)\mathcal{P}(0, 0, 2, 2, 0, 0) + 675p_{3d}^2(b)p_{4p}^2(b)\mathcal{P}(0, 0, 2, 0, 2, 0) \\
& + 45p_{3d}^2(b)\mathcal{P}(0, 0, 2, 0, 0, 2) + 540p_{3d}^2(b)p_{4s}(b)p_{4p}(b)\mathcal{P}(0, 0, 2, 1, 1, 0) \\
& + 90p_{3d}^2(b)p_{4s}(b)\mathcal{P}(0, 0, 2, 1, 0, 1) + 270p_{3d}^2(b)p_{4p}(b)\mathcal{P}(0, 0, 2, 0, 1, 1) \\
& + 200p_{3d}(b)p_{4p}^3(b)\mathcal{P}(0, 0, 1, 0, 3, 0) + 10p_{3d}\mathcal{P}(0, 0, 1, 0, 0, 3) \\
& + 60p_{3d}(b)p_{4s}^2(b)p_{4p}\mathcal{P}(0, 0, 1, 2, 1, 0) + 10p_{3d}(b)p_{4s}^2(b)\mathcal{P}(0, 0, 1, 2, 0, 1) \\
& + 150p_{3d}(b)p_{4p}^2(b)\mathcal{P}(0, 0, 1, 0, 2, 1) + 300p_{3d}(b)p_{4s}(b)p_{4p}^2\mathcal{P}(0, 0, 1, 1, 2, 0) \\
& + 20p_{3d}(b)p_{4s}(b)\mathcal{P}(0, 0, 1, 1, 0, 2) + 60p_{3d}(b)p_{4p}(b)\mathcal{P}(0, 0, 1, 0, 1, 2) \\
& + 120p_{3d}(b)p_{4s}(b)p_{4p}\mathcal{P}(0, 0, 1, 1, 1, 1) + 15p_{4s}^2(b)p_{4p}^2(b)\mathcal{P}(0, 0, 0, 2, 2, 0) \\
& + 40p_{4s}(b)p_{4p}^3(b)\mathcal{P}(0, 0, 0, 1, 3, 0) + 15p_{4p}^4(b)\mathcal{P}(0, 0, 0, 0, 4, 0); \tag{A-22}
\end{aligned}$$

A.4

O átomo de Xe

A.4.1

Tabelas

Tabela A.12: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 1$, ionização simples, com $n_{\text{pos}} = 0$ para o Xe.

$4s$	$4p$	$4d$	$5s$	$5p$	
n_7	n_8	n_9	n_{10}	n_{11}	n_{pos}
1	0	0	0	0	0
0	1	0	0	0	0
0	0	1	0	0	0
0	0	0	1	0	0
0	0	0	0	1	0

A.4.2

Equações

Para $(P_1)_{V_1}$ temos

Tabela A.13: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 2$, ionização dupla, com $n_{\text{pos}} = 0, 1$ para o Xe.

$4s$	$4p$	$4d$	$5s$	$5p$	
n_7	n_8	n_9	n_{10}	n_{11}	n_{pos}
2	0	0	0	0	0
0	2	0	0	0	0
0	0	2	0	0	0
0	0	0	2	0	0
0	0	0	0	2	0
1	1	0	0	0	0
1	0	1	0	0	0
1	0	0	1	0	0
1	0	0	0	1	0
1	0	0	0	0	1
0	1	1	0	0	0
0	1	0	1	0	0
0	1	0	0	1	0
0	1	0	0	0	1
0	0	1	1	0	0
0	0	1	0	1	0
0	0	1	0	0	1
0	0	0	1	1	0

$$\begin{aligned}
(P_1)_{V_1}(b) &= 6p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 0, 0, 0, 1, 0) \\
&+ 2p_{5s}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(0, 0, 0, 1, 0, 0) \\
&+ 10p_{4d}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 0, 1, 0, 0, 0) \\
&+ 6p_{4p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 1, 0, 0, 0, 0) \\
&+ 2p_{4s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(1, 0, 0, 0, 0, 0); \quad (\text{A-23})
\end{aligned}$$

Para $(P_1)_{V_6}$ temos

$$\begin{aligned}
(P_1)_{V_6}(b) &= 6p_{5p}(b)\mathcal{P}(0, 0, 0, 0, 1, 0) + 2p_{5s}(b)\mathcal{P}(0, 0, 0, 1, 0, 0) \\
&+ 10p_{4d}(b)\mathcal{P}(0, 0, 1, 0, 0, 0) + 6p_{4p}(b)\mathcal{P}(0, 1, 0, 0, 0, 0) \\
&+ 2p_{4s}(b)\mathcal{P}(1, 0, 0, 0, 0, 0) \quad (\text{A-24})
\end{aligned}$$

Para $(P_2)_{V_1}$ temos

Tabela A.14: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 3$, ionização tripla, com $n_{\text{pos}} = 0, 1, 2$ para o Xe.

$4s$	$4p$	$4d$	$5s$	$5p$		$4s$	$4p$	$4d$	$5s$	$5p$	
n_7	n_8	n_9	n_{10}	n_{11}	n_{pos}	n_7	n_8	n_9	n_{10}	n_{11}	n_{pos}
2	1	0	0	0	0	0	1	0	2	0	0
2	0	1	0	0	0	0	1	0	0	2	0
2	0	0	1	0	0	0	1	0	0	0	2
2	0	0	0	1	0	0	1	1	1	0	0
2	0	0	0	0	1	0	1	1	0	1	0
1	2	0	0	0	0	0	1	1	0	0	1
1	0	2	0	0	0	0	1	0	1	1	0
1	0	0	2	0	0	0	1	0	1	0	1
1	0	0	0	2	0	0	1	0	0	1	1
1	0	0	0	0	2	0	0	2	1	0	0
1	1	1	0	0	0	0	0	2	0	1	0
1	1	0	1	0	0	0	0	2	0	0	1
1	1	0	0	1	0	0	0	1	2	0	0
1	1	0	0	0	1	0	0	1	0	2	0
1	0	1	1	0	0	0	0	1	0	0	2
1	0	1	0	1	0	0	0	1	1	1	0
1	0	1	0	0	1	0	0	1	1	0	1
1	0	0	1	1	0	0	0	1	0	1	1
1	0	0	1	0	1	0	0	3	0	0	0
1	0	0	0	1	1	0	0	0	2	1	0
0	3	0	0	0	0	0	0	0	1	2	0
0	2	1	0	0	0	0	0	0	0	3	0
0	2	0	1	0	0						
0	2	0	0	1	0						
0	2	0	0	0	1						
0	1	2	0	0	0						

Tabela A.15: Combinações possíveis do número de elétrons ionizados por subcamada e respectiva emissão pós-colisional para $n = 4$, ionização quádrupla, com $n_{\text{pos}} = 0, 1, 2e3$ para o Xe.

$4s$	$4p$	$4d$	$5s$	$5p$		$4s$	$4p$	$4d$	$5s$	$5p$		$4s$	$4p$	$4d$	$5s$	$5p$	
n_7	n_8	n_9	n_{10}	n_{11}	n_{pos}	n_7	n_8	n_9	n_{10}	n_{11}	n_{pos}	n_7	n_8	n_9	n_{10}	n_{11}	n_{pos}
2	2	0	0	0	0	1	0	0	1	2	0	0	1	0	0	2	1
2	0	2	0	0	0	1	0	0	1	0	2	0	1	1	2	0	0
2	0	0	2	0	0	1	0	0	0	1	2	0	1	1	0	2	0
2	0	0	0	2	0	1	1	1	1	0	0	0	1	1	0	0	2
2	0	0	0	0	2	1	1	1	0	1	0	0	1	0	1	2	0
2	1	1	0	0	0	1	1	1	0	0	1	0	1	0	1	0	2
2	1	0	1	0	0	1	1	0	1	1	0	0	1	0	0	1	2
2	1	0	0	1	0	1	1	0	1	0	1	0	1	1	1	1	0
2	1	0	0	0	1	1	1	0	0	1	1	0	1	1	1	0	1
2	0	1	1	0	0	1	0	1	1	1	0	0	1	1	0	1	1
2	0	1	0	1	0	1	0	1	1	0	1	0	1	0	1	1	1
2	0	1	0	0	1	1	0	1	0	1	1	0	0	4	0	0	0
2	0	0	1	1	0	1	0	0	1	1	1	0	0	3	1	0	0
2	0	0	1	0	1	0	4	0	0	0	0	0	0	3	0	1	0
2	0	0	0	1	1	0	3	1	0	0	0	0	0	3	0	0	1
1	3	0	0	0	0	0	3	0	1	0	0	0	0	2	2	0	0
1	0	3	0	0	0	0	3	0	0	1	0	0	0	2	0	2	0
1	0	0	0	3	0	0	3	0	0	0	1	0	0	2	0	0	2
1	0	0	0	0	3	0	2	2	0	0	0	0	0	2	1	1	0
1	2	1	0	0	0	0	2	0	2	0	0	0	0	2	1	0	1
1	2	0	1	0	0	0	2	0	0	2	0	0	0	2	0	1	1
1	2	0	0	1	0	0	2	0	0	0	2	0	0	1	0	3	0
1	2	0	0	0	1	0	2	1	1	0	0	0	0	1	0	0	3
1	0	2	1	0	0	0	2	1	0	1	0	0	0	1	2	1	0
1	0	2	0	1	0	0	2	1	0	0	1	0	0	1	2	0	1
1	0	2	0	0	1	0	2	0	1	1	0	0	0	1	0	2	1
1	0	0	2	1	0	0	2	0	1	0	1	0	0	1	1	2	0
1	0	0	2	0	1	0	2	0	0	1	1	0	0	1	1	0	2
1	0	0	0	2	1	0	1	3	0	0	0	0	0	1	0	1	2
1	1	2	0	0	0	0	1	0	0	3	0	0	0	1	1	1	1
1	1	0	2	0	0	0	1	0	0	0	3	0	0	0	2	2	0
1	1	0	0	2	0	0	1	2	1	0	0	0	0	0	1	3	0
1	1	0	0	0	2	0	1	2	0	1	0	0	0	0	0	4	0
1	0	1	2	0	0	0	1	2	0	0	1	0	0	1	2	0	0
1	0	1	0	2	0	0	1	0	2	1	0	0	0	1	0	2	0
1	0	1	0	0	2	0	1	0	2	0	1	0	0	0	0	4	0

$$\begin{aligned}
 (P_2)_{V_1}(b) = & 15p_{5p}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^4\mathcal{P}(0, 0, 0, 0, 2, 0) \\
 + & 2p_{5s}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5p}(b)]^6\mathcal{P}(0, 0, 0, 2, 0, 0) \\
 + & 12p_{5s}(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^5\mathcal{P}(0, 0, 0, 1, 1, 0) \\
 + & 60p_{4d}(b)p_{4p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 1, 0, 0, 0) \\
 + & 20p_{4d}(b)p_{4s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 1, 0, 0, 0) \\
 + & 10p_{4d}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 0, 1, 0, 0, 1) \\
 + & 6p_{4p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 0, 0, 0, 1) \\
 + & 2p_{4s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 0, 0, 0, 1); \tag{A-25}
 \end{aligned}$$

Para $(P_2)_{V_6}$ temos

$$\begin{aligned}
 (P_2)_{V_6}(b) = & 15p_{5p}^2(b)\mathcal{P}(0, 0, 0, 0, 2, 0) + 2p_{5s}^2(b)\mathcal{P}(0, 0, 0, 2, 0, 0) \\
 + & 12p_{5s}(b)p_{5p}(b)\mathcal{P}(0, 0, 0, 1, 1, 0) + 60p_{4d}(b)p_{4p}(b)\mathcal{P}(0, 1, 1, 0, 0, 0) \\
 + & 20p_{4d}(b)p_{4s}(b)\mathcal{P}(1, 0, 1, 0, 0, 0) + 10p_{4d}(b)\mathcal{P}(0, 0, 1, 0, 0, 1) \\
 + & 6p_{4p}(b)\mathcal{P}(0, 1, 0, 0, 0, 1) + 2p_{4s}(b)\mathcal{P}(1, 0, 0, 0, 0, 1); \tag{A-26}
 \end{aligned}$$

Para $(P_3)_{V_1}$ temos

$$\begin{aligned}
 (P_3)_{V_1}(b) = & 6p_{4s}^2(b)p_{4p}(b)[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(2, 1, 0, 0, 0, 0) \\
 + & 10p_{4s}^2(b)p_{4d}(b)[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(2, 0, 1, 0, 0, 0) \\
 + & 30p_{4s}(b)p_{4p}^2(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 2, 0, 0, 0, 0) \\
 + & 2p_{4s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 0, 0, 0, 2) \\
 + & 120p_{4s}(b)p_{4p}(b)p_{4d}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 1, 1, 0, 0, 0) \\
 + & 24p_{4s}(b)p_{4p}(b)p_{5s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(1, 1, 0, 1, 0, 0) \\
 + & 72p_{4s}(b)p_{4p}(b)p_{5p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}^2(b)][1 - p_{5p}(b)]^5\mathcal{P}(1, 1, 0, 0, 1, 0) \\
 + & 120p_{4s}(b)p_{4d}(b)p_{5p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}^2(b)][1 - p_{5p}(b)]^5\mathcal{P}(1, 0, 1, 0, 1, 0) \\
 + & 4p_{4s}(b)p_{5s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 0, 1, 0, 1) \\
 + & 12p_{4s}(b)p_{5p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(1, 0, 0, 0, 1, 1) \\
 + & 150p_{4p}^2(b)p_{4d}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 2, 1, 0, 0, 0) \\
 + & 270p_{4p}(b)p_{4d}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 2, 0, 0, 0) \\
 + & 6p_{4p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 0, 0, 0, 2) \\
 + & 120p_{4p}(b)p_{4d}(b)p_{5s}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)][1 - p_{4p}(b)]^6\mathcal{P}(0, 1, 1, 1, 0, 0)
 \end{aligned}$$

$$\begin{aligned}
& + 360p_{4p}(b)p_{4d}(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 1, 1, 0, 1, 0) \\
& + 12p_{4p}(b)p_{5s}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 0, 1, 0, 1) \\
& + 36p_{4p}(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 1, 0, 0, 1, 1) \\
& + 10p_{4d}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 0, 1, 0, 0, 2) \\
& + 20p_{4d}(b)p_{5s}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(0, 0, 1, 1, 0, 1) \\
& + 60p_{4d}(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 0, 1, 0, 1, 1) \\
& + 6p_{5s}^2(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5p}(b)]^5\mathcal{P}(0, 0, 0, 2, 1, 0) \\
& + 30p_{5s}(b)p_{5p}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^4\mathcal{P}(0, 0, 0, 1, 2, 0) \\
& + 20p_{5p}^3(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^3\mathcal{P}(0, 0, 0, 0, 3, 0); \quad (\text{A-27})
\end{aligned}$$

Para $(P_3)_{V_6}$ temos

$$\begin{aligned}
& (P_3)_{V_6}(b) = 6p_{4s}^2(b)p_{4p}(b)\mathcal{P}(2, 1, 0, 0, 0, 0) \\
& + 10p_{4s}^2(b)p_{4d}(b)\mathcal{P}(2, 0, 1, 0, 0, 0) + 30p_{4s}(b)p_{4p}^2(b)\mathcal{P}(1, 2, 0, 0, 0, 0) \\
& + 2p_{4s}(b)\mathcal{P}(1, 0, 0, 0, 0, 2) + 120p_{4s}(b)p_{4p}(b)p_{4d}(b)\mathcal{P}(1, 1, 1, 0, 0, 0) \\
& + 24p_{4s}(b)p_{4p}(b)p_{5s}(b)\mathcal{P}(1, 1, 0, 1, 0, 0) + 72p_{4s}(b)p_{4p}(b)p_{5p}(b)\mathcal{P}(1, 1, 0, 0, 1, 0) \\
& + 120p_{4s}(b)p_{4d}(b)p_{5p}(b)\mathcal{P}(1, 0, 1, 0, 1, 0) + 4p_{4s}(b)p_{5s}(b)\mathcal{P}(1, 0, 0, 1, 0, 1) \\
& + 12p_{4s}(b)p_{5p}(b)\mathcal{P}(1, 0, 0, 0, 1, 1) + 150p_{4p}^2(b)p_{4d}(b)\mathcal{P}(0, 2, 1, 0, 0, 0) \\
& + 270p_{4p}(b)p_{4d}^2(b)\mathcal{P}(0, 1, 2, 0, 0, 0) + 6p_{4p}(b)\mathcal{P}(0, 1, 0, 0, 0, 2) \\
& + 120p_{4p}(b)p_{4d}(b)p_{5s}(b)\mathcal{P}(0, 1, 1, 1, 0, 0) + 360p_{4p}(b)p_{4d}(b)p_{5p}(b)\mathcal{P}(0, 1, 1, 0, 1, 0) \\
& + 12p_{4p}(b)p_{5s}(b)\mathcal{P}(0, 1, 0, 1, 0, 1) + 36p_{4p}(b)p_{5p}(b)\mathcal{P}(0, 1, 0, 0, 1, 1) \\
& + 10p_{4d}(b)\mathcal{P}(0, 0, 1, 0, 0, 2) + 20p_{4d}(b)p_{5s}(b)\mathcal{P}(0, 0, 1, 1, 0, 1) \\
& + 60p_{4d}(b)p_{5p}(b)\mathcal{P}(0, 0, 1, 0, 1, 1) + 6p_{5s}^2(b)p_{5p}(b)\mathcal{P}(0, 0, 0, 2, 1, 0) \\
& + 30p_{5s}(b)p_{5p}^2(b)\mathcal{P}(0, 0, 0, 1, 2, 0) + 20p_{5p}^3(b)\mathcal{P}(0, 0, 0, 0, 3, 0); \quad (\text{A-28})
\end{aligned}$$

Para $(P_4)_{V_1}$ temos

$$\begin{aligned}
& (P_4)_{V_1}(b) = 15p_{4p}^4(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^2[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 4, 0, 0, 0, 0) \\
& + 15p_{4s}^2(b)p_{4p}^2(b)[1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(2, 2, 0, 0, 0, 0) \\
& + 45p_{4s}^2(b)p_{4d}^2(b)[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^8[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(2, 0, 2, 0, 0, 0) \\
& + 12p_{4s}^2(b)p_{4p}(b)p_{5s}(b)[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(2, 1, 0, 1, 0, 0) \\
& + 36p_{4s}^2(b)p_{4p}(b)p_{5p}(b)[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(2, 1, 0, 0, 1, 0) \\
& + 20p_{4s}^2(b)p_{4d}(b)p_{5s}(b)[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(2, 0, 1, 1, 0, 0) \\
& + 40p_{4s}(b)p_{4p}^3(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^3[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 3, 0, 0, 0, 0)
\end{aligned}$$

$$\begin{aligned}
& + 240p_{4s}(b)p_{4d}^3(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^7[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 3, 0, 0, 0) \\
& + 2p_{4s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 0, 0, 0, 3) \\
& + 300p_{4s}(b)p_{4p}^2(b)p_{4d}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 2, 1, 0, 0, 0) \\
& + 60p_{4s}(b)p_{4p}^2(b)p_{5s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(1, 2, 0, 1, 0, 0) \\
& + 90p_{4s}(b)p_{4p}^2(b)p_{5p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(1, 2, 0, 0, 1, 0) \\
& + 180p_{4s}(b)p_{4d}^2(b)p_{5s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^8[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 2, 1, 0, 0) \\
& + 540p_{4s}(b)p_{4d}^2(b)p_{5p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^8[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(1, 0, 2, 0, 1, 0) \\
& + 2p_{4s}(b)p_{5s}^2(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 0, 2, 0, 1) \\
& + 30p_{4s}(b)p_{5p}^2(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^4\mathcal{P}(1, 0, 0, 0, 2, 1) \\
& + 540p_{4s}(b)p_{4p}(b)p_{4d}^2(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^8[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 1, 2, 0, 0, 0) \\
& + 12p_{4s}(b)p_{4p}(b)p_{5s}^2(b)[1 - p_{5s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5p}(b)]^6\mathcal{P}(1, 1, 0, 2, 0, 0) \\
& + 180p_{4s}(b)p_{4p}(b)p_{5p}^2(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^4\mathcal{P}(1, 1, 0, 0, 2, 0) \\
& + 12p_{4s}(b)p_{4p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 1, 0, 0, 0, 2) \\
& + 20p_{4s}(b)p_{4d}(b)p_{5s}^2(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 1, 2, 0, 0) \\
& + 300p_{4s}(b)p_{4d}(b)p_{5p}^2(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^4\mathcal{P}(1, 0, 1, 0, 2, 0) \\
& + 20p_{4s}(b)p_{4d}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 1, 0, 0, 2) \\
& + 4p_{4s}(b)p_{5s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(1, 0, 0, 1, 0, 2) \\
& + 12p_{4s}(b)p_{5p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(1, 0, 0, 0, 1, 2) \\
& + 240p_{4s}(b)p_{4p}(b)p_{4d}(b)p_{5s}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(1, 1, 1, 1, 0, 0) \\
& + 720p_{4s}(b)p_{4p}(b)p_{4d}(b)p_{5p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(1, 1, 1, 0, 0, 0) \\
& + 120p_{4s}(b)p_{4p}(b)p_{4d}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(1, 1, 1, 0, 0, 1) \\
& + 144p_{4s}(b)p_{4p}(b)p_{5s}(b)p_{5p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^5\mathcal{P}(1, 1, 0, 1, 0, 0) \\
& + 240p_{4s}(b)p_{4d}(b)p_{5s}(b)p_{5p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)][1 - p_{5p}(b)]^5\mathcal{P}(1, 0, 1, 1, 0, 0) \\
& + 24p_{4s}(b)p_{5s}(b)p_{5p}(b)[1 - p_{4s}(b)][1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^5\mathcal{P}(1, 0, 0, 1, 1, 1) \\
& + 200p_{4p}^3(b)p_{4d}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^3[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 3, 1, 0, 0, 0) \\
& + 675p_{4p}^2(b)p_{4d}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^8[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 2, 2, 0, 0, 0) \\
& + 15p_{4p}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 2, 0, 0, 0, 2) \\
& + 40p_{4p}^2(b)p_{5s}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(0, 2, 0, 1, 0, 1) \\
& + 900p_{4p}^2(b)p_{4d}(b)p_{5s}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^9[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(0, 2, 1, 1, 0, 0) \\
& + 900p_{4p}^2(b)p_{4d}(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 2, 1, 0, 1, 0) \\
& + 120p_{4p}^2(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^4[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 2, 0, 0, 1, 1) \\
& + 720p_{4p}(b)p_{4d}^3(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^7[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 3, 0, 0, 0) \\
& + 6p_{4p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 0, 0, 0, 3)
\end{aligned}$$

$$\begin{aligned}
& + 540p_{4p}(b)p_{4d}^2(b)p_{5s}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^8[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 2, 1, 0, 0) \\
& + 1620p_{4p}(b)p_{4d}^2(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^8[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 1, 2, 0, 1, 0) \\
& + 6p_{4p}(b)p_{5s}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 0, 2, 0, 1) \\
& + 90p_{4p}(b)p_{5p}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^4\mathcal{P}(0, 1, 0, 0, 2, 1) \\
& + 60p_{4p}(b)p_{4d}(b)p_{5s}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 1, 2, 0, 0) \\
& + 900p_{4p}(b)p_{4d}(b)p_{5p}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^4\mathcal{P}(0, 1, 1, 0, 2, 0) \\
& + 60p_{4p}(b)p_{4d}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 1, 0, 0, 2) \\
& + 12p_{4p}(b)p_{5s}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(0, 1, 0, 1, 0, 2) \\
& + 720p_{4p}(b)p_{4d}(b)p_{5s}(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)][1 - p_{5p}(b)]^5\mathcal{P}(0, 1, 1, 1, 0, 0) \\
& + 72p_{4p}(b)p_{5s}(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^5[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 1, 0, 1, 1, 1) \\
& + 45p_{4d}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^8[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^6\mathcal{P}(0, 0, 2, 0, 0, 2) \\
& + 270p_{4d}^2(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^8[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 0, 2, 0, 1, 1) \\
& + 10p_{4d}(b)p_{5s}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5p}(b)]^6\mathcal{P}(0, 0, 1, 2, 0, 1) \\
& + 150p_{4d}(b)p_{5p}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^4\mathcal{P}(0, 0, 1, 0, 2, 1) \\
& + 20p_{4d}(b)p_{5s}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)][1 - p_{5p}(b)]^6\mathcal{P}(0, 0, 1, 1, 0, 2) \\
& + 60p_{4d}(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)]^2[1 - p_{5p}(b)]^5\mathcal{P}(0, 0, 1, 0, 1, 2) \\
& + 120p_{4d}(b)p_{5s}(b)p_{5p}(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^9[1 - p_{5s}(b)][1 - p_{5p}(b)]^5\mathcal{P}(0, 0, 1, 1, 1, 1) \\
& + 15p_{5s}^2(b)p_{5p}^2(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5p}(b)]^4\mathcal{P}(0, 0, 0, 2, 2, 0) \\
& + 40p_{5s}(b)p_{5p}^3(b)[1 - p_{4s}(b)]^2[1 - p_{4p}(b)]^6[1 - p_{4d}(b)]^{10}[1 - p_{5s}(b)][1 - p_{5p}(b)]^3\mathcal{P}(0, 0, 0, 1, 3, 0); \quad (1)
\end{aligned}$$

Para $(P_4)_{V_6}$ temos

$$\begin{aligned}
& (P_4)_{V_6}(b) = 15p_{4p}^4(b)\mathcal{P}(0, 4, 0, 0, 0, 0) + 15p_{4s}^2(b)p_{4p}^2(b)\mathcal{P}(2, 2, 0, 0, 0, 0) \\
& + 45p_{4s}^2(b)p_{4d}^2(b)\mathcal{P}(2, 0, 2, 0, 0, 0) + 12p_{4s}^2(b)p_{4p}(b)p_{5s}(b)\mathcal{P}(2, 1, 0, 1, 0, 0) \\
& + 36p_{4s}^2(b)p_{4p}(b)p_{5p}(b)\mathcal{P}(2, 1, 0, 0, 1, 0) + 20p_{4s}^2(b)p_{4d}(b)p_{5s}(b)\mathcal{P}(2, 0, 1, 1, 0, 0) \\
& + 40p_{4s}(b)p_{4p}^3(b)\mathcal{P}(1, 3, 0, 0, 0, 0) + 240p_{4s}(b)p_{4d}^3(b)\mathcal{P}(1, 0, 3, 0, 0, 0) \\
& + 2p_{4s}(b)\mathcal{P}(1, 0, 0, 0, 0, 3) + 300p_{4s}(b)p_{4p}^2(b)p_{4d}(b)\mathcal{P}(1, 2, 1, 0, 0, 0) \\
& + 60p_{4s}(b)p_{4p}^2(b)p_{5s}(b)\mathcal{P}(1, 2, 0, 1, 0, 0) + 90p_{4s}(b)p_{4p}^2(b)p_{5p}(b)\mathcal{P}(1, 2, 0, 0, 1, 0) \\
& + 180p_{4s}(b)p_{4d}^2(b)p_{5s}(b)\mathcal{P}(1, 0, 2, 1, 0, 0) + 540p_{4s}(b)p_{4d}^2(b)p_{5p}(b)\mathcal{P}(1, 0, 2, 0, 1, 0) \\
& + 2p_{4s}(b)p_{5s}^2(b)\mathcal{P}(1, 0, 0, 2, 0, 1) + 30p_{4s}(b)p_{5p}^2(b)\mathcal{P}(1, 0, 0, 0, 2, 1) \\
& + 540p_{4s}(b)p_{4p}(b)p_{4d}^2(b)\mathcal{P}(1, 1, 2, 0, 0, 0) + 12p_{4s}(b)p_{4p}(b)p_{5s}^2(b)\mathcal{P}(1, 1, 0, 2, 0, 0) \\
& + 180p_{4s}(b)p_{4p}(b)p_{5p}^2(b)\mathcal{P}(1, 1, 0, 0, 2, 0) + 12p_{4s}(b)p_{4p}(b)\mathcal{P}(1, 1, 0, 0, 0, 2) \\
& + 20p_{4s}(b)p_{4d}(b)p_{5s}^2(b)\mathcal{P}(1, 0, 1, 2, 0, 0) + 300p_{4s}(b)p_{4d}(b)p_{5p}^2(b)\mathcal{P}(1, 0, 1, 0, 2, 0) \\
& + 20p_{4s}(b)p_{4d}(b)\mathcal{P}(1, 0, 1, 0, 0, 2) + 4p_{4s}(b)p_{5s}(b)\mathcal{P}(1, 0, 0, 1, 0, 2)
\end{aligned}$$

$$\begin{aligned}
& + 12p_{4s}(b)p_{5p}(b)\mathcal{P}(1, 0, 0, 0, 1, 2) + 240p_{4s}(b)p_{4p}(b)p_{4d}(b)p_{5s}(b)\mathcal{P}(1, 1, 1, 1, 0, 0) \\
& + 720p_{4s}(b)p_{4p}(b)p_{4d}(b)p_{5p}(b)\mathcal{P}(1, 1, 1, 0, 1, 0) + 120p_{4s}(b)p_{4p}(b)p_{4d}(b)\mathcal{P}(1, 1, 1, 0, 0, 1) \\
& + 144p_{4s}(b)p_{4p}(b)p_{5s}(b)p_{5p}(b)\mathcal{P}(1, 1, 0, 1, 1, 0) + 240p_{4s}(b)p_{4d}(b)p_{5s}(b)p_{5p}(b)\mathcal{P}(1, 0, 1, 1, 1, 0) \\
& + 24p_{4s}(b)p_{5s}(b)p_{5p}(b)\mathcal{P}(1, 0, 0, 1, 1, 1) + 200p_{4p}^3(b)p_{4d}(b)\mathcal{P}(0, 3, 1, 0, 0, 0) \\
& + 675p_{4p}^2(b)p_{4d}^2(b)\mathcal{P}(0, 2, 2, 0, 0, 0) + 15p_{4p}^2(b)\mathcal{P}(0, 2, 0, 0, 0, 2) \\
& + 40p_{4p}^2(b)p_{5s}(b)\mathcal{P}(0, 2, 0, 1, 0, 1) + 900p_{4p}^2(b)p_{4d}(b)p_{5s}(b)\mathcal{P}(0, 2, 1, 1, 0, 0) \\
& + 900p_{4p}^2(b)p_{4d}(b)p_{5p}(b)\mathcal{P}(0, 2, 1, 0, 1, 0) + 120p_{4p}^2(b)p_{5p}(b)\mathcal{P}(0, 2, 0, 0, 1, 1) \\
& + 720p_{4p}(b)p_{4d}^3(b)\mathcal{P}(0, 1, 3, 0, 0, 0) + 6p_{4p}(b)\mathcal{P}(0, 1, 0, 0, 0, 3) \\
& + 540p_{4p}(b)p_{4d}^2(b)p_{5s}(b)\mathcal{P}(0, 1, 2, 1, 0, 0) + 1620p_{4p}(b)p_{4d}^2(b)p_{5p}(b)\mathcal{P}(0, 1, 2, 0, 1, 0) \\
& + 6p_{4p}(b)p_{5s}^2(b)\mathcal{P}(0, 1, 0, 2, 0, 1) + 90p_{4p}(b)p_{5p}^2(b)\mathcal{P}(0, 1, 0, 0, 2, 1) \\
& + 60p_{4p}(b)p_{4d}(b)p_{5s}^2(b)\mathcal{P}(0, 1, 1, 2, 0, 0) + 900p_{4p}(b)p_{4d}(b)p_{5p}^2(b)\mathcal{P}(0, 1, 1, 0, 2, 0) \\
& + 60p_{4p}(b)p_{4d}(b)\mathcal{P}(0, 1, 1, 0, 0, 2) + 12p_{4p}(b)p_{5s}(b)\mathcal{P}(0, 1, 0, 1, 0, 2) \\
& + 720p_{4p}(b)p_{4d}(b)p_{5s}(b)p_{5p}(b)\mathcal{P}(0, 1, 1, 1, 1, 0) + 72p_{4p}(b)p_{5s}(b)p_{5p}(b)\mathcal{P}(0, 1, 0, 1, 1, 1) \\
& + 45p_{4d}^2(b)\mathcal{P}(0, 0, 2, 0, 0, 2) + 270p_{4d}^2(b)p_{5p}(b)\mathcal{P}(0, 0, 2, 0, 1, 1) \\
& + 10p_{4d}(b)p_{5s}^2(b)\mathcal{P}(0, 0, 1, 2, 0, 1) + 150p_{4d}(b)p_{5p}^2(b)\mathcal{P}(0, 0, 1, 0, 2, 1) \\
& + 20p_{4d}(b)p_{5s}(b)\mathcal{P}(0, 0, 1, 1, 0, 2) + 60p_{4d}(b)p_{5p}(b)\mathcal{P}(0, 0, 1, 0, 1, 2) \\
& + 120p_{4d}(b)p_{5s}(b)p_{5p}\mathcal{P}(0, 0, 1, 1, 1, 1) + 15p_{5s}^2(b)p_{5p}^2(b)\mathcal{P}(0, 0, 0, 2, 2, 0) \\
& + 40p_{5s}(b)p_{5p}^3(b)\mathcal{P}(0, 0, 0, 1, 3, 0); \tag{A-30}
\end{aligned}$$