

主な点群のキャラクターテーブルと基底

1次元テンソルを V 、2次元テンソルを D 、3次元テンソルを Y 、4次元テンソルを W で表し、分子固定座標系を (a, b, c) 系とする。ラマン散乱やレーリー散乱に対する散乱テンソルは D に属し、SHG、SFGの感受率テンソルは Y に、CARS, CSRS, THG といった4波混合の感受率テンソルは W に属する。

対称種ごとにキャラクターテーブル、球対称群におけるテンソルの基底が属する既約表現の分類表を示し、最後にゼロでない値を持つテンソル成分の一覧を示す。

ここでいうゼロでない値を持つ成分とは、(光吸収やラマン散乱のような)分子の励起を伴わない散乱過程、即ちレーリー散乱、SFG、SHG、CARS、4波混合等を与える感受率テンソルの成分である。全対称表現に属する基底だけが値を持ち、それ以外の表現に属する基底はゼロであるという条件から、別ファイル「基底テンソル」を参照して(逆変換をすることで)デカルト座標でのノンゼロ成分とその間の関係を見出すことが出来る。

ラマンテンソルについては、2次元テンソル D の成分が属する既約表現と同じ対称の振動モードが、そのテンソル成分によってラマン散乱を生起するという条件が成り立つ。ラマン散乱のノンゼロ成分の探し方については、 W テンソルの成分のうちのしかるべき形をしたもの(同じ D テンソル成分の直積、下付き文字の並び方が $abba$ の形をしたもの)を選ぶとき、その時の D_{ab} がラマンテンソルのノンゼロ成分であるというやり方も可能である。

目次

(下の目次で*印を付けた対称性をもつ系は SFG 活性である。)

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2 — C_s^* , C_1 , C_2^*	12 — D_{4h}
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6 — C_{5v} *, C_{4v} *	16 — S_6 , C_{3h}^*
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8 — C_{6v} *, D_6^*	18 — T_d^* , T_h
9 — D_{3d} *, D_{4d}	19 — T^* , O
10 — D_{5d} , D_{6d}	20 — O_h
11 — D_{3h} *, D_{5h}	21 — $C_{\infty v}$ *
	22 — $D_{\infty h}$

C_s	E	σ_{xy}			
A'	+1	+1	T_x, T_y	R_z	x^2, y^2, z^2, xy
A''	+1	-1	T_z	R_x, R_y	xz, yz

C_s	HN ₃
A'	$V_{1b}, V_{1a}, D^{(0)}_0, D^{(1)}_0, D^{(2)}_0, D^{(2)}_{2b}, D^{(2)}_{2a}, Y^{(1)}_{1b}, Y^{(1)}_{1a}, Y^{(2)}_{1b}, Y^{(2)}_{1a}, Y^{(3)}_{1b}, Y^{(3)}_{1a}, Y^{(3)}_{3b}, Y^{(3)}_{3a}$ $W^{(0)}_0, W^{(1)}_0, W^{(2)}_0, W^{(2)}_{2b}, W^{(2)}_{2a}, W^{(3)}_0, W^{(3)}_{2b}, W^{(3)}_{2a}, W^{(4)}_0, W^{(4)}_{2b}, W^{(4)}_{2a}, W^{(4)}_{4b}, W^{(4)}_{4a}$
A''	$V_0, D^{(1)}_{1b}, D^{(1)}_{1a}, D^{(2)}_{1b}, D^{(2)}_{1a}, Y^{(0)}_0, Y^{(1)}_0, Y^{(2)}_0, Y^{(3)}_0, Y^{(2)}_{2b}, Y^{(2)}_{2a}, Y^{(3)}_{2b}, Y^{(3)}_{2a}$ $W^{(1)}_{1b}, W^{(1)}_{1a}, W^{(2)}_{1b}, W^{(2)}_{1a}, W^{(3)}_{1b}, W^{(3)}_{1a}, W^{(3)}_{3b}, W^{(3)}_{3a}, W^{(4)}_{1b}, W^{(4)}_{1a}, W^{(4)}_{3b}, W^{(4)}_{3a}$

$\beta_{aaa}, \beta_{bbb}, \beta_{acc}, \beta_{bcc}, \beta_{abb}, \beta_{aab}, \beta_{cac}, \beta_{cca}, \beta_{cbc}, \beta_{ccb}, \beta_{bab}, \beta_{bba}, \beta_{aba}, \beta_{baa}, \beta_{aaa}$,

$\gamma_{aaa}, \gamma_{bbb}, \gamma_{ccc}, \gamma_{aabb}, \gamma_{bbcc}, \gamma_{caaa}, \gamma_{bbba}, \gamma_{ccbb}, \gamma_{aac}, \gamma_{abba}, \gamma_{bccb}, \gamma_{caab}, \gamma_{bbaa}, \gamma_{cbcc}, \gamma_{acc}, \gamma_{abba}, \gamma_{bbba}, \gamma_{cbcc}, \gamma_{ccaa}, \gamma_{abab}, \gamma_{bbaa}, \gamma_{cbcb}, \gamma_{ccaa}, \gamma_{aac}$,

$\gamma_{aaab}, \gamma_{bbba}, \gamma_{ccca}, \gamma_{abaa}, \gamma_{abbb}, \gamma_{abcc}, \gamma_{aaba}, \gamma_{bbba}, \gamma_{cbca}, \gamma_{baaa}, \gamma_{babb}, \gamma_{baac}, \gamma_{aacb}, \gamma_{cabc}, \gamma_{cbca}, \gamma_{cbac}, \gamma_{acbc}, \gamma_{cabc}, \gamma_{cbac}, \gamma_{cbac}, \gamma_{caac}, \gamma_{bbba}$

C_i	E	I			
A _g	+1	+1		R_x, R_y, R_z	all components
A _u	+1	-1	T_x, T_y, T_z		

C_i	trans-CFH ₂ -CFH ₂ without internal rotation
A _g	$D^{(0)}_0, D^{(1)}_0, D^{(1)}_{1b}, D^{(1)}_{1a}, D^{(2)}_0, D^{(2)}_{1b}, D^{(2)}_{1a}, D^{(2)}_{2b}, D^{(2)}_{2a}, W^{(0)}_0, W^{(1)}_0, W^{(1)}_{1b}, W^{(1)}_{1a},$ $W^{(2)}_0, W^{(2)}_{1b}, W^{(2)}_{1a}, W^{(2)}_{2b}, W^{(2)}_{2a}, W^{(3)}_0, W^{(3)}_{1b}, W^{(3)}_{1a}, W^{(3)}_{2b}, W^{(3)}_{2a}, W^{(3)}_{3b}, W^{(3)}_{3a},$ $W^{(4)}_0, W^{(4)}_{1b}, W^{(4)}_{1a}, W^{(4)}_{2b}, W^{(4)}_{2a}, W^{(4)}_{3b}, W^{(4)}_{3a}, W^{(4)}_{4b}, W^{(4)}_{4a}$
A _u	$V_{1b}, V_{1a}, V_0, Y^{(0)}_0, Y^{(1)}_0, Y^{(1)}_{1b}, Y^{(1)}_{1a}, Y^{(2)}_0, Y^{(2)}_{1b}, Y^{(2)}_{1a}, Y^{(2)}_{2b}, Y^{(2)}_{2a},$ $Y^{(3)}_0, Y^{(3)}_{1b}, Y^{(3)}_{1a}, Y^{(3)}_{2b}, Y^{(3)}_{2a}, Y^{(3)}_{3b}, Y^{(3)}_{3a}$

(すべての γ)

C_2	E	C_{2z}			
A	+1	+1	T_z	R_z	x^2, y^2, z^2, xy
B	+1	-1	T_x, T_y	R_x, R_y	xz, yz

C_2	H ₂ O ₂ , H ₂ S ₂ (Two HOO/HSS planes are perpendicular.)
A	$V_{1a}, D^{(0)}_0, D^{(1)}_{1a}, D^{(2)}_0, D^{(2)}_{1b}, D^{(2)}_{2b}, Y^{(0)}_0, Y^{(1)}_{1a}, Y^{(2)}_0, Y^{(2)}_{1b}, Y^{(2)}_{2b}, Y^{(3)}_{1a}, Y^{(3)}_{2a}, Y^{(3)}_{3a},$ $W^{(0)}_0, W^{(1)}_{1a}, W^{(2)}_0, W^{(2)}_{1b}, W^{(2)}_{2b}, W^{(3)}_{1a}, W^{(3)}_{2a}, W^{(3)}_{3a}, W^{(4)}_{1b}, W^{(4)}_{2b}, W^{(4)}_{3b}, W^{(4)}_{4b}$
B	$V_{1b}, V_0, D^{(1)}_0, D^{(1)}_{1b}, D^{(2)}_{1a}, D^{(2)}_{2a}, Y^{(0)}_0, Y^{(1)}_{1b}, Y^{(2)}_{1a}, Y^{(2)}_{2a}, Y^{(3)}_{1b}, Y^{(3)}_{2b}, Y^{(3)}_{3b}$ $W^{(1)}_0, W^{(1)}_{1b}, W^{(2)}_{1a}, W^{(2)}_{2a}, W^{(3)}_{1b}, W^{(3)}_{2b}, W^{(3)}_{3b}, W^{(4)}_{1a}, W^{(4)}_{2a}, W^{(4)}_{3a}, W^{(4)}_{4a}$

$\beta_{bbb}, \beta_{baa}, \beta_{aab}, \beta_{aba}, \beta_{bcc}, \beta_{ccb}, \beta_{cbb}, \beta_{abc}, \beta_{bac}, \beta_{cab}, \beta_{cba}, \beta_{cab}, \beta_{acb}$,

$\gamma_{aaa}, \gamma_{bbb}, \gamma_{ccc}, \gamma_{aabb}, \gamma_{bbcc}, \gamma_{caaa}, \gamma_{bbba}, \gamma_{ccbb}, \gamma_{aac}, \gamma_{abba}, \gamma_{bccb}, \gamma_{caac}, \gamma_{bbaa}, \gamma_{cbcc}, \gamma_{acc}, \gamma_{abba}, \gamma_{bbba}, \gamma_{cbcc}, \gamma_{ccaa}, \gamma_{abab}, \gamma_{bbaa}, \gamma_{cbcb}, \gamma_{ccaa}, \gamma_{aac}$,

$\gamma_{aaca}, \gamma_{bbca}, \gamma_{ccca}, \gamma_{caaa}, \gamma_{cabb}, \gamma_{cacc}, \gamma_{aac}, \gamma_{bbca}, \gamma_{ccac}, \gamma_{caaa}, \gamma_{acbb}, \gamma_{aac}, \gamma_{cbba}, \gamma_{bcab}, \gamma_{abbc}, \gamma_{cbab}, \gamma_{cbab}, \gamma_{abcb}, \gamma_{babc}$

C_{2v}	E	C_{2z}	$\sigma_v(yz)$	$\sigma_v(xz)$			
A_1	+1	+1	+1	+1	T_z		x^2, y^2, z^2
A_2	+1	+1	-1	-1		R_z	xy
B_1	+1	-1	+1	-1	T_y	R_x	yz
B_2	+1	-1	-1	+1	T_x	R_y	xz

C_{2v}	H_2O
A_1	$V_{1a}, D_{0z}^{(0)}, D_{2z}^{(2)}, D_{2b}^{(2)}, Y_{1a}^{(1)}, Y_{1b}^{(2)}, Y_{1a}^{(3)}, Y_{3a}^{(3)}, W_{0z}^{(0)}, W_{0z}^{(2)}, W_{2b}^{(2)}, W_{2a}^{(3)}, W_{0z}^{(4)}, W_{2b}^{(4)}, W_{4b}^{(4)}$
A_2	$D_{1a}^{(1)}, D_{1b}^{(2)}, Y_{0z}^{(0)}, Y_{2z}^{(2)}, Y_{2a}^{(3)}, W_{1a}^{(1)}, W_{1b}^{(2)}, W_{3a}^{(3)}, W_{3a}^{(4)}, W_{1b}^{(4)}, W_{3b}^{(4)}$
B_1	$V_{0z}, D_{1b}^{(1)}, D_{1a}^{(2)}, Y_{0z}^{(1)}, Y_{2a}^{(2)}, Y_{0z}^{(3)}, Y_{2b}^{(3)}, W_{1b}^{(1)}, W_{1a}^{(2)}, W_{3b}^{(3)}, W_{3b}^{(4)}, W_{1a}^{(4)}, W_{3a}^{(4)}$
B_2	$V_{1b}, D_{0z}^{(1)}, D_{2a}^{(2)}, Y_{1b}^{(1)}, Y_{1a}^{(2)}, Y_{3b}^{(3)}, Y_{3b}^{(4)}, W_{0z}^{(1)}, W_{2a}^{(2)}, W_{3b}^{(3)}, W_{3b}^{(4)}, W_{2a}^{(4)}, W_{4a}^{(4)}$

$\beta_{bbb}, \beta_{baa}, \beta_{bcc}, \beta_{aab}, \beta_{ccb}, \beta_{aba}, \beta_{cbe}$

$\gamma_{aaa}, \gamma_{bbb}, \gamma_{ccc}, \gamma_{abb}, \gamma_{bcc}, \gamma_{caa}, \gamma_{baa}, \gamma_{ccb}, \gamma_{aac}, \gamma_{abb}, \gamma_{ccb}, \gamma_{cac}, \gamma_{baa}, \gamma_{cbb}, \gamma_{aca}, \gamma_{bab}, \gamma_{bba}, \gamma_{bcb}, \gamma_{cba}, \gamma_{cab}, \gamma_{cac}$

C_{2h}	E	C_{2z}	$\sigma_h(xy)$	I			
A_g	+1	+1	+1	+1		R_z	x^2, y^2, z^2, xy
A_u	+1	+1	-1	-1	T_z		
B_g	+1	-1	-1	+1		R_x, R_y	xz, yz
B_u	+1	-1	+1	-1	T_x, T_y		

C_{2h}	trans-dichloroethylene without internal rotation
A_g	$D_{0z}^{(0)}, D_{0z}^{(1)}, D_{0z}^{(2)}, D_{2a}^{(2)}, D_{2b}^{(2)}, W_{0z}^{(0)}, W_{0z}^{(1)}, W_{0z}^{(2)}, W_{2a}^{(2)}, W_{2b}^{(2)}, W_{0z}^{(3)}, W_{2b}^{(3)}, W_{2a}^{(3)}, W_{0z}^{(4)}, W_{2b}^{(4)}, W_{2a}^{(4)}, W_{4b}^{(4)}, W_{4a}^{(4)}$
A_u	$V_{0z}, Y_{0z}^{(0)}, Y_{0z}^{(1)}, Y_{0z}^{(2)}, Y_{2b}^{(2)}, Y_{2a}^{(3)}, Y_{0z}^{(3)}, Y_{2b}^{(3)}, Y_{2a}^{(3)}$
B_g	$D_{1b}^{(1)}, D_{1a}^{(2)}, D_{1b}^{(2)}, D_{1a}^{(2)}, W_{1b}^{(1)}, W_{1a}^{(1)}, W_{2b}^{(2)}, W_{2a}^{(2)}, W_{1b}^{(3)}, W_{1a}^{(3)}, W_{3b}^{(3)}, W_{3a}^{(3)}, W_{1b}^{(4)}, W_{1a}^{(4)}, W_{3b}^{(4)}, W_{3a}^{(4)}$
B_u	$V_{1b}, V_{1a}, Y_{1b}^{(1)}, Y_{1a}^{(1)}, Y_{1b}^{(2)}, Y_{1a}^{(2)}, Y_{3b}^{(3)}, Y_{3a}^{(3)}, Y_{3b}^{(3)}, Y_{3a}^{(3)}$

$\gamma_{aaa}, \gamma_{bbb}, \gamma_{ccc}, \gamma_{abb}, \gamma_{bcc}, \gamma_{caa}, \gamma_{baa}, \gamma_{ccb}, \gamma_{aac}, \gamma_{abb}, \gamma_{ccb}, \gamma_{cac}, \gamma_{baa}, \gamma_{cbb}, \gamma_{aca}, \gamma_{bab}, \gamma_{bba}, \gamma_{bcb}, \gamma_{cba}, \gamma_{cab}, \gamma_{cac}$

$\gamma_{aab}, \gamma_{bab}, \gamma_{cab}, \gamma_{aba}, \gamma_{abb}, \gamma_{bcc}, \gamma_{aba}, \gamma_{bba}, \gamma_{cba}, \gamma_{baa}, \gamma_{bab}, \gamma_{bac}, \gamma_{acb}, \gamma_{cab}, \gamma_{bca}, \gamma_{abc}, \gamma_{acb}, \gamma_{bca}, \gamma_{cba}$

D_2	E	C_{2z}	C_{2y}	C_{2x}			
A	+1	+1	+1	+1			x^2, y^2, z^2
B ₁	+1	+1	-1	-1	T_z	R_z	xy
B ₂	+1	-1	+1	-1	T_y	R_y	xz
B ₃	+1	-1	-1	+1	T_x	R_x	yz

D_2	
A	$D_{0,0}^{(0)}, D_{0,0}^{(2)}, D_{2b,0}^{(2)}, Y_{0,0}^{(0)}, Y_{0,0}^{(2)}, Y_{2b,0}^{(2)}, Y_{2a,0}^{(3)}, W_{0,0}^{(0)}, W_{0,0}^{(2)}, W_{2b,0}^{(2)}, W_{2a,0}^{(3)}, W_{0,0}^{(4)}, W_{2b,0}^{(4)}, W_{4b,0}^{(4)}$
B ₁	$V_{0,0}, D_{0,0}^{(1)}, D_{2a,0}^{(2)}, Y_{0,0}^{(1)}, Y_{2a,0}^{(2)}, Y_{0,0}^{(3)}, Y_{2b,0}^{(3)}, W_{0,0}^{(1)}, W_{2a,0}^{(2)}, W_{0,0}^{(3)}, W_{2b,0}^{(3)}, W_{2a,0}^{(4)}, W_{4a,0}^{(4)}$
B ₂	$V_{1a,0}, D_{1a,0}^{(1)}, D_{1b,0}^{(2)}, Y_{1a,0}^{(1)}, Y_{1b,0}^{(2)}, Y_{1a,0}^{(3)}, Y_{3a,0}^{(3)}, W_{1a,0}, W_{1b,0}^{(2)}, W_{1a,0}^{(3)}, W_{3a,0}^{(3)}, W_{1b,0}^{(4)}, W_{3b,0}^{(4)}$
B ₃	$V_{1b,0}, D_{1b,0}^{(1)}, D_{1a,0}^{(2)}, Y_{1b,0}^{(1)}, Y_{1a,0}^{(2)}, Y_{1b,0}^{(3)}, Y_{3b,0}^{(3)}, W_{1b,0}, W_{1a,0}^{(2)}, W_{1b,0}^{(3)}, W_{3b,0}^{(3)}, W_{1a,0}^{(4)}, W_{3a,0}^{(4)}$

$\beta_{abc}, \beta_{bca}, \beta_{cab}, \beta_{cba}, \beta_{acb}, \beta_{bac}$

$\gamma_{aaaa}, \gamma_{bbbb}, \gamma_{cccc}, \gamma_{aabb}, \gamma_{bbcc}, \gamma_{ccaa}, \gamma_{bbaa}, \gamma_{cbbb}, \gamma_{aacc}, \gamma_{abbb}, \gamma_{cbcb}, \gamma_{caac}, \gamma_{baab}, \gamma_{cbcb}, \gamma_{cbcb}, \gamma_{acaa}, \gamma_{abab}, \gamma_{baba}, \gamma_{cbcb}, \gamma_{cbcb}, \gamma_{caca}, \gamma_{acac}$

D_{2h}	E	C_{2z}	C_{2y}	C_{2x}	I	σ_{xy}	σ_{xz}	σ_{yz}			
A _g	+1	+1	+1	+1	+1	+1	+1	+1			x^2, y^2, z^2
A _u	+1	+1	+1	+1	-1	-1	-1	-1			
B _{1g}	+1	+1	-1	-1	+1	+1	-1	-1		R_z	xy
B _{1u}	+1	+1	-1	-1	-1	-1	+1	+1	T_z		
B _{2g}	+1	-1	+1	-1	+1	-1	+1	-1		R_y	xz
B _{2u}	+1	-1	+1	-1	-1	+1	-1	+1	T_y		
B _{3g}	+1	-1	-1	+1	+1	-1	-1	+1		R_x	yz
B _{3u}	+1	-1	-1	+1	-1	+1	+1	-1	T_x		

D_{2h}	ethylene without internal rotation
A _g	$D_{0,0}^{(0)}, D_{0,0}^{(2)}, D_{2b,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(2)}, W_{2b,0}^{(2)}, W_{2a,0}^{(3)}, W_{0,0}^{(4)}, W_{2b,0}^{(4)}, W_{4b,0}^{(4)}$
A _u	$Y_{0,0}^{(0)}, Y_{0,0}^{(2)}, Y_{2b,0}^{(2)}, Y_{2a,0}^{(3)}$
B _{1g}	$D_{1b,0}, D_{1a,0}^{(2)}, W_{1b,0}, W_{1a,0}^{(2)}, W_{1b,0}^{(3)}, W_{3b,0}^{(3)}, W_{1a,0}^{(4)}, W_{3a,0}^{(4)}$
B _{1u}	$V_{1b,0}, Y_{1b,0}^{(1)}, Y_{1a,0}^{(2)}, Y_{1b,0}^{(3)}, Y_{3b,0}^{(3)}$
B _{2g}	$D_{1a,0}, D_{1b,0}^{(2)}, W_{1a,0}, W_{1b,0}^{(2)}, W_{1a,0}^{(3)}, W_{3a,0}^{(3)}, W_{1b,0}^{(4)}, W_{3b,0}^{(4)}$
B _{2u}	$V_{1a,0}, Y_{1a,0}^{(1)}, Y_{1b,0}^{(2)}, Y_{1a,0}^{(3)}, Y_{3a,0}^{(3)}$
B _{3g}	$D_{0,0}^{(1)}, D_{2a,0}^{(2)}, W_{0,0}^{(1)}, W_{2a,0}^{(2)}, W_{0,0}^{(3)}, W_{2b,0}^{(3)}, W_{2a,0}^{(4)}, W_{4a,0}^{(4)}$
B _{3u}	$V_{0,0}, Y_{0,0}^{(1)}, Y_{2a,0}^{(2)}, Y_{0,0}^{(3)}, Y_{2b,0}^{(3)}$

$\gamma_{aaaa}, \gamma_{bbbb}, \gamma_{cccc}, \gamma_{aabb}, \gamma_{bbcc}, \gamma_{ccaa}, \gamma_{bbaa}, \gamma_{cbbb}, \gamma_{aacc}, \gamma_{abbb}, \gamma_{cbcb}, \gamma_{caac}, \gamma_{baab}, \gamma_{cbcb}, \gamma_{cbcb}, \gamma_{acaa}, \gamma_{abab}, \gamma_{baba}, \gamma_{cbcb}, \gamma_{cbcb}, \gamma_{caca}, \gamma_{acac}$

C_{3v}	E	$2C_{3z}$	$3C_2$			
A ₁	+1	+1	+1	T_z		x^2+y^2, z^2
A ₂	+1	+1	-1		R_z	
E	+2	-1	0	(T_x, T_y)	(R_x, R_y)	$(x^2-y^2, xy); (xz, yz)$

C_{3v}	CH_3X
A ₁	$V_0, D_0^{(0)}, D_0^{(2)}, Y_0^{(1)}, Y_0^{(3)}, Y_{3b}^{(3)}, W_0^{(0)}, W_0^{(2)}, W_{3a}^{(3)}, W_0^{(4)}, W_{3b}^{(4)}$
A ₂	$D_0^{(1)}, Y_0^{(0)}, Y_0^{(2)}, Y_{3a}^{(3)}, W_0^{(1)}, W_0^{(3)}, W_{3b}^{(3)}, W_{3a}^{(4)}$
E	$(V_{1b}, V_{1a}), (D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{2b}^{(3)}, W_{2a}^{(3)}), (W_{1b}^{(4)}, W_{1a}^{(4)}), (W_{2b}^{(4)}, W_{2a}^{(4)}), (W_{4b}, W_{4a})$

$$\beta_{cc}, \beta_{ac} = \beta_{bc}, \beta_{ca} = \beta_{cb}, \beta_{ca} = \beta_{cb}, \beta_{aa} = -\beta_{bb} = -\beta_{ba} = -\beta_{ab},$$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{abbb} = \gamma_{bbaa}, \gamma_{aac} = \gamma_{bcc}, \gamma_{aca} = \gamma_{ccb}, \gamma_{aac} = \gamma_{bcc}, \gamma_{caa} = \gamma_{cbb},$$

$$\gamma_{abba} = \gamma_{baba}, \gamma_{acca} = \gamma_{cabb}, \gamma_{cac} = \gamma_{ccb},$$

$$\gamma_{aca} = -\gamma_{bcc}, \gamma_{caa} = -\gamma_{cbb} = -\gamma_{cbab} = -\gamma_{cbba}, \gamma_{aac} = -\gamma_{bcc} = -\gamma_{bbc} = -\gamma_{bacc}, \gamma_{aca} = -\gamma_{cbb} = -\gamma_{cbab} = -\gamma_{cbba}$$

D_3	E	$2C_{3z}$	$3C_2$			
A ₁	+1	+1	+1	T_z		x^2+y^2, z^2
A ₂	+1	+1	-1		R_z	
E	+2	-1	0	(T_x, T_y)	(R_x, R_y)	$(x^2-y^2, xy); (xz, yz)$

D_3	
A ₁	$D_0^{(0)}, D_0^{(2)}, Y_0^{(1)}, Y_0^{(3)}, Y_{3b}^{(3)}, W_0^{(0)}, W_0^{(2)}, W_{3b}^{(3)}, W_0^{(4)}, W_{3a}^{(4)}$
A ₂	$V_0, D_0^{(1)}, Y_0^{(0)}, Y_0^{(2)}, Y_{3a}^{(3)}, W_0^{(1)}, W_0^{(3)}, W_{3a}^{(3)}, W_{3b}^{(4)}$
E	$(V_{1b}, V_{1a}), (D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{2b}^{(3)}, W_{2a}^{(3)}), (W_{1b}^{(4)}, W_{1a}^{(4)}), (W_{2b}^{(4)}, W_{2a}^{(4)}), (W_{4b}, W_{4a})$

$$\beta_{aa} = -\beta_{bb} = -\beta_{ba} = -\beta_{ab},$$

$$-\gamma_{bbbc} = \gamma_{abcc} = \gamma_{baac} = \gamma_{abac}, \quad -\gamma_{ccbb} = \gamma_{cbaa} = \gamma_{acba} = \gamma_{acab}, \quad -\gamma_{bbcb} = \gamma_{aacb} = \gamma_{abca} = \gamma_{baca}, \quad -\gamma_{ccbb} = \gamma_{cbaa} = \gamma_{caab} = \gamma_{caba},$$

C_{5v}	E	$2C_{5z}$	$2C_5^2$	$5C_5$			
A ₁	+1	+1	+1	+1	T _z	R _z	x ² +y ² , z ²
A ₂	+1	+1	+1	-1			
E ₁	+2	2cos72°	2cos144°	0	(T _x , T _y)	(R _x , R _y)	(xz, yz)
E ₂	+2	2cos144°	2cos72°	0			(x ² -y ² , xy)

C_{5v}	
A ₁	V ₀ , D ₀ ⁽⁰⁾ , D ₀ ⁽²⁾ , Y ₀ ⁽¹⁾ , Y ₀ ⁽³⁾ , W ₀ ⁽⁰⁾ , W ₀ ⁽²⁾ , W ₀ ⁽⁴⁾
A ₂	D ₀ ⁽¹⁾ , Y ₀ ⁽⁰⁾ , Y ₀ ⁽²⁾ , W ₀ ⁽¹⁾ , W ₀ ⁽³⁾
E ₁	(V _{1b} , V _{1a}), (D _{1b} ⁽¹⁾ , D _{1a} ⁽¹⁾), (D _{1b} ⁽²⁾ , D _{1a} ⁽²⁾), (Y _{1b} ⁽¹⁾ , Y _{1a} ⁽¹⁾), (Y _{1b} ⁽²⁾ , Y _{1a} ⁽²⁾), (Y _{1b} ⁽³⁾ , Y _{1a} ⁽³⁾), (W _{1b} ⁽¹⁾ , W _{1a} ⁽¹⁾), (W _{1b} ⁽²⁾ , W _{1a} ⁽²⁾), (W _{1b} ⁽³⁾ , W _{1a} ⁽³⁾), (W _{1b} ⁽⁴⁾ , W _{1a} ⁽⁴⁾), (W _{4b} ⁽⁴⁾ , W _{4a} ⁽⁴⁾)
E ₂	(D _{2b} ⁽²⁾ , D _{2a} ⁽²⁾), (Y _{2b} ⁽²⁾ , Y _{2a} ⁽²⁾), (Y _{2b} ⁽³⁾ , Y _{2a} ⁽³⁾), (Y _{2b} ⁽³⁾ , Y _{2a} ⁽³⁾), (Y _{3b} ⁽³⁾ , Y _{3a} ⁽³⁾), (W _{2b} ⁽²⁾ , W _{2a} ⁽²⁾), (W _{2b} ⁽³⁾ , W _{2a} ⁽³⁾), (W _{3b} ⁽³⁾ , W _{3a} ⁽³⁾), (W _{3b} ⁽⁴⁾ , W _{3a} ⁽⁴⁾)

$$\beta_{cc}, \beta_{ac} = \beta_{bc}, \beta_{ca} = \beta_{cb}, \beta_{ca} = \beta_{cb}$$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \gamma_{abb} = \gamma_{baa}, \gamma_{abb} = \gamma_{baa}, \gamma_{aac} = \gamma_{bcc}, \gamma_{aca} = \gamma_{ccb}, \gamma_{aac} = \gamma_{bcc}, \gamma_{caa} = \gamma_{cbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{cbcb}, \gamma_{cac} = \gamma_{cbc}$$

C_{4v}	E	$2C_{4z}$	$C_4^2 \equiv C_2$	$2C_2$	$2C_2$			
A ₁	+1	+1	+1	+1	+1	T _z	R _z	x ² +y ² , z ²
A ₂	+1	+1	+1	-1	-1			
B ₁	+1	-1	+1	+1	-1	(T _x , T _y)	(R _x , R _y)	x ² -y ²
B ₂	+1	-1	+1	-1	+1			xy
E	+2	0	-2	0	0			(xz, yz)

C_{4v}	
A ₁	V ₀ , D ₀ ⁽⁰⁾ , D ₀ ⁽²⁾ , Y ₀ ⁽¹⁾ , Y ₀ ⁽³⁾ , W ₀ ⁽⁰⁾ , W ₀ ⁽²⁾ , W ₀ ⁽⁴⁾ , W _{4b} ⁽⁴⁾
A ₂	D ₀ ⁽¹⁾ , Y ₀ ⁽⁰⁾ , Y ₀ ⁽²⁾ , W ₀ ⁽¹⁾ , W ₀ ⁽³⁾ , W _{4a} ⁽⁴⁾
B ₁	D _{2b} ⁽²⁾ , Y _{2a} ⁽²⁾ , Y _{2b} ⁽³⁾ , W _{2b} ⁽²⁾ , W _{2a} ⁽³⁾ , W _{4b} ⁽⁴⁾
B ₂	D _{2a} ⁽²⁾ , Y _{2b} ⁽²⁾ , Y _{2a} ⁽³⁾ , W _{2a} ⁽²⁾ , W _{2b} ⁽³⁾ , W _{4a} ⁽⁴⁾
E	(V _{1b} , V _{1a}), (D _{1b} ⁽¹⁾ , D _{1a} ⁽¹⁾), (D _{1b} ⁽²⁾ , D _{1a} ⁽²⁾), (Y _{1b} ⁽¹⁾ , Y _{1a} ⁽¹⁾), (Y _{1b} ⁽²⁾ , Y _{1a} ⁽²⁾), (Y _{1b} ⁽³⁾ , Y _{1a} ⁽³⁾), (Y _{1b} ⁽³⁾ , Y _{1a} ⁽³⁾), (Y _{3b} ⁽³⁾ , Y _{3a} ⁽³⁾), (W _{1b} ⁽¹⁾ , W _{1a} ⁽¹⁾), (W _{1b} ⁽²⁾ , W _{1a} ⁽²⁾), (W _{1b} ⁽³⁾ , W _{1a} ⁽³⁾), (W _{3b} ⁽³⁾ , W _{3a} ⁽³⁾), (W _{1b} ⁽⁴⁾ , W _{1a} ⁽⁴⁾), (W _{3b} ⁽⁴⁾ , W _{3a} ⁽⁴⁾)

$$\beta_{cc}, \beta_{ac} = \beta_{bc}, \beta_{ca} = \beta_{cb}, \beta_{ca} = \beta_{cb}$$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \gamma_{abb} = \gamma_{baa}, \gamma_{aac} = \gamma_{bcc} = \gamma_{caa} = \gamma_{cbb}, \gamma_{abba} = \gamma_{baab}, \gamma_{abab} = \gamma_{baba}, \gamma_{acca} = \gamma_{cbcb} = \gamma_{cac} = \gamma_{cbcb}$$

$$\gamma_{cac} = \gamma_{bcbc} = \gamma_{aca} = \gamma_{cbcb}$$

D_4	E	$2C_{4z}$	$C_4^2 \equiv C_2''$	$2C_2$	$2C_2'$			
A ₁	+1	+1	+1	+1	+1			x^2+y^2, z^2
A ₂	+1	+1	+1	-1	-1	T_z	R_z	
B ₁	+1	-1	+1	+1	-1			x^2-y^2
B ₂	+1	-1	+1	-1	+1			xy
E	+2	0	-2	0	0	(T_x, T_y)	(R_x, R_y)	(xz, yz)

D_4	
A ₁	$D_{0z}^{(0)}, D_{0z}^{(2)}, Y_{0z}^{(0)}, Y_{0z}^{(2)}, W_{0z}^{(0)}, W_{0z}^{(2)}, W_{0z}^{(4)}, W_{4b}^{(4)}$
A ₂	$V_{0z}, D_{0z}^{(1)}, Y_{0z}^{(1)}, Y_{0z}^{(3)}, W_{0z}^{(1)}, W_{0z}^{(3)}, W_{4a}^{(4)}$
B ₁	$D_{2bz}^{(2)}, Y_{2bz}^{(2)}, Y_{2a}^{(3)}, W_{2bz}^{(2)}, W_{2a}^{(3)}, W_{2b}^{(4)}$
B ₂	$D_{2a}^{(2)}, Y_{2a}^{(2)}, Y_{2bz}^{(3)}, W_{2a}^{(2)}, W_{2bz}^{(3)}, W_{2a}^{(4)}$
E	$(V_{1b}, V_{1a}), (D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), ((W_{3b}^{(3)}, W_{3a}^{(3)}), W_{1b}^{(4)}, W_{1a}^{(4)}), (W_{3b}^{(4)}, W_{3a}^{(4)})$

$$\beta_{abc} = -\beta_{bac}, \quad \beta_{bca} = -\beta_{acb}, \quad \beta_{cab} = -\beta_{cba}$$

$$\gamma_{ccc}, \quad \gamma_{aaa} = \gamma_{bbb}, \quad \gamma_{aabb} = \gamma_{bbaa}, \quad \gamma_{aac} = \gamma_{bcc} = \gamma_{caa} = \gamma_{cbb}, \quad \gamma_{abba} = \gamma_{baab}, \quad \gamma_{abab} = \gamma_{baba}, \quad \gamma_{acca} = \gamma_{bccb} = \gamma_{caac} = \gamma_{cbcb}$$

$$\gamma_{aac} = \gamma_{bcc} = \gamma_{caa} = \gamma_{cbb}$$

D_{2d}	E	$2S_{4z}$	$S_4^2 \equiv C_2''$	$2C_2$	$2\sigma_d$			
A ₁	+1	+1	+1	+1	+1			x^2+y^2, z^2
A ₂	+1	+1	+1	-1	-1		R_z	
B ₁	+1	-1	+1	+1	-1			x^2-y^2
B ₂	+1	-1	+1	-1	+1	T_z		xy
E	+2	0	-2	0	0	(T_x, T_y)	(R_x, R_y)	(xz, yz)

D_{2d}	
A ₁	$D_{0z}^{(0)}, D_{0z}^{(2)}, Y_{2a}^{(2)}, Y_{2b}^{(3)}, W_{0z}^{(0)}, W_{0z}^{(2)}, W_{0z}^{(4)}, W_{4b}^{(4)}$
A ₂	$D_{0z}^{(1)}, Y_{2b}^{(2)}, Y_{2a}^{(3)}, W_{0z}^{(1)}, W_{0z}^{(3)}, W_{4a}^{(4)}$
B ₁	$D_{2a}^{(2)}, Y_{0z}^{(0)}, Y_{0z}^{(2)}, W_{2a}^{(2)}, W_{2b}^{(3)}, W_{2a}^{(4)}$
B ₂	$V_{0z}, D_{2b}^{(2)}, Y_{0z}^{(1)}, Y_{0z}^{(3)}, W_{2b}^{(2)}, W_{2a}^{(3)}, W_{2b}^{(4)}$
E	$(V_{1b}, V_{1a}), (D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), ((W_{3b}^{(3)}, W_{3a}^{(3)}), W_{1b}^{(4)}, W_{1a}^{(4)}), (W_{3b}^{(4)}, W_{3a}^{(4)})$

$$\beta_{aac} = -\beta_{bcc}, \quad \beta_{aca} = -\beta_{ccb}, \quad \beta_{caa} = -\beta_{cbb}$$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \quad \gamma_{aac} = \gamma_{bcc} = \gamma_{caa} = \gamma_{cbb}, \quad \gamma_{aabb} = \gamma_{bbaa}, \quad \gamma_{abba} = \gamma_{baab}, \quad \gamma_{abab} = \gamma_{baba}, \quad \gamma_{bccb} = \gamma_{acac}, \quad \gamma_{caca} = \gamma_{cbcb},$$

$$\gamma_{bccb} = \gamma_{acac}, \quad \gamma_{caac} = \gamma_{cbbc}$$

C_{6v}	E	$2C_{6z}$	$2C_6^2 \equiv 2C_3$	$C_6^3 \equiv C_2''$	$3\sigma_v$	$3\sigma_d$			
A ₁	+1	+1	+1	+1	+1	+1	T _z	R _z	x ² +y ² , z ²
A ₂	+1	+1	+1	+1	-1	-1			
B ₁	+1	-1	+1	-1	+1	-1	(T _x , T _y)	(R _x , R _y)	(xz, yz)
B ₂	+1	-1	+1	-1	-1	+1			
E ₁	+2	+1	-1	-2	0	0			(xz, yz)
E ₂	+2	-1	-1	+2	0	0			(x ² -y ² , xy)

C_{6v}	
A ₁	V ₀ , D ₀ ⁽⁰⁾ , D ₀ ⁽²⁾ , Y ₀ ⁽¹⁾ , Y ₀ ⁽³⁾ , W ₀ ⁽⁰⁾ , W ₀ ⁽²⁾ , W ₀ ⁽⁴⁾
A ₂	D ₀ ⁽¹⁾ , Y ₀ ⁽⁰⁾ , Y ₀ ⁽²⁾ , W ₀ ⁽¹⁾ , W ₀ ⁽³⁾
B ₁	Y _{3b} ⁽³⁾ , W _{3a} ⁽³⁾ , W _{3b} ⁽⁴⁾
B ₂	Y _{3a} ⁽³⁾ , W _{3b} ⁽³⁾ , W _{3a} ⁽⁴⁾
E ₁	(V _{1b} , V _{1a}), (D _{1b} ⁽¹⁾ , D _{1a} ⁽¹⁾), (D _{1b} ⁽²⁾ , D _{1a} ⁽²⁾), (Y _{1b} ⁽¹⁾ , Y _{1a} ⁽¹⁾), (Y _{1b} ⁽²⁾ , Y _{1a} ⁽²⁾), (Y _{1b} ⁽³⁾ , Y _{1a} ⁽³⁾), (W _{1b} ⁽¹⁾ , W _{1a} ⁽¹⁾), (W _{1b} ⁽²⁾ , W _{1a} ⁽²⁾), (W _{1b} ⁽³⁾ , W _{1a} ⁽³⁾), W _{1b} ⁽⁴⁾ , W _{1a} ⁽⁴⁾
E ₂	(D _{2b} ⁽²⁾ , D _{2a} ⁽²⁾), (Y _{2b} ⁽²⁾ , Y _{2a} ⁽²⁾), (Y _{2b} ⁽³⁾ , Y _{2a} ⁽³⁾), (W _{2b} ⁽²⁾ , W _{2a} ⁽²⁾), (W _{2b} ⁽³⁾ , W _{2a} ⁽³⁾), (W _{2b} ⁽⁴⁾ , W _{2a} ⁽⁴⁾), (W _{4b} ⁽⁴⁾ , W _{4a} ⁽⁴⁾)

$$\beta_{cc}, \beta_{ac} = \beta_{bc}, \beta_{ca} = \beta_{cb}, \beta_{ca} = \beta_{cb}$$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{aac} = \gamma_{bcb}, \gamma_{aca} = \gamma_{cbcb}, \gamma_{aac} = \gamma_{bbc}, \gamma_{caa} = \gamma_{cbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcbb}, \gamma_{cac} = \gamma_{cbb}$$

D_6	E	$2C_{6z}$	$2C_6^2 \equiv 2C_3$	$C_6^3 \equiv C_2''$	$3C_2$	$3C_2'$			
A ₁	+1	+1	+1	+1	+1	+1	T _z	R _z	x ² +y ² , z ²
A ₂	+1	+1	+1	+1	-1	-1			
B ₁	+1	-1	+1	-1	+1	-1	(T _x , T _y)	(R _x , R _y)	(xz, yz)
B ₂	+1	-1	+1	-1	-1	+1			
E ₁	+2	+1	-1	-2	0	0			(xz, yz)
E ₂	+2	-1	-1	+2	0	0			(x ² -y ² , xy)

D_6	
A ₁	D ₀ ⁽⁰⁾ , D ₀ ⁽²⁾ , Y ₀ ⁽⁰⁾ , Y ₀ ⁽²⁾ , W ₀ ⁽⁰⁾ , W ₀ ⁽²⁾ , W ₀ ⁽⁴⁾
A ₂	V ₀ , D ₀ ⁽¹⁾ , Y ₀ ⁽¹⁾ , Y ₀ ⁽³⁾ , W ₀ ⁽¹⁾ , W ₀ ⁽³⁾
B ₁	Y _{3a} ⁽³⁾ , W _{3a} ⁽³⁾ , W _{3b} ⁽⁴⁾
B ₂	Y _{3b} ⁽³⁾ , W _{3b} ⁽³⁾ , W _{3a} ⁽⁴⁾
E ₁	(V _{1b} , V _{1a}), (D _{1b} ⁽¹⁾ , D _{1a} ⁽¹⁾), (D _{1b} ⁽²⁾ , D _{1a} ⁽²⁾), (Y _{1b} ⁽¹⁾ , Y _{1a} ⁽¹⁾), (Y _{1b} ⁽²⁾ , Y _{1a} ⁽²⁾), (Y _{1b} ⁽³⁾ , Y _{1a} ⁽³⁾), (W _{1b} ⁽¹⁾ , W _{1a} ⁽¹⁾), (W _{1b} ⁽²⁾ , W _{1a} ⁽²⁾), (W _{1b} ⁽³⁾ , W _{1a} ⁽³⁾), W _{1b} ⁽⁴⁾ , W _{1a} ⁽⁴⁾
E ₂	(D _{2b} ⁽²⁾ , D _{2a} ⁽²⁾), (Y _{2b} ⁽²⁾ , Y _{2a} ⁽²⁾), (Y _{2b} ⁽³⁾ , Y _{2a} ⁽³⁾), (W _{2b} ⁽²⁾ , W _{2a} ⁽²⁾), (W _{2b} ⁽³⁾ , W _{2a} ⁽³⁾), (W _{2b} ⁽⁴⁾ , W _{2a} ⁽⁴⁾), (W _{4b} ⁽⁴⁾ , W _{4a} ⁽⁴⁾)

$$\beta_{abc} = -\beta_{bac}, \beta_{bca} = -\beta_{acb}, \beta_{cab} = -\beta_{cba}$$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{aac} = \gamma_{bcb}, \gamma_{aca} = \gamma_{cbcb}, \gamma_{aac} = \gamma_{bbc}, \gamma_{caa} = \gamma_{cbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcbb}, \gamma_{cac} = \gamma_{cbb}$$

D_{3d}	E	$2S_{6z}$	$2S_6^2 \equiv 2C_{3z}$	I	$3C_2$	$3\sigma_d$			
A_{1g}	+1	+1	+1	+1	+1	+1			x^2+y^2, z^2
A_{1u}	+1	-1	+1	-1	+1	-1			
A_{2g}	+1	+1	+1	+1	-1	-1		R_z	
A_{2u}	+1	-1	+1	-1	-1	+1	T_z		
E_g	+2	-1	-1	+2	0	0		(R_x, R_y)	$(xz, yz); (x^2-y^2, xy)$
E_u	+2	+1	-1	-2	0	0	(T_x, T_y)		

D_{3d}	
A_{1g}	$D_{0,0}^{(0)}, D_{0,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(2)}, W_{3a,0}^{(3)}, W_{0,0}^{(4)}, W_{3b}^{(4)}$
A_{1u}	$Y_{0,0}^{(0)}, Y_{0,0}^{(2)}, Y_{3a}^{(3)}$
A_{2g}	$D_{0,0}^{(1)}, W_{0,0}^{(1)}, W_{0,0}^{(3)}, W_{3b,0}^{(3)}, W_{3a}^{(4)}$
A_{2u}	$V_{0,0}, Y_{0,0}^{(1)}, Y_{0,0}^{(3)}, Y_{3b}^{(3)}$
E_g	$(D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (D_{2b}^{(2)}, D_{2a}^{(2)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{3b}^{(4)}, W_{3a}^{(4)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_u	$(V_{1b}, V_{1a}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (Y_{3b}^{(4)}, Y_{3a}^{(4)})$

$$\beta_{ccc}, \beta_{aac} = \beta_{bbc}, \beta_{aca} = \beta_{ccb}, \beta_{caa} = \beta_{cbb}, \beta_{aaa} = -\beta_{abb} = -\beta_{bba} = -\beta_{bab},$$

$$\gamma_{ccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{acac} = \gamma_{cbcb}, \gamma_{caca} = \gamma_{cbcb}, \gamma_{aacc} = \gamma_{bbcc}, \gamma_{ccaa} = \gamma_{cbbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcbb}, \gamma_{cac} = \gamma_{cbcb}$$

$$\gamma_{aaca} = -\gamma_{bbcb}, \gamma_{caaa} = -\gamma_{cabb} = -\gamma_{cbab} = -\gamma_{cbba}, \gamma_{aaac} = -\gamma_{bbac} = -\gamma_{abbc} = -\gamma_{babc}, \gamma_{acaa} = -\gamma_{acbb} = -\gamma_{bcab} = -\gamma_{cbca}$$

D_{4d}	E	$2S_{8z}$	$2S_8^2 \equiv 2C_4$	$2S_8^3$	$S_8^4 \equiv C_2$	$4C_2$	$4\sigma_d$			
A_1	+1	+1	+1	+1	+1	+1	+1			x^2+y^2, z^2
A_2	+1	+1	+1	+1	+1	-1	-1		R_z	
B_1	+1	-1	+1	-1	+1	+1	-1			
B_2	+1	-1	+1	-1	+1	-1	+1	T_z		
E_1	+2	$+\sqrt{2}$	0	$-\sqrt{2}$	-2	0	0	(T_x, T_y)		
E_2	+2	0	-2	0	+2	0	0		(R_x, R_y)	(x^2-y^2, xy)
E_3	+2	$-\sqrt{2}$	0	$+\sqrt{2}$	-2	0	0			(xz, yz)

D_{4d}	
A_1	$D_{0,0}^{(0)}, D_{0,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(2)}, W_{0,0}^{(4)}$
A_2	$D_{0,0}^{(1)}, W_{0,0}^{(1)}, W_{0,0}^{(3)}$
B_1	$Y_{0,0}^{(0)}, Y_{0,0}^{(2)}, W_{4b}^{(4)}$
B_2	$V_{0,0}, Y_{0,0}^{(1)}, Y_{0,0}^{(3)}, W_{4a}^{(4)}$
E_1	$(V_{1b}, V_{1a}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_2	$(D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_3	$(D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{3b}^{(3)}, W_{3a}^{(3)})$

$$\gamma_{ccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{acac} = \gamma_{cbcb}, \gamma_{caca} = \gamma_{cbcb}, \gamma_{aacc} = \gamma_{bbcc}, \gamma_{ccaa} = \gamma_{cbbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcbb}, \gamma_{cac} = \gamma_{cbcb}$$

D_{5d}	E	$2C_5$	$2C_5^2$	I	$5C_2$	$5\sigma_d$	$2S_{10}^3$	$2S_{10}$			
A_{1g}	+1	+1	+1	+1	+1	+1	+1	+1			x^2+y^2, z^2
A_{1u}	+1	+1	+1	-1	+1	-1	-1	-1			
A_{2g}	+1	+1	+1	+1	-1	-1	+1	+1			
A_{2u}	+1	+1	+1	-1	-1	+1	-1	-1	T_z	R_z	
E_{1g}	+2	$+2\cos 72^\circ$	$+2\cos 144^\circ$	+2	0	$0+2\cos 72^\circ$	$+2\cos 144^\circ$		(T_x, T_y)	(R_x, R_y)	(xz, yz)
E_{1u}	+2	$+2\cos 72^\circ$	$+2\cos 144^\circ$	-2	0	$0-2\cos 72^\circ$	$-2\cos 144^\circ$				
E_{2g}	+2	$+2\cos 144^\circ$	$+2\cos 72^\circ$	+2	0	$0+2\cos 144^\circ$	$+2\cos 72^\circ$				(x^2-y^2, xy)
E_{2u}	+2	$+2\cos 144^\circ$	$+2\cos 72^\circ$	-2	0	$0-2\cos 144^\circ$	$-2\cos 72^\circ$				

D_{5d}	
A_{1g}	$D_{0,0}^{(0)}, D_{0,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(2)}, W_{0,0}^{(4)}$
A_{1u}	$Y_{0,0}^{(0)}, Y_{0,0}^{(2)}$
A_{2g}	$D_{0,0}^{(1)}, W_{0,0}^{(1)}, W_{0,0}^{(3)}$
A_{2u}	$V_{0,0}, Y_{0,0}^{(1)}, Y_{0,0}^{(3)}$
E_{1g}	$(D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{1b}^{(4)}, W_{1a}^{(4)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_{1u}	$(V_{1b}, V_{1a}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)})$
E_{2g}	$(D_{2b}^{(2)}, D_{2a}^{(2)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{2b}^{(3)}, W_{2a}^{(3)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)}), (W_{2b}^{(4)}, W_{2a}^{(4)}), (W_{3b}^{(4)}, W_{3a}^{(4)})$
E_{2u}	$(Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)})$

$$\gamma_{ccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{aac} = \gamma_{bcb}, \gamma_{aca} = \gamma_{cbcb}, \gamma_{aac} = \gamma_{bbcb}, \gamma_{caa} = \gamma_{cbbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcbb}, \gamma_{cac} = \gamma_{cbbc}$$

D_{6d}	E	$2S_{12z}$	$2C_6$	$2S_4$	$2C_3$	$2S_{12}^5$	C_2	$6C_2'$	$6\sigma_d$			
A_1	+1	+1	+1	+1	+1	+1	+1	+1	+1			x^2+y^2, z^2
A_2	+1	+1	+1	+1	+1	+1	+1	-1	-1			
B_1	+1	-1	+1	-1	+1	-1	+1	+1	-1			
B_2	+1	-1	+1	-1	+1	-1	+1	-1	+1	T_z	R_z	
E_1	+2	$+\sqrt{3}$	+1	0	-1	$-\sqrt{3}$	-2	0	0	(T_x, T_y)		
E_2	+2	+1	-1	-2	-1	+1	+2	0	0			(x^2-y^2, xy)
E_3	+2	0	-2	0	+2	0	-2	0	0			
E_4	+2	-1	-1	+2	-1	-1	+2	0	0			
E_5	+2	$-\sqrt{3}$	+1	0	-1	$+\sqrt{3}$	-2	0	0		(R_x, R_y)	(xz, yz)

D_{6d}	
A_1	$D_{0,0}^{(0)}, D_{0,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(2)}, W_{0,0}^{(4)}$
A_2	$D_{0,0}^{(1)}, W_{0,0}^{(1)}, W_{0,0}^{(3)}$
B_1	$Y_{0,0}^{(0)}, Y_{0,0}^{(2)}$
B_2	$V_{0,0}, Y_{0,0}^{(1)}, Y_{0,0}^{(3)}$
E_1	$(V_{1b}, V_{1a}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)})$
E_2	$(D_{2b}^{(2)}, D_{2a}^{(2)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{2b}^{(3)}, W_{2a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_3	$(Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_4	$(Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_5	$(D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{1b}^{(4)}, W_{1a}^{(4)})$

$$\gamma_{ccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{aac} = \gamma_{bcb}, \gamma_{aca} = \gamma_{cbcb}, \gamma_{aac} = \gamma_{bbcb}, \gamma_{caa} = \gamma_{cbbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcbb}, \gamma_{cac} = \gamma_{cbbc}$$

D_{3h}	E	$2C_{3z}$	$3C_2$	σ_h	$2S_{3z}$	$3\sigma_v$			
A_1'	+1	+1	+1	+1	+1	+1			x^2+y^2, z^2
A_1''	+1	-1	+1	-1	-1	-1			
A_2'	+1	+1	-1	+1	+1	-1		R_z	
A_2''	+1	+1	-1	-1	-1	+1	T_z		
E'	+2	-1	0	+2	-1	0	(T_x, T_y)		(x^2-y^2, xy)
E''	+2	-1	0	-2	+1	0		(R_x, R_y)	$(xz, yz);$

D_{3h}	
A_1'	$D_{0,0}^{(0)}, D_{0,0}^{(2)}, Y_{3b,0}^{(3)}, W_{0,0}^{(0)}, W_{0,0}^{(2)}, W_{0,0}^{(4)}$
A_1''	$Y_{0,0}^{(0)}, Y_{0,0}^{(2)}, W_{3b,0}^{(3)}, W_{3a,0}^{(4)}$
A_2'	$D_{0,0}^{(1)}, Y_{3a,0}^{(3)}, W_{0,0}^{(1)}, W_{0,0}^{(3)}$
A_2''	$V_0, Y_{0,0}^{(1)}, Y_{0,0}^{(3)}, W_{3a,0}^{(3)}, W_{3b,0}^{(4)}$
E'	$(V_{1b}, V_{1a}), (D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{2b}^{(3)}, W_{2a}^{(3)}), (W_{2b}^{(4)}, W_{2a}^{(4)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E''	$(D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{3b}^{(4)}, W_{3a}^{(4)})$

$$\beta_{aaa} = -\beta_{abb} = -\beta_{bba} = -\beta_{bab},$$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{acac} = \gamma_{bcbc}, \gamma_{caca} = \gamma_{cbcb}, \gamma_{aacc} = \gamma_{bbcc}, \gamma_{ccaa} = \gamma_{cddb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcdb}, \gamma_{cacac} = \gamma_{cbbbe}$$

D_{5h}	E	$2C_{5z}$	$2C_{5z}^2$	σ_h	$5C_2$	$5\sigma_v$	$2S_5$	$2S_5^3$			
A_1'	+1	+1	+1	+1	+1	+1	+1	+1			x^2+y^2, z^2
A_1''	+1	+1	+1	-1	+1	-1	-1	-1			
A_2'	+1	+1	+1	+1	-1	-1	+1	+1		R_z	
A_2''	+1	+1	+1	-1	-1	+1	-1	-1	T_z		
E_1'	+2	+2cos72°	+2cos144°	+2	0	0	+2cos72°	+2cos144°	(T_x, T_y)		
E_1''	+2	+2cos72°	+2cos144°	-2	0	0	-2cos72°	-2cos144°		(R_x, R_y)	(xz, yz)
E_2'	+2	+2cos144°	+2cos72°	+2	0	0	+2cos144°	+2cos72°			(x^2-y^2, xy)
E_2''	+2	+2cos144°	+2cos72°	-2	0	0	-2cos144°	-2cos72°			

D_{5h}	
A_1'	$D_{0,0}^{(0)}, D_{0,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(2)}, W_{0,0}^{(4)}$
A_1''	$Y_{0,0}^{(0)}, Y_{0,0}^{(2)}$
A_2'	$D_{0,0}^{(1)}, W_{0,0}^{(1)}, W_{0,0}^{(3)}$
A_2''	$V_0, Y_{0,0}^{(1)}, Y_{0,0}^{(3)}$
E_1'	$(V_{1b}, V_{1a}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_1''	$(D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_2'	$(D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{2b}^{(3)}, W_{2a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_2''	$(Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{3b}^{(4)}, W_{3a}^{(4)})$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{acac} = \gamma_{bcbc}, \gamma_{caca} = \gamma_{cbcb}, \gamma_{aacc} = \gamma_{bbcc}, \gamma_{ccaa} = \gamma_{cddb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcdb}, \gamma_{cacac} = \gamma_{cbbbe}$$

D_{4h}	E	$2C_{4z}$	$C_{4z}^2 \equiv C_2$	$2C_2$	$2C_2'$	σ_h	$2\sigma_v$	$2\sigma_d$	$2S_{4z}$	$S_2 \equiv I$			
A_{1g}	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	T_z	R_z	x^2+y^2, z^2
A_{1u}	+1	+1	+1	+1	+1	-1	-1	-1	-1	-1			
A_{2g}	+1	+1	+1	-1	-1	+1	-1	-1	+1	+1			
A_{2u}	+1	+1	+1	-1	-1	-1	+1	+1	-1	-1			
B_{1g}	+1	-1	+1	+1	-1	+1	+1	-1	-1	+1			
B_{1u}	+1	-1	+1	+1	-1	-1	-1	+1	+1	-1			
B_{2g}	+1	-1	+1	-1	+1	+1	-1	+1	-1	+1			
B_{2u}	+1	-1	+1	-1	+1	-1	+1	-1	+1	-1			
E_g	+2	0	-2	0	0	-2	0	0	0	+2	(R_x, R_y)	x^2-y^2	
E_u	+2	0	-2	0	0	+2	0	0	0	-2		(T_x, T_y)	(xz, yz)

D_{4h}	
A_{1g}	$D_{0z}^{(0)}, D_{0z}^{(2)}, W_{0z}^{(0)}, W_{0z}^{(2)}, W_{0z}^{(4)}, W_{4b}^{(4)}$
A_{1u}	$Y_{0z}^{(0)}, Y_{0z}^{(2)}$
A_{2g}	$D_{0z}^{(1)}, W_{0z}^{(1)}, W_{0z}^{(3)}, W_{4a}^{(4)}$
A_{2u}	$V_{0z}, Y_{0z}^{(1)}, Y_{0z}^{(3)}$
B_{1g}	$D_{2bz}^{(2)}, W_{2bz}^{(2)}, W_{2a}^{(3)}, W_{2b}^{(4)}$
B_{1u}	$Y_{2bz}^{(2)}, Y_{2a}^{(3)}$
B_{2g}	$D_{2a}^{(2)}, W_{2a}^{(2)}, W_{2b}^{(3)}, W_{2a}^{(4)}$
B_{2u}	$Y_{2a}^{(2)}, Y_{2b}^{(3)}$
E_g	$(D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)}), (W_{3b}^{(4)}, W_{3a}^{(4)})$
E_u	$(V_{1b}, V_{1a}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)})$

$$\gamma_{cccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{acac} = \gamma_{cbcb}, \gamma_{caca} = \gamma_{cbcb}, \gamma_{aac} = \gamma_{bbc}, \gamma_{cca} = \gamma_{cbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcab}, \gamma_{caac} = \gamma_{cbcb}$$

D_{6h}	E	$2C_{6z}$	$2C_6^2$ $\equiv 2C_3$	C_6^3 $\equiv C_2$	$3C_2$	$3C_2'$	σ_h	$3\sigma_v$	$3\sigma_d$	$2S_6$	$2S_3$	S_6^3 $\equiv I$			
A_{1g}	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1	T_z	R_z	x^2+y^2, z^2
A_{1u}	+1	+1	+1	+1	+1	+1	-1	-1	-1	-1	-1	-1			
A_{2g}	+1	+1	+1	+1	-1	-1	+1	-1	-1	+1	+1	+1			
A_{2u}	+1	+1	+1	+1	-1	-1	-1	+1	+1	-1	-1	-1			
B_{1g}	+1	-1	+1	-1	+1	-1	-1	-1	+1	+1	-1	+1			
B_{1u}	+1	-1	+1	-1	+1	-1	+1	+1	-1	-1	+1	-1			
B_{2g}	+1	-1	+1	-1	-1	+1	-1	+1	-1	+1	-1	+1			
B_{2u}	+1	-1	+1	-1	-1	+1	+1	-1	+1	-1	+1	-1			
E_{1g}	+2	+1	-1	-2	0	0	-2	0	0	-1	+1	+2	(T_x, T_y)	(R_x, R_y)	(xz, yz)
E_{1u}	+2	+1	-1	-2	0	0	+2	0	0	+1	-1	-2			
E_{2g}	+2	-1	-1	+2	0	0	+2	0	0	-1	-1	+2			
E_{2u}	+2	-1	-1	+2	0	0	-2	0	0	+1	+1	-2			

D_{6h}	
A_{1g}	$D_{0,0}^{(0)}, D_{0,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(2)}, W_{0,0}^{(4)}$
A_{1u}	$Y_{0,0}^{(0)}, Y_{0,0}^{(2)}$
A_{2g}	$D_{0,0}^{(1)}, W_{0,0}^{(1)}, W_{0,0}^{(3)}$
A_{2u}	$V_{0,0}, Y_{0,0}^{(1)}, Y_{0,0}^{(3)}$
B_{1g}	$W_{3a,3b}^{(3)}, W_{3b,3a}^{(4)}$
B_{1u}	$Y_{3a,3b}^{(3)}$
B_{2g}	$W_{3b,3a}^{(3)}, W_{3a,3b}^{(4)}$
B_{2u}	$Y_{3b,3a}^{(3)}$
E_{1g}	$(D_{1b,1a}^{(1)}, D_{1a,1b}^{(1)}), (D_{1b,1a}^{(2)}, D_{1a,1b}^{(2)}), (W_{1b,1a}^{(1)}, W_{1a,1b}^{(1)}), (W_{1b,1a}^{(2)}, W_{1a,1b}^{(2)}), (W_{1b,1a}^{(3)}, W_{1a,1b}^{(3)}), (W_{1b,1a}^{(4)}, W_{1a,1b}^{(4)})$
E_{1u}	$(V_{1b,1a}, Y_{1b,1a}^{(1)}), (Y_{1b,1a}^{(1)}, Y_{1a,1b}^{(1)}), (Y_{1b,1a}^{(2)}, Y_{1a,1b}^{(2)}), (Y_{1b,1a}^{(3)}, Y_{1a,1b}^{(3)})$
E_{2g}	$(D_{2b,2a}^{(2)}, D_{2a,2b}^{(2)}), (W_{2b,2a}^{(2)}, W_{2a,2b}^{(2)}), (W_{2b,2a}^{(3)}, W_{2a,2b}^{(3)}), (W_{2b,2a}^{(4)}, W_{2a,2b}^{(4)}), (W_{4b,4a}^{(4)}, W_{4a,4b}^{(4)})$
E_{2u}	$(Y_{2b,2a}^{(2)}, Y_{2a,2b}^{(2)}), (Y_{2b,2a}^{(3)}, Y_{2a,2b}^{(3)})$

$$\gamma_{cccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{acac} = \gamma_{cbcb}, \gamma_{caca} = \gamma_{cbcb}, \gamma_{aacc} = \gamma_{bbcc}, \gamma_{ccaa} = \gamma_{ccbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcbcb}, \gamma_{caac} = \gamma_{cbcb}$$

C_3	E	$2C_{3z}$			
A	+1	+1	T_z	R_z	x^2+y^2, z^2
E	+2	-1	(T_x, T_y)	(R_x, R_y)	$(x^2-y^2, xy); (xz, yz)$

C_3	
A	$V_0, D_0^{(0)}, D_0^{(1)}, D_0^{(2)}, Y_0^{(0)}, Y_0^{(1)}, Y_0^{(2)}, Y_0^{(3)}, Y_0^{(3)}, Y_{3a}^{(3)}, Y_{3b}^{(3)}, W_0^{(0)}, W_0^{(1)}, W_0^{(2)}, W_0^{(3)}, W_{3a}^{(3)}, W_{3b}^{(3)}, W_0^{(4)}, W_{3a}^{(4)}, W_{3b}^{(4)}$
E	$(V_{1b}, V_{1a}), (D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{2b}^{(3)}, W_{2a}^{(3)}), (W_{1b}^{(4)}, W_{1a}^{(4)}), (W_{2b}^{(4)}, W_{2a}^{(4)}), (W_{4b}, W_{4a})$

$$\beta_{cc}, \beta_{ac} = \beta_{bc}, \beta_{ca} = \beta_{cb}, \beta_{aa} = \beta_{cb}, \beta_{abb} = \beta_{ba} = \beta_{bab} = -\beta_{aaa}, \beta_{baa} = \beta_{aab} = \beta_{aba} = -\beta_{bbb},$$

$$\beta_{abc} = -\beta_{bac}, \beta_{bca} = -\beta_{acb}, \beta_{cab} = -\beta_{cba}$$

$$\gamma_{ccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{abba} = \gamma_{baab}, \gamma_{abab} = \gamma_{baba}, \gamma_{aacc} = \gamma_{bbcc}, \gamma_{ccaa} = \gamma_{ccbb}, \gamma_{acca} = \gamma_{bccb}, \gamma_{caac} = \gamma_{cbbc}$$

$$\gamma_{acac} = \gamma_{bcbe}, \gamma_{caca} = \gamma_{cbcb},$$

$$\gamma_{bcaa} = \gamma_{acba} = \gamma_{acab} = -\gamma_{bccb}, \gamma_{aabc} = \gamma_{baac} = \gamma_{abac} = -\gamma_{bbbc}, \gamma_{bcba} = \gamma_{acba} = \gamma_{acab} = -\gamma_{bccb}, \gamma_{aacb} = \gamma_{abca} = \gamma_{baca} = -\gamma_{bbcb},$$

$$\gamma_{bbca} = \gamma_{bacb} = \gamma_{abcb} = -\gamma_{aaca}, \gamma_{cabb} = \gamma_{cbab} = \gamma_{cbba} = -\gamma_{caaa}, \gamma_{bbac} = \gamma_{abbc} = \gamma_{babc} = -\gamma_{aac}, \gamma_{aaab} = -\gamma_{bbba}, \gamma_{aaba} = -\gamma_{bbab},$$

$$\gamma_{abaa} = -\gamma_{baaa}, \gamma_{baaa} = -\gamma_{abbb}, \gamma_{ccab} = -\gamma_{cbca}, \gamma_{abcc} = -\gamma_{bacc}, \gamma_{accb} = -\gamma_{bcc}, \gamma_{cabc} = -\gamma_{cbac}, \gamma_{acbc} = -\gamma_{bcac}, \gamma_{cacb} = -\gamma_{cbca}$$

C_4	E	$2C_{4z}$	$C_4^2 \equiv C_2$			
A	+1	+1	+1	T_z	R_z	x^2+y^2, z^2
B	+1	-1	+1			x^2-y^2, xy
E	+2	0	-2	(T_x, T_y)	(R_x, R_y)	(xz, yz)

C_4	
A	$V_0, D_0^{(0)}, D_0^{(1)}, D_0^{(2)}, Y_0^{(0)}, Y_0^{(1)}, Y_0^{(2)}, Y_0^{(3)}, W_0^{(0)}, W_0^{(1)}, W_0^{(2)}, W_0^{(3)}, W_0^{(4)}, W_{4a}^{(4)}, W_{4b}^{(4)}$
B	$D_{2b}^{(2)}, D_{2a}^{(2)}, Y_{2b}^{(2)}, Y_{2a}^{(2)}, Y_{2b}^{(3)}, Y_{2a}^{(3)}, W_{2b}^{(2)}, W_{2a}^{(2)}, W_{2b}^{(3)}, W_{2a}^{(3)}, W_{2b}^{(4)}, W_{2a}^{(4)}$
E	$(V_{1b}, V_{1a}), (D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{1b}^{(4)}, W_{1a}^{(4)}), (W_{3b}^{(4)}, W_{3a}^{(4)})$

$$\beta_{cc}, \beta_{ac} = \beta_{bc}, \beta_{ca} = \beta_{cb}, \beta_{aa} = \beta_{cb},$$

$$\gamma_{ccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{abba} = \gamma_{baab}, \gamma_{abab} = \gamma_{baba}, \gamma_{aacc} = \gamma_{bbcc}, \gamma_{ccaa} = \gamma_{ccbb}, \gamma_{acca} = \gamma_{bccb}, \gamma_{caac} = \gamma_{cbbc}$$

$$\gamma_{acac} = \gamma_{bcbe}, \gamma_{caca} = \gamma_{cbcb},$$

$$\gamma_{aaab} = -\gamma_{bbba}, \gamma_{aaba} = -\gamma_{bbab}, \gamma_{abaa} = -\gamma_{babb}, \gamma_{baaa} = -\gamma_{abbb}, \gamma_{ccab} = -\gamma_{cbca}, \gamma_{abcc} = -\gamma_{bacc}, \gamma_{accb} = -\gamma_{bcc}, \gamma_{cabc} = -\gamma_{cbac},$$

$$\gamma_{acbc} = -\gamma_{bcac}, \gamma_{cacb} = -\gamma_{cbca}$$

C_6	E	$2C_{6z}$	$2C_6^2 \equiv 2C_3$	$C_6^3 \equiv C_2$			
A	+1	+1	+1	+1	T_z	R_z	x^2+y^2, z^2
B	+1	-1	+1	-1			
E ₁	+2	+1	-1	-2	(T_x, T_y)	(R_x, R_y)	(xz, yz)
E ₂	+2	-1	-1	+2			(x^2-y^2, xy)

C_6	
A	$V_{0z}, D_{0z}^{(0)}, D_{0z}^{(1)}, D_{0z}^{(2)}, Y_{0z}^{(0)}, Y_{0z}^{(1)}, Y_{0z}^{(2)}, Y_{0z}^{(3)}, W_{0z}^{(0)}, W_{0z}^{(1)}, W_{0z}^{(2)}, W_{0z}^{(3)}, W_{0z}^{(4)}$
B	$Y_{3b}^{(3)}, Y_{3a}^{(3)}, W_{3b}^{(3)}, W_{3a}^{(3)}, W_{3b}^{(4)}, W_{3a}^{(4)}$
E ₁	$(V_{1b}, V_{1a}), (D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{1b}^{(4)}, W_{1a}^{(4)})$
E ₂	$(D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{2b}^{(3)}, W_{2a}^{(3)}), (W_{2b}^{(4)}, W_{2a}^{(4)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$

$$\beta_{cc}, \beta_{aac} = \beta_{bbc}, \beta_{caa} = \beta_{cbb}, \beta_{aca} = \beta_{ccb}$$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \gamma_{abb} = \gamma_{bba}, \gamma_{abba} = \gamma_{baab}, \gamma_{abab} = \gamma_{baba}, \gamma_{aac} = \gamma_{bcc}, \gamma_{caa} = \gamma_{cbb}, \gamma_{aca} = \gamma_{ccb}, \gamma_{cac} = \gamma_{cbb}$$

$$\gamma_{aac} = \gamma_{bcb}, \gamma_{aca} = \gamma_{ccb}, \gamma_{aab} = -\gamma_{bba}$$

$$\gamma_{aaba} = -\gamma_{bbab}, \gamma_{abaa} = -\gamma_{babb}, \gamma_{baaa} = -\gamma_{abbb}, \gamma_{cab} = -\gamma_{cba}, \gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}, \gamma_{cab} = -\gamma_{cba}, \gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}$$

$$\gamma_{acb} = -\gamma_{bca}$$

S_4	E	$2S_{4z}$	$S_4^2 \equiv S_2$			
A	+1	+1	+1		R_z	x^2+y^2, z^2
B	+1	-1	+1	T_z		$x-y^2, xy$
E	+2	0	-2	(T_x, T_y)	(R_x, R_y)	(xz, yz)

S_4	
A	$D_{0z}^{(0)}, D_{0z}^{(1)}, D_{0z}^{(2)}, Y_{2b}^{(2)}, Y_{2a}^{(2)}, Y_{2b}^{(3)}, Y_{2a}^{(3)}, W_{0z}^{(0)}, W_{0z}^{(1)}, W_{0z}^{(2)}, W_{0z}^{(3)}, W_{0z}^{(4)}, W_{4b}^{(4)}, W_{4a}^{(4)}$
B	$V_{0z}, D_{2b}^{(2)}, D_{2a}^{(2)}, Y_{0z}^{(0)}, Y_{0z}^{(1)}, Y_{0z}^{(2)}, Y_{0z}^{(3)}, W_{2b}^{(2)}, W_{2a}^{(2)}, W_{2b}^{(3)}, W_{2a}^{(3)}, W_{2b}^{(4)}, W_{2a}^{(4)}$
E	$(V_{1b}, V_{1a}), (D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)}), (W_{3b}^{(4)}, W_{3a}^{(4)})$

$$\beta_{aac} = -\beta_{bbc}, \beta_{caa} = -\beta_{cbb}, -\beta_{aca} = \beta_{ccb}, \beta_{abc} = \beta_{bac}, \beta_{bca} = \beta_{acb}, \beta_{cab} = \beta_{cba}$$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \gamma_{abb} = \gamma_{bba}, \gamma_{abba} = \gamma_{baab}, \gamma_{abab} = \gamma_{baba}, \gamma_{aac} = \gamma_{bcc}, \gamma_{caa} = \gamma_{cbb}, \gamma_{aca} = \gamma_{ccb}, \gamma_{cac} = \gamma_{cbb}$$

$$\gamma_{aac} = \gamma_{bcb}, \gamma_{aca} = \gamma_{ccb}$$

$$\gamma_{aaba} = -\gamma_{bbab}, \gamma_{abaa} = -\gamma_{babb}, \gamma_{baaa} = -\gamma_{abbb}, \gamma_{cab} = -\gamma_{cba}, \gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}, \gamma_{cab} = -\gamma_{cba}, \gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}$$

$$\gamma_{acb} = -\gamma_{bca}, \gamma_{acb} = -\gamma_{bca}$$

S_6	E	$2S_{6z}$	$2S_6^2 \equiv 2C_3$	$S_6^3 \equiv S_2$			
A_g	+1	+1	+1	+1		R_z	x^2+y^2, z^2
A_g	+1	-1	+1	-1	T_z		
E_g	+2	-1	-1	+2	(T_x, T_y)	(R_x, R_y)	$(xz, yz), (x^2-y^2, xy)$
E_u	+2	+1	-1	-2			

S_6	
A_g	$D_{0,0}^{(0)}, D_{0,0}^{(1)}, D_{0,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(1)}, W_{0,0}^{(2)}, W_{0,0}^{(3)}, W_{3b,0}^{(3)}, W_{3a,0}^{(3)}, W_{0,0}^{(4)}, W_{3b,0}^{(4)}, W_{3a,0}^{(4)}$
A_u	$V_{0,0}, Y_{0,0}^{(0)}, Y_{0,0}^{(1)}, Y_{0,0}^{(2)}, Y_{0,0}^{(3)}, Y_{3b,0}^{(3)}, Y_{3a,0}^{(3)}$
E_g	$(D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (D_{2b}^{(2)}, D_{2a}^{(2)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E_u	$(V_{1b}, V_{1a}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (Y_{4b}^{(4)}, Y_{4a}^{(4)})$

$$\gamma_{cccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{abba} = \gamma_{baab}, \gamma_{abab} = \gamma_{baba}, \gamma_{aac} = \gamma_{bbc}, \gamma_{caa} = \gamma_{cbb}, \gamma_{aca} = \gamma_{ccb}, \gamma_{cac} = \gamma_{cbb},$$

$$\gamma_{cac} = \gamma_{cbb}, \gamma_{caa} = \gamma_{cbb},$$

$$\gamma_{bcaa} = \gamma_{acba} = \gamma_{acab} = -\gamma_{bcb}, \gamma_{abcb} = \gamma_{bac} = \gamma_{abac} = -\gamma_{bbcb}, \gamma_{bcba} = \gamma_{acba} = \gamma_{acab} = -\gamma_{bcb}, \gamma_{acb} = \gamma_{abca} = \gamma_{baca} = -\gamma_{bbcb},$$

$$\gamma_{bbca} = \gamma_{bacb} = \gamma_{abcb} = -\gamma_{aaca}, \gamma_{cabb} = \gamma_{cbab} = \gamma_{cbba} = -\gamma_{caaa}, \gamma_{bbac} = \gamma_{abbc} = \gamma_{babc} = -\gamma_{aac}, \gamma_{aabb} = -\gamma_{bba}, \gamma_{aaba} = -\gamma_{babb}, \gamma_{abaa} =$$

$$-\gamma_{baaa}, \gamma_{baaa} = -\gamma_{abbb}, \gamma_{cab} = -\gamma_{cbba}, \gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}, \gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}, \gamma_{acb} = -\gamma_{bca}$$

C_{3h}	E	$2C_{3z}$	σ_h	$2S_6$			
A'	+1	+1	+1	+1		R_z	x^2+y^2, z^2
A''	+1	+1	-1	-1	T_z		
E'	+2	-1	+2	-1	(T_x, T_y)	(R_x, R_y)	(x^2-y^2, xy)
E''	+2	-1	-2	+1			

C_{3h}	
A'	$D_{0,0}^{(0)}, D_{0,0}^{(1)}, D_{0,0}^{(2)}, Y_{3b,0}^{(3)}, Y_{3a,0}^{(3)}, W_{0,0}^{(0)}, W_{0,0}^{(1)}, W_{0,0}^{(2)}, W_{0,0}^{(3)}, W_{0,0}^{(4)}$
A''	$V_{0,0}, Y_{0,0}^{(0)}, Y_{0,0}^{(1)}, Y_{0,0}^{(2)}, Y_{0,0}^{(3)}, W_{3b,0}^{(3)}, W_{3a,0}^{(3)}, W_{3b,0}^{(4)}, W_{3a,0}^{(4)}$
E'	$(V_{1b}, V_{1a}), (D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$
E''	$(D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{4b}^{(4)}, W_{4a}^{(4)})$

$$\beta_{aaa} = -\beta_{abb} = -\beta_{bba} = -\beta_{bab}, \beta_{bbb} = -\beta_{baa} = -\beta_{aab} = -\beta_{aba}$$

$$\gamma_{cccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{abba} = \gamma_{baab}, \gamma_{abab} = \gamma_{baba}, \gamma_{aac} = \gamma_{bbc}, \gamma_{caa} = \gamma_{cbb}, \gamma_{aca} = \gamma_{ccb}, \gamma_{cac} = \gamma_{cbb},$$

$$\gamma_{cac} = \gamma_{cbb}, \gamma_{caa} = \gamma_{cbb},$$

$$\gamma_{aabb} = -\gamma_{bba}, \gamma_{aaba} = -\gamma_{babb}, \gamma_{abaa} = -\gamma_{abbb}, \gamma_{baaa} = -\gamma_{abbb}, \gamma_{cab} = -\gamma_{cbba}, \gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}, \gamma_{abc} = -\gamma_{bac}, \gamma_{acb} =$$

$$-\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}$$

C_{4h}	E	$2C_{4z}$	$C_{4z}^2 \equiv C_2$	σ_h	$2S_{4z}$	$S_2 \equiv I$				
A_g	+1	+1	+1	+1	+1	+1	T_z	R_z	x^2+y^2, z^2	
A_u	+1	+1	+1	-1	-1	-1				
B_g	+1	-1	+1	+1	-1	+1				x^2-y^2, xy
B_u	+1	-1	+1	-1	+1	-1				
E_g	+2	0	-2	-2	0	+2	(T_x, T_y)	(R_x, R_y)	(xz, yz)	
E_u	+2	0	-2	+2	0	-2				

C_{4h}	
A_g	$D_{0,0}^{(0)}, D_{0,0}^{(1)}, D_{0,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(1)}, W_{0,0}^{(2)}, W_{0,0}^{(3)}, W_{0,0}^{(4)}, W_{4b,0}^{(4)}, W_{4a}^{(4)}$
A_u	$V_{0,0}, Y_{0,0}^{(0)}, Y_{0,0}^{(1)}, Y_{0,0}^{(2)}, Y_{0,0}^{(3)}$
B_g	$D_{2b,0}^{(2)}, D_{2a,0}^{(2)}, W_{2b,0}^{(2)}, W_{2a,0}^{(2)}, W_{2b,0}^{(3)}, W_{2a,0}^{(3)}, W_{2b,0}^{(4)}, W_{2a,0}^{(4)}$
B_u	$Y_{2b,0}^{(2)}, Y_{2a,0}^{(2)}, Y_{2b,0}^{(3)}, Y_{2a,0}^{(3)}$
E_g	$(D_{1b,0}^{(1)}, D_{1a,0}^{(1)}), (D_{1b,0}^{(2)}, D_{1a,0}^{(2)}), (W_{1b,0}^{(1)}, W_{1a,0}^{(1)}), (W_{1b,0}^{(2)}, W_{1a,0}^{(2)}), (W_{1b,0}^{(3)}, W_{1a,0}^{(3)}), (W_{3b,0}^{(3)}, W_{3a,0}^{(3)}), (W_{4b,0}^{(4)}, W_{4a,0}^{(4)}), (W_{4b,0}^{(4)}, W_{4a,0}^{(4)})$
E_u	$(V_{1b,0}, V_{1a,0}), (Y_{1b,0}^{(1)}, Y_{1a,0}^{(1)}), (Y_{1b,0}^{(2)}, Y_{1a,0}^{(2)}), (Y_{1b,0}^{(3)}, Y_{1a,0}^{(3)}), (Y_{3b,0}^{(3)}, Y_{3a,0}^{(3)})$

$\gamma_{cccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{abba} = \gamma_{baab}, \gamma_{abab} = \gamma_{baba}, \gamma_{aacc} = \gamma_{bbcc}, \gamma_{ccaa} = \gamma_{cbbb}, \gamma_{acca} = \gamma_{bcb}, \gamma_{caac} = \gamma_{ebbc}$
 $\gamma_{acac} = \gamma_{bcbe}, \gamma_{caca} = \gamma_{cbcb},$
 $\gamma_{aaab} = -\gamma_{bbba}, \gamma_{aaba} = -\gamma_{bbab}, \gamma_{abaa} = -\gamma_{babb}, \gamma_{baaa} = -\gamma_{abbb}, \gamma_{cab} = -\gamma_{cba}, \gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}, \gamma_{cab} = -\gamma_{cba},$
 $\gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}$

C_{6h}	E	$2C_{6z}$	$2C_6^2 \equiv 2C_3$	$C_6^3 \equiv C_2$	σ_h	$2S_6$	$2S_3$	$S_6^3 \equiv I$					
A_g	+1	+1	+1	+1	+1	+1	+1	+1	T_z	R_z	x^2+y^2, z^2		
A_u	+1	+1	+1	+1	-1	-1	-1	-1					
B_g	+1	-1	+1	-1	-1	+1	-1	+1					
B_u	+1	-1	+1	-1	+1	-1	+1	-1					
E_{1g}	+2	+1	-1	-2	-2	-1	+1	+2	(T_x, T_y)	(R_x, R_y)	(xz, yz)		
E_{1u}	+2	+1	-1	-2	+2	+1	-1	-2					
E_{2g}	+2	-1	-1	+2	+2	-1	-1	+2					(x^2-y^2, xy)
E_{2u}	+2	-1	-1	+2	-2	+1	+1	-2					

C_{6h}	
A_g	$D_{0,0}^{(0)}, D_{0,0}^{(1)}, D_{0,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(1)}, W_{0,0}^{(2)}, W_{0,0}^{(3)}, W_{0,0}^{(4)}$
A_u	$V_{0,0}, Y_{0,0}^{(0)}, Y_{0,0}^{(1)}, Y_{0,0}^{(2)}, Y_{0,0}^{(3)}$
B_g	$W_{3b,0}^{(3)}, W_{3a,0}^{(3)}, W_{3b,0}^{(4)}, W_{3a,0}^{(4)}$
B_u	$Y_{3b,0}^{(3)}, Y_{3a,0}^{(3)}$
E_{1g}	$(D_{1b,0}^{(1)}, D_{1a,0}^{(1)}), (D_{1b,0}^{(2)}, D_{1a,0}^{(2)}), (W_{1b,0}^{(1)}, W_{1a,0}^{(1)}), (W_{1b,0}^{(2)}, W_{1a,0}^{(2)}), (W_{1b,0}^{(3)}, W_{1a,0}^{(3)}), (W_{1b,0}^{(4)}, W_{1a,0}^{(4)})$
E_{1u}	$(V_{1b,0}, V_{1a,0}), (Y_{1b,0}^{(1)}, Y_{1a,0}^{(1)}), (Y_{1b,0}^{(2)}, Y_{1a,0}^{(2)}), (Y_{1b,0}^{(3)}, Y_{1a,0}^{(3)})$
E_{2g}	$(D_{2b,0}^{(2)}, D_{2a,0}^{(2)}), (W_{2b,0}^{(2)}, W_{2a,0}^{(2)}), (W_{2b,0}^{(3)}, W_{2a,0}^{(3)}), (W_{4b,0}^{(4)}, W_{4a,0}^{(4)}), (W_{4b,0}^{(4)}, W_{4a,0}^{(4)})$
E_{2u}	$(Y_{2b,0}^{(2)}, Y_{2a,0}^{(2)}), (Y_{2b,0}^{(3)}, Y_{2a,0}^{(3)})$

$\gamma_{cccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{abba} = \gamma_{baab}, \gamma_{abab} = \gamma_{baba}, \gamma_{aacc} = \gamma_{bbcc}, \gamma_{ccaa} = \gamma_{cbbb}, \gamma_{acca} = \gamma_{bcb}, \gamma_{caac} = \gamma_{ebbc}$
 $\gamma_{acac} = \gamma_{bcbe}, \gamma_{caca} = \gamma_{cbcb},$
 $\gamma_{aaab} = -\gamma_{bbba}, \gamma_{aaba} = -\gamma_{bbab}, \gamma_{abaa} = -\gamma_{babb}, \gamma_{baaa} = -\gamma_{abbb}, \gamma_{cab} = -\gamma_{cba}, \gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}, \gamma_{cab} = -\gamma_{cba},$
 $\gamma_{abc} = -\gamma_{bac}, \gamma_{acb} = -\gamma_{bca}$

T_d	E	$8C_3$	$6\sigma_d$	$6S_4$	$3S_4^2 = 3C_2$			
A_1	+1	+1	+1	+1	+1			$x^2+y^2+z^2$
A_2	+1	+1	-1	-1	+1			$(x^2+y^2-2z^2, x^2-y^2)$
E	+2	-1	0	0	+2			
F_1	+3	0	-1	+1	-1		(R_x, R_y, R_z)	
F_2	+3	0	+1	-1	-1	(T_x, T_y, T_z)		(xy, xz, yz)

T_d	
A_1	$D_{0,}^{(0)}, Y_{2b,}^{(3)}, W_{0,}^{(0)}$
A_2	$Y_{0,}^{(0)}, W_{2b,}^{(3)}$
E	$(D_{0,}^{(2)}, D_{2a,}^{(2)}), (Y_{0,}^{(2)}, Y_{2a,}^{(2)}), (W_{0,}^{(2)}, W_{2a,}^{(2)})$
F_1	$(D_{1b,}^{(1)}, D_{1a,}^{(1)}, D_{0,}^{(1)}), (Y_{2b,}^{(2)}, Y_{1b,}^{(2)}, Y_{1a,}^{(2)}), (W_{1b,}^{(1)}, W_{1a,}^{(1)}, W_{0,}^{(1)})$
F_2	$(V_{1b,}^{(1)}, V_{1a,}^{(1)}, V_{0,}^{(1)}), (D_{2b,}^{(2)}, D_{1b,}^{(2)}, D_{1a,}^{(2)}), (Y_{1b,}^{(1)}, Y_{1a,}^{(1)}, Y_{0,}^{(1)}), (W_{2b,}^{(2)}, W_{1b,}^{(2)}, W_{1a,}^{(2)})$

$[Y_{0,}^{(3)}, Y_{1b,}^{(3)}, Y_{1a,}^{(3)}, Y_{2a,}^{(3)}, Y_{3b,}^{(3)}, Y_{3a,}^{(3)}], [W_{0,}^{(3)}, W_{1b,}^{(3)}, W_{1a,}^{(3)}, W_{2a,}^{(3)}, W_{3b,}^{(3)}, W_{3a,}^{(3)}], [W_{1b,}^{(4)}, W_{1a,}^{(4)}, W_{2b,}^{(4)}, W_{3b,}^{(4)}, W_{3a,}^{(4)},$

$W_{4a,}^{(4)}]$: distributed over $F_1 + F_2$, $[W_{0,}^{(4)}, W_{2a,}^{(4)}, W_{4b,}^{(4)}]$: distributed over $A_1 + E$.

(without consideration of the above "distributed terms,)

$$\beta_{aac} = \beta_{caa} = \beta_{aca} = -\beta_{bbc} = -\beta_{cbb} = -\beta_{cbc}$$

$$\gamma_{aaaa} = \gamma_{bbbb} = \gamma_{cccc}, \quad \gamma_{aabb} = \gamma_{bbaa} = \gamma_{aac} = \gamma_{bcc} = \gamma_{caa} = \gamma_{cbb}, \quad \gamma_{abba} = \gamma_{baab} = \gamma_{acca} = \gamma_{bcb} = \gamma_{cac} = \gamma_{cbbc}$$

$$\gamma_{abab} = \gamma_{baba} = \gamma_{acac} = \gamma_{bcbc} = \gamma_{caca} = \gamma_{cbcb}$$

T_h	E	$8C_3$	$3C_2''$	I	$8S_6$	$3\sigma_h$			
A_g	+1	+1	+1	+1	+1	+1			$x^2+y^2+z^2$
A_u	+1	+1	+1	-1	-1	-1			$(x^2+y^2-2z^2, x^2-y^2)$
E_g	+2	-1	+2	+2	-1	+2			
E_u	+2	-1	+2	-2	+1	-2	(T_x, T_y, T_z)	(R_x, R_y, R_z)	
F_g	+3	0	-1	+3	0	-1			(xy, xz, yz)
F_u	+3	0	-1	-3	0	+1			

T_h	
A_g	$D_{0,}^{(0)}, W_{0,}^{(0)}, W_{2b,}^{(3)}$
A_u	$Y_{0,}^{(0)}, Y_{2b,}^{(3)}$
E_g	$(D_{2a,}^{(2)}, D_{0,}^{(2)}), (W_{2a,}^{(2)}, W_{0,}^{(2)})$
E_u	$(Y_{2a,}^{(2)}, Y_{0,}^{(2)})$
F_g	$(D_{1b,}^{(1)}, D_{1a,}^{(1)}, D_{0,}^{(1)}), (D_{2b,}^{(2)}, D_{1b,}^{(2)}, D_{1a,}^{(2)}), (W_{1b,}^{(1)}, W_{1a,}^{(1)}, W_{0,}^{(1)}), (W_{2b,}^{(2)}, W_{1b,}^{(2)}, W_{1a,}^{(2)})$
F_u	$(V_{1b,}^{(1)}, V_{1a,}^{(1)}, V_{0,}^{(1)}), (Y_{1b,}^{(1)}, Y_{1a,}^{(1)}, Y_{0,}^{(1)}), (Y_{2b,}^{(2)}, Y_{1b,}^{(2)}, Y_{1a,}^{(2)})$

$[Y_{0,}^{(3)}, Y_{1b,}^{(3)}, Y_{1a,}^{(3)}, Y_{2a,}^{(3)}, Y_{3b,}^{(3)}, Y_{3a,}^{(3)}]$: distributed over $2F_u$, $[W_{0,}^{(3)}, W_{1b,}^{(3)}, W_{1a,}^{(3)}, W_{2a,}^{(3)}, W_{3b,}^{(3)}, W_{3a,}^{(3)}], [W_{1b,}^{(4)},$

$W_{1a,}^{(4)}, W_{2b,}^{(4)}, W_{3b,}^{(4)}, W_{3a,}^{(4)}, W_{4a,}^{(4)}]$: distributed over $2F_g$, $[W_{0,}^{(4)}, W_{2a,}^{(4)}, W_{4b,}^{(4)}]$: distributed over $A_g + E_g$.

(without consideration of the above "distributed terms,)

$$\gamma_{aaaa} = \gamma_{bbbb} = \gamma_{cccc}, \quad \gamma_{aabb} = \gamma_{bbaa} = \gamma_{aac} = \gamma_{bcc} = \gamma_{caa} = \gamma_{cbb}, \quad \gamma_{abba} = \gamma_{baab} = \gamma_{acca} = \gamma_{bcb} = \gamma_{cac} = \gamma_{cbbc}$$

$$\gamma_{abab} = \gamma_{baba} = \gamma_{acac} = \gamma_{bcbc} = \gamma_{caca} = \gamma_{cbcb}, \quad \gamma_{aabb} = \gamma_{bbba}, \quad \gamma_{bbab} = \gamma_{aaba}, \quad \gamma_{abaa} = \gamma_{babb}, \quad \gamma_{abbb} = \gamma_{baaa}$$

$$\gamma_{cab} = \gamma_{cba} = -\gamma_{abc} = -\gamma_{bac}, \quad \gamma_{acb} = \gamma_{bca} = -\gamma_{cab} = -\gamma_{cba}, \quad \gamma_{abc} = \gamma_{bca} = -\gamma_{cab} = -\gamma_{cba}$$

T	E	8C ₃	3C ₂			
A	+1	+1	+1			$x^2+y^2+z^2$
E	+2	-1	+2			$(x^2+y^2-2z^2, x^2-y^2)$
F	+3	0	-1	(T _x , T _y , T _z)	(R _x , R _y , R _z)	(xy, xz, yz)

T	
A	$D_{0,0}^{(0)}, Y_{0,0}^{(0)}, Y_{2b,0}^{(3)}, W_{0,0}^{(0)}, W_{2b,0}^{(3)}$
E	$(D_{2a,0}^{(2)}, D_{0,0}^{(2)}), (Y_{2a,0}^{(2)}, Y_{0,0}^{(2)}), (W_{2a,0}^{(2)}, W_{0,0}^{(2)})$
F	$(V_{1b,0}, V_{1a,0}, V_{0,0}), (D_{1b,0}^{(1)}, D_{1a,0}^{(1)}, D_{0,0}^{(1)}), (D_{2b,0}^{(2)}, D_{1b,0}^{(2)}, D_{1a,0}^{(2)}), (Y_{1b,0}^{(1)}, Y_{1a,0}^{(1)}, Y_{0,0}^{(1)}), (Y_{2b,0}^{(2)}, Y_{1b,0}^{(2)}, Y_{1a,0}^{(2)}), (W_{1b,0}^{(1)}, W_{1a,0}^{(1)}, W_{0,0}^{(1)}), (W_{2b,0}^{(2)}, W_{1b,0}^{(2)}, W_{1a,0}^{(2)})$

$[Y_{0,0}^{(3)}, Y_{1b,0}^{(3)}, Y_{1a,0}^{(3)}, Y_{2a,0}^{(3)}, Y_{3b,0}^{(3)}, Y_{3a,0}^{(3)}], [W_{0,0}^{(3)}, W_{1b,0}^{(3)}, W_{1a,0}^{(3)}, W_{2a,0}^{(3)}, W_{3b,0}^{(3)}, W_{3a,0}^{(3)}], [W_{1b,0}^{(4)}, W_{1a,0}^{(4)}, W_{2b,0}^{(4)}, W_{2a,0}^{(4)}, W_{3b,0}^{(4)}, W_{3a,0}^{(4)},$

$W_{4a,0}^{(4)}]$: distributed over 2F, $[W_{0,0}^{(4)}, W_{2a,0}^{(4)}, W_{4b,0}^{(4)}]$: distributed over A + E.

(without consideration of the above "distributed terms,)

$$\beta_{aac} = \beta_{caa} = \beta_{aca} = -\beta_{bbc} = -\beta_{cbb} = -\beta_{bcb}, \quad \beta_{abc} = \beta_{bca} = \beta_{cab} = -\beta_{bac} = -\beta_{acb} = -\beta_{cba}$$

$$\gamma_{aaaa} = \gamma_{bbbb} = \gamma_{cccc}, \quad \gamma_{aabb} = \gamma_{bbaa} = \gamma_{aac} = \gamma_{bcc} = \gamma_{caa} = \gamma_{cbb}, \quad \gamma_{abba} = \gamma_{baab} = \gamma_{acca} = \gamma_{bcb} = \gamma_{cac} = \gamma_{cbbc}$$

$$\gamma_{abab} = \gamma_{baba} = \gamma_{acac} = \gamma_{bcbc} = \gamma_{caca} = \gamma_{cbcb}, \quad \gamma_{aaab} = \gamma_{bbba}, \quad \gamma_{bbab} = \gamma_{aaba}, \quad \gamma_{abaa} = \gamma_{babb}, \quad \gamma_{abbb} = \gamma_{baaa}$$

$$\gamma_{cab} = \gamma_{cba} = -\gamma_{abc} = -\gamma_{bac}, \quad \gamma_{acb} = \gamma_{bca} = -\gamma_{cab} = -\gamma{cba}, \quad \gamma_{abc} = \gamma_{bac} = -\gamma_{acb} = -\gamma_{cba}$$

O	E	8C ₃	6C ₂	6C ₄	3C ₄ ² ≡3C ₂ ²			
A ₁	+1	+1	+1	+1	+1			$x^2+y^2+z^2$
A ₂	+1	+1	-1	-1	+1			$(x^2+y^2-2z^2, x^2-y^2)$
E	+2	-1	0	0	+2			
F ₁	+3	0	-1	+1	-1	(T _x , T _y , T _z)	(R _x , R _y , R _z)	
F ₂	+3	0	+1	-1	-1			(xy, xz, yz)

O	
A ₁	$D_{0,0}^{(0)}, Y_{0,0}^{(0)}, W_{0,0}^{(0)}$
A ₂	$Y_{2b,0}^{(3)}, W_{2b,0}^{(3)}$
E	$(D_{2a,0}^{(2)}, D_{0,0}^{(2)}), (Y_{2a,0}^{(2)}, Y_{0,0}^{(2)}), (W_{2a,0}^{(2)}, W_{0,0}^{(2)})$
F ₁	$(V_{1b,0}, V_{1a,0}, V_{0,0}), (D_{1b,0}^{(1)}, D_{1a,0}^{(1)}, D_{0,0}^{(1)}), (Y_{1b,0}^{(1)}, Y_{1a,0}^{(1)}, Y_{0,0}^{(1)}), (W_{1b,0}^{(1)}, W_{1a,0}^{(1)}, W_{0,0}^{(1)})$
F ₂	$(D_{2b,0}^{(2)}, D_{1b,0}^{(2)}, D_{1a,0}^{(2)}), (Y_{2b,0}^{(2)}, Y_{1b,0}^{(2)}, Y_{1a,0}^{(2)}), (W_{2b,0}^{(2)}, W_{1b,0}^{(2)}, W_{1a,0}^{(2)})$

$[Y_{0,0}^{(3)}, Y_{1b,0}^{(3)}, Y_{1a,0}^{(3)}, Y_{2a,0}^{(3)}, Y_{3b,0}^{(3)}, Y_{3a,0}^{(3)}], [W_{0,0}^{(3)}, W_{1b,0}^{(3)}, W_{1a,0}^{(3)}, W_{2a,0}^{(3)}, W_{3b,0}^{(3)}, W_{3a,0}^{(3)}], [W_{1b,0}^{(4)}, W_{1a,0}^{(4)}, W_{2b,0}^{(4)}, W_{2a,0}^{(4)}, W_{3b,0}^{(4)}, W_{3a,0}^{(4)},$

$W_{4a,0}^{(4)}]$: distributed over F₁ + F₂, $[W_{0,0}^{(4)}, W_{2a,0}^{(4)}, W_{4b,0}^{(4)}]$: distributed over A₁ + E.

(without consideration of the above "distributed terms,)

$$\beta_{abc} = \beta_{bca} = \beta_{cab} = -\beta_{bac} = -\beta_{acb} = -\beta_{cba}$$

$$\gamma_{aaaa} = \gamma_{bbbb} = \gamma_{cccc}, \quad \gamma_{aabb} = \gamma_{bbaa} = \gamma_{aac} = \gamma_{bcc} = \gamma_{caa} = \gamma_{cbb}, \quad \gamma_{abba} = \gamma_{baab} = \gamma_{acca} = \gamma_{bcb} = \gamma_{cac} = \gamma_{cbbc}$$

$$\gamma_{abab} = \gamma_{baba} = \gamma_{acac} = \gamma_{bcbc} = \gamma_{caca} = \gamma_{cbcb}$$

O_h	E	$8C_3$	$6C_2$	$6C_4$	$3C_4^2$	S_2	$6S_4$	$8S_6$	$3\sigma_h$	$6\sigma_d$			
					$\equiv 3C_2''$	$\equiv I$							
A_{1g}	+1	+1	+1	+1	+1	+1	+1	+1	+1	+1			$x^2+y^2+z^2$
A_{1u}	+1	+1	+1	+1	+1	-1	-1	-1	-1	-1			
A_{2g}	+1	+1	-1	-1	+1	-1	+1	+1	+1	-1			
A_{2u}	+1	+1	-1	-1	+1	-1	+1	-1	-1	+1			
E_g	+2	-1	0	0	+2	+2	0	-1	+2	0			$(x^2+y^2-2z^2, x^2-y^2)$
E_u	+2	-1	0	0	+2	-2	0	+1	-2	0			
F_{1g}	+3	0	-1	+1	-1	+3	+1	0	-1	-1			
F_{1u}	+3	0	-1	+1	-1	-3	-1	0	+1	+1	(T_x, T_y, T_z)	(R_x, R_y, R_z)	
F_{2g}	+3	0	+1	-1	-1	+3	-1	0	-1	+1			(xy, xz, yz)
F_{2u}	+3	0	+1	-1	-1	-3	+1	0	+1	-1			

O_h	
A_{1g}	$D_{0,0}^{(0)}, W_{0,0}^{(0)}$
A_{1u}	$Y_{0,0}^{(0)}$
A_{2g}	$W_{2b}^{(3)}$
A_{2u}	$Y_{2b}^{(3)}$
E_g	$(D_{2a}^{(2)}, D_{0,0}^{(2)}), (W_{2a}^{(2)}, W_{0,0}^{(2)})$
E_u	$(Y_{2a}^{(2)}, Y_{0,0}^{(2)})$
F_{1g}	$(D_{1b}^{(1)}, D_{1a}^{(1)}, D_{0,0}^{(1)}), (W_{1b}^{(1)}, W_{1a}^{(1)}, W_{0,0}^{(1)})$
F_{1u}	$(V_{1b}, V_{1a}, V_{0,0}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}, Y_{0,0}^{(1)})$
F_{2g}	$(D_{2b}^{(2)}, D_{1b}^{(2)}, D_{1a}^{(2)}), (W_{2b}^{(2)}, W_{1b}^{(2)}, W_{1a}^{(2)})$
F_{2u}	$(Y_{2b}^{(2)}, Y_{1b}^{(2)}, Y_{1a}^{(2)})$

$[Y_{0,0}^{(3)}, Y_{1b}^{(3)}, Y_{1a}^{(3)}, Y_{2a}^{(3)}, Y_{3b}^{(3)}, Y_{3a}^{(3)}]$: distributed over $F_{1u} + F_{2u}$, $[W_{0,0}^{(3)}, W_{1b}^{(3)}, W_{1a}^{(3)}, W_{2a}^{(3)}, W_{3b}^{(3)}, W_{3a}^{(3)}]$, $[W_{1b}^{(4)},$

$W_{1a}^{(4)}, W_{2b}^{(4)}, W_{3b}^{(4)}, W_{3a}^{(4)}, W_{4a}^{(4)}]$: distributed over $F_{1g} + F_{2g}$, $[W_{0,0}^{(4)}, W_{2a}^{(4)}, W_{4b}^{(4)}]$: distributed over $A_{1g} + E_g$.

(without consideration of the above "distributed terms,)

$$\gamma_{aaaa} = \gamma_{bbbb} = \gamma_{cccc}, \quad \gamma_{aabb} = \gamma_{bbaa} = \gamma_{aacc} = \gamma_{bbcc} = \gamma_{caaa} = \gamma_{cbbb}, \quad \gamma_{abba} = \gamma_{baab} = \gamma_{acca} = \gamma_{bccb} = \gamma_{caac} = \gamma_{cbcb}$$

$$\gamma_{abab} = \gamma_{baba} = \gamma_{acac} = \gamma_{bcbc} = \gamma_{caca} = \gamma_{cbcb}$$

$C_{\infty v}$	E	$2C_{\infty}^{\phi}$	$2C_{\infty}^{2\phi}$	$2C_{\infty}^{3\phi}$	\dots	$\infty\sigma_v$			
Σ^+	+1	+1	+1	+1	\dots	+1	T_z		x^2+y^2, z^2
Σ^-	+1	+1	+1	+1	\dots	-1		R_z	
Π	+2	$2\cos\phi$	$2\cos2\phi$	$2\cos3\phi$	\dots	0	(T_x, T_y)	(R_x, R_y)	(xz, yz)
Δ	+2	$2\cos2\phi$	$2\cos4\phi$	$2\cos6\phi$	\dots	0			(x^2-y^2, xy)
Φ	+2	$2\cos3\phi$	$2\cos6\phi$	$2\cos9\phi$	\dots	0			
\dots	\dots	\dots	\dots	\dots	\dots	\dots			

$C_{\infty v}$	
Σ^+	$V_0, D_0^{(0)}, D_0^{(2)}, Y_0^{(1)}, Y_0^{(3)}, W_0^{(0)}, W_0^{(2)}, W_0^{(4)}$
Σ^-	$D_0^{(1)}, Y_0^{(0)}, Y_0^{(2)}, W_0^{(1)}, W_0^{(3)}$
P	$(V_{1b}, V_{1a}), (D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{1b}^{(4)}, W_{1a}^{(4)})$
D	$(D_{2b}^{(2)}, D_{2a}^{(2)}), (Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)}), (W_{2b}^{(1)}, W_{2a}^{(1)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{2b}^{(3)}, W_{2a}^{(3)}), (W_{2b}^{(4)}, W_{2a}^{(4)})$
Φ	$(Y_{3b}^{(3)}, Y_{3a}^{(3)}), (W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{3b}^{(4)}, W_{3a}^{(4)})$
Γ	$(W_{4b}^{(4)}, W_{4a}^{(4)})$

$$\beta_{cac}, \beta_{aac} = \beta_{bbc}, \beta_{aca} = \beta_{bcb}, \beta_{caa} = \beta_{cbb}$$

$$\gamma_{ccc}, \gamma_{aaa} = \gamma_{bbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{acac} = \gamma_{cbcb}, \gamma_{caca} = \gamma_{cbcb}, \gamma_{aac} = \gamma_{bbc}, \gamma_{cca} = \gamma_{cbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{bcbb}, \gamma_{caac} = \gamma_{cbcb}$$

$D_{\infty h}$	E	$2C_{\infty}^{\phi}$	$2C_{\infty}^{2\phi}$	$2C_{\infty}^{3\phi}$	...	σ_h	∞C_2	$\infty \sigma_v$	$2S_{\infty}^{\phi}$	$2S_{\infty}^{2\phi}$	S_2				
Σ_g^+	+1	+1	+1	+1	...	+1	+1	+1	+1	+1	...	+1	T_z	R_z	x^2+y^2, z^2
Σ_u^+	+1	+1	+1	+1	...	-1	-1	+1	-1	-1	...	-1			
Σ_g^-	+1	+1	+1	+1	...	+1	-1	-1	+1	+1	...	+1	(T_x, T_y)	(R_x, R_y)	(xz, yz)
Σ_u^-	+2	$+2\cos\phi$	$+2\cos2\phi$	$+2\cos3\phi$...	-2	0	0	$-2\cos\phi$	$-2\cos2\phi$...	+2					$(x^2-y^2, xy)$
Π_g	+2	$+2\cos\phi$	$+2\cos2\phi$	$+2\cos3\phi$	...	+2	0	0	$+2\cos\phi$	$+2\cos2\phi$	...	-2			
Π_u	+2	$+2\cos2\phi$	$+2\cos4\phi$	$+2\cos6\phi$	...	+2	0	0	$-2\cos2\phi$	$-2\cos4\phi$	...	+2			
Δ_g	+2	$+2\cos2\phi$	$+2\cos4\phi$	$+2\cos6\phi$	...	-2	0	0	$+2\cos2\phi$	$+2\cos4\phi$	...	-2			
Δ_u	+2	$+2\cos3\phi$	$+2\cos6\phi$	$+2\cos9\phi$	...	-2	0	0	$-2\cos3\phi$	$-2\cos6\phi$	...	+2			
Φ_g	+2	$+2\cos3\phi$	$+2\cos6\phi$	$+2\cos9\phi$	...	+2	0	0	$+2\cos3\phi$	$+2\cos6\phi$	...	-2			
Φ_u	...	...	...	...	...	...	...	...	...	...	...	...
Γ_g															
Γ_u															

$D_{\infty h}$	
Σ_g^+	$D_{0,0}^{(0)}, D_{0,0}^{(2)}, W_{0,0}^{(0)}, W_{0,0}^{(2)}, W_{0,0}^{(4)}$
Σ_u^+	$V_0, Y_{0,0}^{(1)}, Y_{0,0}^{(3)}$
Σ_g^-	$D_{0,0}^{(1)}, W_{0,0}^{(1)}, W_{0,0}^{(3)}$
Σ_u^-	$Y_{0,0}^{(0)}, Y_{0,0}^{(2)}$
Π_g	$(D_{1b}^{(1)}, D_{1a}^{(1)}), (D_{1b}^{(2)}, D_{1a}^{(2)}), (W_{1b}^{(1)}, W_{1a}^{(1)}), (W_{1b}^{(2)}, W_{1a}^{(2)}), (W_{1b}^{(3)}, W_{1a}^{(3)}), (W_{1b}^{(4)}, W_{1a}^{(4)})$
Π_u	$(V_{1b}, V_{1a}), (Y_{1b}^{(1)}, Y_{1a}^{(1)}), (Y_{1b}^{(2)}, Y_{1a}^{(2)}), (Y_{1b}^{(3)}, Y_{1a}^{(3)})$
Δ_g	$(D_{2b}^{(2)}, D_{2a}^{(2)}), (W_{2b}^{(2)}, W_{2a}^{(2)}), (W_{2b}^{(3)}, W_{2a}^{(3)}), (W_{2b}^{(4)}, W_{2a}^{(4)})$
Δ_u	$(Y_{2b}^{(2)}, Y_{2a}^{(2)}), (Y_{2b}^{(3)}, Y_{2a}^{(3)})$
Φ_g	$(W_{3b}^{(3)}, W_{3a}^{(3)}), (W_{3b}^{(4)}, W_{3a}^{(4)})$
Φ_u	$(Y_{3b}^{(3)}, Y_{3a}^{(3)})$
Γ_g	
Γ_u	$(W_{4b}^{(4)}, W_{4a}^{(4)})$

$$\gamma_{cccc}, \gamma_{aaaa} = \gamma_{bbbb}, \gamma_{abab} = \gamma_{baba}, \gamma_{aabb} = \gamma_{bbaa}, \gamma_{acac} = \gamma_{cbcb}, \gamma_{caca} = \gamma_{cbcb}, \gamma_{aacc} = \gamma_{bbcc}, \gamma_{ccaa} = \gamma_{ccbb},$$

$$\gamma_{abba} = \gamma_{baab}, \gamma_{acca} = \gamma_{cbcb}, \gamma_{caac} = \gamma_{cbcb}$$