

# Model for “C3v5”

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## General Condition

- Basis type: **lgs**
- SAMB selection:
  - Type: [Q, G]
  - Rank: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]
  - Irrep.: [ $A_1$ ,  $A_2$ ,  $E$ ]
  - Spin (s): [0, 1]
- Atomic selection:
  - Type: [Q, G, M, T]
  - Rank: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]
  - Irrep.: [ $A_1$ ,  $A_2$ ,  $E$ ]
  - Spin (s): [0, 1]
- Site-cluster selection:
  - Rank: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]
  - Irrep.: [ $A_1$ ,  $A_2$ ,  $E$ ]
- Bond-cluster selection:
  - Type: [Q, G, M, T]
  - Rank: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]
  - Irrep.: [ $A_1$ ,  $A_2$ ,  $E$ ]
- Max. neighbor: 10
- Search cell range: (-2, 3), (-2, 3), (-2, 3)
- Toroidal priority: **false**

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## Group and Unit Cell

- Group: SG No. 160  $C_{3v}^5$   $R3m$  [ trigonal ]
- Associated point group: PG No. 160  $C_{3v}$   $3m$  (3m1 setting) [ trigonal ]
- Unit cell:
  - $a = 1.00000$ ,  $b = 1.00000$ ,  $c = 1.00000$ ,  $\alpha = 90.0$ ,  $\beta = 90.0$ ,  $\gamma = 120.0$
- Lattice vectors (conventional cell):
  - $\mathbf{a}_1 = [ 1.00000, 0.00000, 0.00000 ]$
  - $\mathbf{a}_2 = [ -0.50000, 0.86603, 0.00000 ]$
  - $\mathbf{a}_3 = [ 0.00000, 0.00000, 1.00000 ]$

- Plus sets:  
 $+ [0, 0, 0], \quad + [\frac{2}{3}, \frac{1}{3}, \frac{1}{3}], \quad + [\frac{1}{3}, \frac{2}{3}, \frac{2}{3}]$

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## Symmetry Operation

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Table 1: Symmetry operation

#	SO	#	SO	#	SO	#	SO	#	SO
1	$\{1 0\}$	2	$\{3_{001}^+ 0\}$	3	$\{3_{001}^- 0\}$	4	$\{m_{110} 0\}$	5	$\{m_{100} 0\}$
6	$\{m_{010} 0\}$								

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## Harmonics

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Table 2: Harmonics

#	symbol	irrep.	rank	X	multiplicity	component	symmetry
1	$Q_0(A_1)$	$A_1$	0	$Q, T$	-	-	1
2	$Q_1(A_1)$	$A_1$	1	$Q, T$	-	-	$z$
3	$Q_2(A_1)$	$A_1$	2	$Q, T$	-	-	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$
4	$G_3(A_1)$	$A_1$	3	$G, M$	-	-	$\frac{\sqrt{10}x(x^2-3y^2)}{4}$
5	$Q_3(A_1, 1)$	$A_1$	3	$Q, T$	1	-	$-\frac{z(3x^2+3y^2-2z^2)}{2}$
6	$Q_3(A_1, 2)$	$A_1$	3	$Q, T$	2	-	$\frac{\sqrt{10}y(3x^2-y^2)}{4}$

*continued ...*

Table 2

#	symbol	irrep.	rank	X	multiplicity	component	symmetry
7	$\mathbb{Q}_4(A_1, 2)$	$A_1$	4	$Q, T$	2	-	$\frac{\sqrt{70}yz(3x^2-y^2)}{4}$
8	$\mathbb{G}_0(A_2)$	$A_2$	0	$G, M$	-	-	1
9	$\mathbb{G}_1(A_2)$	$A_2$	1	$G, M$	-	-	$z$
10	$\mathbb{G}_2(A_2)$	$A_2$	2	$G, M$	-	-	$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$
11	$\mathbb{G}_3(A_2, 1)$	$A_2$	3	$G, M$	1	-	$-\frac{z(3x^2+3y^2-2z^2)}{2}$
12	$\mathbb{G}_3(A_2, 2)$	$A_2$	3	$G, M$	2	-	$\frac{\sqrt{10}y(3x^2-y^2)}{4}$
13	$\mathbb{Q}_3(A_2)$	$A_2$	3	$Q, T$	-	-	$\frac{\sqrt{10}x(x^2-3y^2)}{4}$
14	$\mathbb{Q}_4(A_2)$	$A_2$	4	$Q, T$	-	-	$\frac{\sqrt{70}xz(x^2-3y^2)}{4}$
15	$\mathbb{G}_{1,1}(E)$	$E$	1	$G, M$	-	1	$-y$
16	$\mathbb{G}_{1,2}(E)$					2	$x$
17	$\mathbb{Q}_{1,1}(E)$	$E$	1	$Q, T$	-	1	$x$
18	$\mathbb{Q}_{1,2}(E)$					2	$y$
19	$\mathbb{G}_{2,1}(E, 1)$	$E$	2	$G, M$	1	1	$\sqrt{3}yz$
20	$\mathbb{G}_{2,2}(E, 1)$					2	$-\sqrt{3}xz$
21	$\mathbb{G}_{2,1}(E, 2)$	$E$	2	$G, M$	2	1	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
22	$\mathbb{G}_{2,2}(E, 2)$					2	$-\sqrt{3}xy$
23	$\mathbb{Q}_{2,1}(E, 1)$	$E$	2	$Q, T$	1	1	$\sqrt{3}xz$
24	$\mathbb{Q}_{2,2}(E, 1)$					2	$\sqrt{3}yz$
25	$\mathbb{Q}_{2,1}(E, 2)$	$E$	2	$Q, T$	2	1	$\sqrt{3}xy$
26	$\mathbb{Q}_{2,2}(E, 2)$					2	$\frac{\sqrt{3}(x-y)(x+y)}{2}$
27	$\mathbb{G}_{3,1}(E, 1)$	$E$	3	$G, M$	1	1	$\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$

continued ...

Table 2

#	symbol	irrep.	rank	X	multiplicity	component	symmetry
28	$\mathbb{G}_{3,2}(E, 1)$					2	$-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$
29	$\mathbb{G}_{3,1}(E, 2)$	$E$	3	$G, M$	2	1	$-\frac{\sqrt{15}z(x-y)(x+y)}{2}$
30	$\mathbb{G}_{3,2}(E, 2)$					2	$\sqrt{15}xyz$
31	$\mathbb{Q}_{3,1}(E, 1)$	$E$	3	$Q, T$	1	1	$-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$
32	$\mathbb{Q}_{3,2}(E, 1)$					2	$-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$
33	$\mathbb{Q}_{3,1}(E, 2)$	$E$	3	$Q, T$	2	1	$\sqrt{15}xyz$
34	$\mathbb{Q}_{3,2}(E, 2)$					2	$\frac{\sqrt{15}z(x-y)(x+y)}{2}$
35	$\mathbb{G}_{4,1}(E, 2)$	$E$	4	$G, M$	2	1	$\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$
36	$\mathbb{G}_{4,2}(E, 2)$					2	$\frac{\sqrt{35}xy(x-y)(x+y)}{2}$
37	$\mathbb{Q}_{4,1}(E, 2)$	$E$	4	$Q, T$	2	1	$-\frac{\sqrt{35}xy(x-y)(x+y)}{2}$
38	$\mathbb{Q}_{4,2}(E, 2)$					2	$\frac{\sqrt{35}(x^2-2xy-y^2)(x^2+2xy-y^2)}{8}$

— Basis in full matrix —

Table 3: dimension = 54

#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)
0	$ p_x, \uparrow\rangle @A(1)$	1	$ p_x, \downarrow\rangle @A(1)$	2	$ p_y, \uparrow\rangle @A(1)$	3	$ p_y, \downarrow\rangle @A(1)$	4	$ p_z, \uparrow\rangle @A(1)$
5	$ p_z, \downarrow\rangle @A(1)$	6	$ p_x, \uparrow\rangle @A(2)$	7	$ p_x, \downarrow\rangle @A(2)$	8	$ p_y, \uparrow\rangle @A(2)$	9	$ p_y, \downarrow\rangle @A(2)$

continued ...

Table 3

#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)	#	orbital@atom(SL)
10	$ p_z, \uparrow\rangle @A(2)$	11	$ p_z, \downarrow\rangle @A(2)$	12	$ p_x, \uparrow\rangle @A(3)$	13	$ p_x, \downarrow\rangle @A(3)$	14	$ p_y, \uparrow\rangle @A(3)$
15	$ p_y, \downarrow\rangle @A(3)$	16	$ p_z, \uparrow\rangle @A(3)$	17	$ p_z, \downarrow\rangle @A(3)$	18	$ p_x, \uparrow\rangle @B(1)$	19	$ p_x, \downarrow\rangle @B(1)$
20	$ p_y, \uparrow\rangle @B(1)$	21	$ p_y, \downarrow\rangle @B(1)$	22	$ p_z, \uparrow\rangle @B(1)$	23	$ p_z, \downarrow\rangle @B(1)$	24	$ p_x, \uparrow\rangle @B(2)$
25	$ p_x, \downarrow\rangle @B(2)$	26	$ p_y, \uparrow\rangle @B(2)$	27	$ p_y, \downarrow\rangle @B(2)$	28	$ p_z, \uparrow\rangle @B(2)$	29	$ p_z, \downarrow\rangle @B(2)$
30	$ p_x, \uparrow\rangle @B(3)$	31	$ p_x, \downarrow\rangle @B(3)$	32	$ p_y, \uparrow\rangle @B(3)$	33	$ p_y, \downarrow\rangle @B(3)$	34	$ p_z, \uparrow\rangle @B(3)$
35	$ p_z, \downarrow\rangle @B(3)$	36	$ p_x, \uparrow\rangle @B(4)$	37	$ p_x, \downarrow\rangle @B(4)$	38	$ p_y, \uparrow\rangle @B(4)$	39	$ p_y, \downarrow\rangle @B(4)$
40	$ p_z, \uparrow\rangle @B(4)$	41	$ p_z, \downarrow\rangle @B(4)$	42	$ p_x, \uparrow\rangle @B(5)$	43	$ p_x, \downarrow\rangle @B(5)$	44	$ p_y, \uparrow\rangle @B(5)$
45	$ p_y, \downarrow\rangle @B(5)$	46	$ p_z, \uparrow\rangle @B(5)$	47	$ p_z, \downarrow\rangle @B(5)$	48	$ p_x, \uparrow\rangle @B(6)$	49	$ p_x, \downarrow\rangle @B(6)$
50	$ p_y, \uparrow\rangle @B(6)$	51	$ p_y, \downarrow\rangle @B(6)$	52	$ p_z, \uparrow\rangle @B(6)$	53	$ p_z, \downarrow\rangle @B(6)$		

Table 4: Atomic basis (orbital part only)

orbital	definition
$ p_x\rangle$	$x$
$ p_y\rangle$	$y$
$ p_z\rangle$	$z$

234 (all 351) SAMBs

• 'A' site-cluster

\* bra:  $\langle p_x, \uparrow |, \langle p_x, \downarrow |, \langle p_y, \uparrow |, \langle p_y, \downarrow |, \langle p_z, \uparrow |, \langle p_z, \downarrow |$

\* ket:  $|p_x, \uparrow\rangle, |p_x, \downarrow\rangle, |p_y, \uparrow\rangle, |p_y, \downarrow\rangle, |p_z, \uparrow\rangle, |p_z, \downarrow\rangle$

\* wyckoff: 9b

$$\boxed{\text{z1}} \quad \mathbb{Q}_0^{(c)}(A_1) = \mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_0^{(s)}(A_1)$$

$$\boxed{\text{z2}} \quad \mathbb{Q}_1^{(c)}(A_1) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z3}} \quad \mathbb{Q}_2^{(c)}(A_1) = \mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_0^{(s)}(A_1)$$

$$\boxed{\text{z4}} \quad \mathbb{Q}_3^{(c)}(A_1, 2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z5}} \quad \mathbb{Q}_1^{(1,-1;c)}(A_1) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z6}} \quad \mathbb{Q}_2^{(1,-1;c)}(A_1) = \mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_0^{(s)}(A_1)$$

$$\boxed{\text{z7}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1, 2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z8}} \quad \mathbb{Q}_1^{(1,0;c)}(A_1) = \frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z9}} \quad \mathbb{Q}_0^{(1,1;c)}(A_1) = \mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_0^{(s)}(A_1)$$

$$\boxed{\text{z61}} \quad \mathbb{Q}_3^{(c)}(A_2) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z62}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_2) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z63}} \quad \mathbb{G}_2^{(c)}(A_2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} - \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z64}} \quad \mathbb{G}_2^{(1,-1;c)}(A_2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} - \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z65}} \quad \mathbb{G}_0^{(1,0;c)}(A_2) = -\frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z66}} \quad \mathbb{G}_1^{(1,0;c)}(A_2) = \mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_0^{(s)}(A_1)$$

$$\boxed{\text{z118}} \quad \mathbb{Q}_{1,1}^{(c)}(E, a) = \frac{\sqrt{2}\mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z119}} \quad \mathbb{Q}_{1,2}^{(c)}(E, a) = \frac{\sqrt{2}\mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z120}} \quad \mathbb{Q}_{1,1}^{(c)}(E, b) = \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{14}$$

$$\boxed{\text{z121}} \quad \mathbb{Q}_{1,2}^{(c)}(E, b) = \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{14}$$

$$\boxed{\text{z122}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 1) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z123}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 1) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z124}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z125}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 2) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z126}} \quad \mathbb{Q}_{3,1}^{(c)}(E, 1) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{7}$$

$$\boxed{\text{z127}} \quad \mathbb{Q}_{3,2}^{(c)}(E, 1) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{7}$$

$$\boxed{\text{z128}} \quad \mathbb{Q}_{3,1}^{(c)}(E, 2) = \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\begin{aligned}
\boxed{\text{z129}} \quad \mathbb{Q}_{3,2}^{(c)}(E, 2) &= \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} - \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} \\
\boxed{\text{z130}} \quad \mathbb{Q}_{1,1}^{(1,-1;c)}(E) &= \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{14} \\
\boxed{\text{z131}} \quad \mathbb{Q}_{1,2}^{(1,-1;c)}(E) &= \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{14} \\
\boxed{\text{z132}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E, 1) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_0^{(s)}(A_1)}{2} \\
\boxed{\text{z133}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E, 1) &= \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_0^{(s)}(A_1)}{2} \\
\boxed{\text{z134}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E, 2) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_0^{(s)}(A_1)}{2} \\
\boxed{\text{z135}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E, 2) &= \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_0^{(s)}(A_1)}{2} \\
\boxed{\text{z136}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 1) &= \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{7} \\
\boxed{\text{z137}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 1) &= \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{7} \\
\boxed{\text{z138}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 2) &= \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} \\
\boxed{\text{z139}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 2) &= \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} - \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} \\
\boxed{\text{z140}} \quad \mathbb{Q}_{1,1}^{(1,0;c)}(E) &= -\frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{1,2}^{(s)}(E)}{2} \\
\boxed{\text{z141}} \quad \mathbb{Q}_{1,2}^{(1,0;c)}(E) &= \frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{1,1}^{(s)}(E)}{2} \\
\boxed{\text{z142}} \quad \mathbb{Q}_{1,1}^{(1,1;c)}(E) &= \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}
\end{aligned}$$



$$\boxed{\text{z143}} \quad \mathbb{Q}_{1,2}^{(1,1;c)}(E) = \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z144}} \quad \mathbb{G}_{1,1}^{(1,0;c)}(E) = \frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z145}} \quad \mathbb{G}_{1,2}^{(1,0;c)}(E) = \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z146}} \quad \mathbb{G}_{2,1}^{(1,0;c)}(E, 2) = \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z147}} \quad \mathbb{G}_{2,2}^{(1,0;c)}(E, 2) = \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(s)}(E)}{2} - \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

• 'B' site-cluster

\* bra:  $\langle p_x, \uparrow |, \langle p_x, \downarrow |, \langle p_y, \uparrow |, \langle p_y, \downarrow |, \langle p_z, \uparrow |, \langle p_z, \downarrow |$

\* ket:  $|p_x, \uparrow\rangle, |p_x, \downarrow\rangle, |p_y, \uparrow\rangle, |p_y, \downarrow\rangle, |p_z, \uparrow\rangle, |p_z, \downarrow\rangle$

\* wyckoff: 18c

$$\boxed{\text{z10}} \quad \mathbb{Q}_0^{(c)}(A_1, a) = \mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_0^{(s)}(A_1)$$

$$\boxed{\text{z11}} \quad \mathbb{Q}_0^{(c)}(A_1, b) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z12}} \quad \mathbb{Q}_1^{(c)}(A_1) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z13}} \quad \mathbb{Q}_2^{(c)}(A_1) = \mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_0^{(s)}(A_1)$$

$$\boxed{\text{z14}} \quad \mathbb{Q}_3^{(c)}(A_1, 2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z15}} \quad \mathbb{Q}_4^{(c)}(A_1, 2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z16}} \quad \mathbb{Q}_0^{(1,-1;c)}(A_1) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\begin{aligned}
\boxed{\text{z17}} \quad \mathbb{Q}_1^{(1,-1;c)}(A_1) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} \\
\boxed{\text{z18}} \quad \mathbb{Q}_2^{(1,-1;c)}(A_1) &= \mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_0^{(s)}(A_1) \\
\boxed{\text{z19}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1,2) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,2}^{(s)}(E)}{2} \\
\boxed{\text{z20}} \quad \mathbb{Q}_4^{(1,-1;c)}(A_1,2) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_{2,1}^{(s)}(E,2)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_{2,2}^{(s)}(E,2)}{2} \\
\boxed{\text{z21}} \quad \mathbb{Q}_1^{(1,0;c)}(A_1) &= \frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(s)}(E)}{2} \\
\boxed{\text{z22}} \quad \mathbb{Q}_3^{(1,0;c)}(A_1,2) &= \mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_3^{(s)}(A_2) \\
\boxed{\text{z23}} \quad \mathbb{Q}_0^{(1,1;c)}(A_1) &= \mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_0^{(s)}(A_1) \\
\boxed{\text{z24}} \quad \mathbb{G}_3^{(1,0;c)}(A_1) &= \frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{2,1}^{(s)}(E,2)}{2} + \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{2,2}^{(s)}(E,2)}{2} \\
\boxed{\text{z67}} \quad \mathbb{Q}_3^{(c)}(A_2,a) &= \mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_3^{(s)}(A_2) \\
\boxed{\text{z68}} \quad \mathbb{Q}_3^{(c)}(A_2,b) &= -\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_3^{(s)}(A_2) \\
\boxed{\text{z69}} \quad \mathbb{Q}_3^{(c)}(A_2,c) &= -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E,2)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E,2)\mathbb{Q}_{1,1}^{(s)}(E)}{2} \\
\boxed{\text{z70}} \quad \mathbb{Q}_4^{(c)}(A_2) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E,1)\mathbb{Q}_{2,2}^{(s)}(E,2)}{2} - \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E,1)\mathbb{Q}_{2,1}^{(s)}(E,2)}{2} \\
\boxed{\text{z71}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_2,a) &= -\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_3^{(s)}(A_2) \\
\boxed{\text{z72}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_2,b) &= -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,1}^{(s)}(E)}{2} \\
\boxed{\text{z73}} \quad \mathbb{Q}_4^{(1,-1;c)}(A_2) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_{2,2}^{(s)}(E,2)}{2} - \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_{2,1}^{(s)}(E,2)}{2}
\end{aligned}$$

$$\boxed{\text{z74}} \quad \mathbb{Q}_3^{(1,1;c)}(A_2) = \mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_3^{(s)}(A_2)$$

$$\boxed{\text{z75}} \quad \mathbb{G}_1^{(c)}(A_2) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E,2)\mathbb{Q}_{2,2}^{(s)}(E,2)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E,2)\mathbb{Q}_{2,1}^{(s)}(E,2)}{2}$$

$$\boxed{\text{z76}} \quad \mathbb{G}_2^{(c)}(A_2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E,1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} - \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E,1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z77}} \quad \mathbb{G}_1^{(1,-1;c)}(A_2) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_{2,2}^{(s)}(E,2)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_{2,1}^{(s)}(E,2)}{2}$$

$$\boxed{\text{z78}} \quad \mathbb{G}_2^{(1,-1;c)}(A_2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} - \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z79}} \quad \mathbb{G}_0^{(1,0;c)}(A_2) = -\frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z80}} \quad \mathbb{G}_1^{(1,0;c)}(A_2) = \mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_0^{(s)}(A_1)$$

$$\boxed{\text{z81}} \quad \mathbb{G}_3^{(1,0;c)}(A_2,2) = -\frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{2,2}^{(s)}(E,2)}{2} + \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{2,1}^{(s)}(E,2)}{2}$$

$$\boxed{\text{z148}} \quad \mathbb{Q}_{1,1}^{(c)}(E,a) = \frac{\sqrt{2}\mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z149}} \quad \mathbb{Q}_{1,2}^{(c)}(E,a) = \frac{\sqrt{2}\mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z150}} \quad \mathbb{Q}_{1,1}^{(c)}(E,b) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E,2)\mathbb{Q}_3^{(s)}(A_2)}{2}$$

$$\boxed{\text{z151}} \quad \mathbb{Q}_{1,2}^{(c)}(E,b) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E,2)\mathbb{Q}_3^{(s)}(A_2)}{2}$$

$$\boxed{\text{z152}} \quad \mathbb{Q}_{1,1}^{(c)}(E,c) = \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(a)}(E,2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(a)}(E,2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{14}$$

$$\boxed{\text{z153}} \quad \mathbb{Q}_{1,2}^{(c)}(E,c) = \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(a)}(E,2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(a)}(E,2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{14}$$

$$\boxed{\text{z154}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 1a) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z155}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 1a) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z156}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 1b) = \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2} + \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z157}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 1b) = \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} - \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z158}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 2a) = \frac{\sqrt{2}\mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z159}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 2a) = \frac{\sqrt{2}\mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z160}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 2b) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z161}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 2b) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z162}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 2c) = -\frac{\sqrt{2}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z163}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 2c) = -\frac{\sqrt{2}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z164}} \quad \mathbb{Q}_{3,1}^{(c)}(E, 1) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{7}$$

$$\boxed{\text{z165}} \quad \mathbb{Q}_{3,2}^{(c)}(E, 1) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{7}$$

$$\boxed{\text{z166}} \quad \mathbb{Q}_{3,1}^{(c)}(E, 2a) = -\frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_3^{(s)}(A_2)}{2}$$

$$\boxed{\text{z167}} \quad \mathbb{Q}_{3,2}^{(c)}(E, 2a) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_3^{(s)}(A_2)}{2}$$

$$\boxed{\text{z168}} \quad \mathbb{Q}_{3,1}^{(c)}(E, 2b) = \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z169}} \quad \mathbb{Q}_{3,2}^{(c)}(E, 2b) = \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} - \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z170}} \quad \mathbb{Q}_{4,1}^{(c)}(E, 2) = -\frac{\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2} - \frac{\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z171}} \quad \mathbb{Q}_{4,2}^{(c)}(E, 2) = -\frac{\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} + \frac{\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z172}} \quad \mathbb{Q}_{1,1}^{(1,-1;c)}(E, a) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_3^{(s)}(A_2)}{2}$$

$$\boxed{\text{z173}} \quad \mathbb{Q}_{1,2}^{(1,-1;c)}(E, a) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_3^{(s)}(A_2)}{2}$$

$$\boxed{\text{z174}} \quad \mathbb{Q}_{1,1}^{(1,-1;c)}(E, b) = \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{14}$$

$$\boxed{\text{z175}} \quad \mathbb{Q}_{1,2}^{(1,-1;c)}(E, b) = \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{14}$$

$$\boxed{\text{z176}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E, 1a) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z177}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E, 1a) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z178}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E, 1b) = \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2} + \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z179}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E, 1b) = \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} - \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z180}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E, 2a) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z181}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E, 2a) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\begin{aligned}
\boxed{\text{z182}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E, 2b) &= -\frac{\sqrt{2}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} \\
\boxed{\text{z183}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E, 2b) &= -\frac{\sqrt{2}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2} \\
\boxed{\text{z184}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 1) &= \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{7} \\
\boxed{\text{z185}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 1) &= \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{7} \\
\boxed{\text{z186}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 2a) &= -\frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_3^{(s)}(A_2)}{2} \\
\boxed{\text{z187}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 2a) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_3^{(s)}(A_2)}{2} \\
\boxed{\text{z188}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 2b) &= \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} \\
\boxed{\text{z189}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 2b) &= \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} - \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} \\
\boxed{\text{z190}} \quad \mathbb{Q}_{4,1}^{(1,-1;c)}(E, 2) &= -\frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2} - \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} \\
\boxed{\text{z191}} \quad \mathbb{Q}_{4,2}^{(1,-1;c)}(E, 2) &= -\frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} + \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2} \\
\boxed{\text{z192}} \quad \mathbb{Q}_{1,1}^{(1,0;c)}(E) &= -\frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{1,2}^{(s)}(E)}{2} \\
\boxed{\text{z193}} \quad \mathbb{Q}_{1,2}^{(1,0;c)}(E) &= \frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{1,1}^{(s)}(E)}{2} \\
\boxed{\text{z194}} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 1) &= \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2} + \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} \\
\boxed{\text{z195}} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 1) &= \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} - \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}
\end{aligned}$$

$$\boxed{\text{z196}} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 2) = \frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z197}} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 2) = -\frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z198}} \quad \mathbb{Q}_{3,1}^{(1,0;c)}(E, 2) = -\frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_3^{(s)}(A_2)}{2}$$

$$\boxed{\text{z199}} \quad \mathbb{Q}_{3,2}^{(1,0;c)}(E, 2) = \frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_3^{(s)}(A_2)}{2}$$

$$\boxed{\text{z200}} \quad \mathbb{Q}_{1,1}^{(1,1;c)}(E) = \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z201}} \quad \mathbb{Q}_{1,2}^{(1,1;c)}(E) = \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z202}} \quad \mathbb{Q}_{2,1}^{(1,1;c)}(E, 2) = \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{2,1}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z203}} \quad \mathbb{Q}_{2,2}^{(1,1;c)}(E, 2) = \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\boxed{\text{z204}} \quad \mathbb{G}_{1,1}^{(1,0;c)}(E) = \frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z205}} \quad \mathbb{G}_{1,2}^{(1,0;c)}(E) = \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z206}} \quad \mathbb{G}_{2,1}^{(1,0;c)}(E, 2) = \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z207}} \quad \mathbb{G}_{2,2}^{(1,0;c)}(E, 2) = \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(s)}(E)}{2} - \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

• 'A'-'B' bond-cluster

\* bra:  $\langle p_x, \uparrow |, \langle p_x, \downarrow |, \langle p_y, \uparrow |, \langle p_y, \downarrow |, \langle p_z, \uparrow |, \langle p_z, \downarrow |$

\* ket:  $|p_x, \uparrow \rangle, |p_x, \downarrow \rangle, |p_y, \uparrow \rangle, |p_y, \downarrow \rangle, |p_z, \uparrow \rangle, |p_z, \downarrow \rangle$

\* wyckoff: 18a@18c

$$\boxed{\text{z25}} \quad \mathbb{Q}_0^{(c)}(A_1, a) = \mathbb{Q}_0^{(a)}(A_1) \mathbb{Q}_0^{(b)}(A_1)$$

$$\boxed{\text{z26}} \quad \mathbb{Q}_0^{(c)}(A_1, b) = \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(a)}(E, 2) \mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(a)}(E, 2) \mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z27}} \quad \mathbb{Q}_0^{(c)}(A_1, c) = \mathbb{M}_1^{(a)}(A_2) \mathbb{M}_1^{(b)}(A_2)$$

$$\boxed{\text{z28}} \quad \mathbb{Q}_1^{(c)}(A_1, a) = \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(a)}(E, 1) \mathbb{Q}_{1,1}^{(b)}(E)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(a)}(E, 1) \mathbb{Q}_{1,2}^{(b)}(E)}{2}$$

$$\boxed{\text{z29}} \quad \mathbb{Q}_1^{(c)}(A_1, b) = \frac{\sqrt{2} \mathbb{M}_{1,1}^{(a)}(E) \mathbb{T}_{1,1}^{(b)}(E, a)}{2} + \frac{\sqrt{2} \mathbb{M}_{1,2}^{(a)}(E) \mathbb{T}_{1,2}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z30}} \quad \mathbb{Q}_1^{(c)}(A_1, c) = \frac{\sqrt{2} \mathbb{M}_{1,1}^{(a)}(E) \mathbb{T}_{1,1}^{(b)}(E, b)}{2} + \frac{\sqrt{2} \mathbb{M}_{1,2}^{(a)}(E) \mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z31}} \quad \mathbb{Q}_2^{(c)}(A_1) = \mathbb{Q}_2^{(a)}(A_1) \mathbb{Q}_0^{(b)}(A_1)$$

$$\boxed{\text{z32}} \quad \mathbb{Q}_3^{(c)}(A_1, 2) = \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(a)}(E, 2) \mathbb{Q}_{1,1}^{(b)}(E)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(a)}(E, 2) \mathbb{Q}_{1,2}^{(b)}(E)}{2}$$

$$\boxed{\text{z33}} \quad \mathbb{Q}_4^{(c)}(A_1, 2) = \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(a)}(E, 1) \mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(a)}(E, 1) \mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z34}} \quad \mathbb{Q}_0^{(1,-1;c)}(A_1, a) = \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2) \mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2) \mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z35}} \quad \mathbb{Q}_0^{(1,-1;c)}(A_1, b) = \mathbb{M}_1^{(1,-1;a)}(A_2) \mathbb{M}_1^{(b)}(A_2)$$

$$\boxed{\text{z36}} \quad \mathbb{Q}_1^{(1,-1;c)}(A_1, a) = \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1) \mathbb{Q}_{1,1}^{(b)}(E)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1) \mathbb{Q}_{1,2}^{(b)}(E)}{2}$$

$$\boxed{\text{z37}} \quad \mathbb{Q}_1^{(1,-1;c)}(A_1, b) = \frac{\sqrt{2} \mathbb{M}_{1,1}^{(1,-1;a)}(E) \mathbb{T}_{1,1}^{(b)}(E, a)}{2} + \frac{\sqrt{2} \mathbb{M}_{1,2}^{(1,-1;a)}(E) \mathbb{T}_{1,2}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z38}} \quad \mathbb{Q}_1^{(1,-1;c)}(A_1, c) = \frac{\sqrt{2} \mathbb{M}_{1,1}^{(1,-1;a)}(E) \mathbb{T}_{1,1}^{(b)}(E, b)}{2} + \frac{\sqrt{2} \mathbb{M}_{1,2}^{(1,-1;a)}(E) \mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$



$$\begin{aligned}
\text{z39} \quad \mathbb{Q}_2^{(1,-1;c)}(A_1, a) &= \mathbb{Q}_2^{(1,-1;a)}(A_1) \mathbb{Q}_0^{(b)}(A_1) \\
\text{z40} \quad \mathbb{Q}_2^{(1,-1;c)}(A_1, b) &= \mathbb{M}_3^{(1,-1;a)}(A_2, 1) \mathbb{M}_1^{(b)}(A_2) \\
\text{z41} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1, 1a) &= \frac{\sqrt{2} \mathbb{M}_{3,1}^{(1,-1;a)}(E, 1) \mathbb{T}_{1,1}^{(b)}(E, a)}{2} + \frac{\sqrt{2} \mathbb{M}_{3,2}^{(1,-1;a)}(E, 1) \mathbb{T}_{1,2}^{(b)}(E, a)}{2} \\
\text{z42} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1, 1b) &= \frac{\sqrt{2} \mathbb{M}_{3,1}^{(1,-1;a)}(E, 1) \mathbb{T}_{1,1}^{(b)}(E, b)}{2} + \frac{\sqrt{2} \mathbb{M}_{3,2}^{(1,-1;a)}(E, 1) \mathbb{T}_{1,2}^{(b)}(E, b)}{2} \\
\text{z43} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1, 2a) &= \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2) \mathbb{Q}_{1,1}^{(b)}(E)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2) \mathbb{Q}_{1,2}^{(b)}(E)}{2} \\
\text{z44} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1, 2b) &= -\frac{\sqrt{2} \mathbb{M}_{3,1}^{(1,-1;a)}(E, 2) \mathbb{T}_{1,1}^{(b)}(E, a)}{2} - \frac{\sqrt{2} \mathbb{M}_{3,2}^{(1,-1;a)}(E, 2) \mathbb{T}_{1,2}^{(b)}(E, a)}{2} \\
\text{z45} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1, 2c) &= -\frac{\sqrt{2} \mathbb{M}_{3,1}^{(1,-1;a)}(E, 2) \mathbb{T}_{1,1}^{(b)}(E, b)}{2} - \frac{\sqrt{2} \mathbb{M}_{3,2}^{(1,-1;a)}(E, 2) \mathbb{T}_{1,2}^{(b)}(E, b)}{2} \\
\text{z46} \quad \mathbb{Q}_4^{(1,-1;c)}(A_1, 2a) &= \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1) \mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1) \mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} \\
\text{z47} \quad \mathbb{Q}_4^{(1,-1;c)}(A_1, 2b) &= \mathbb{M}_3^{(1,-1;a)}(A_2, 2) \mathbb{M}_1^{(b)}(A_2) \\
\text{z48} \quad \mathbb{Q}_1^{(1,0;c)}(A_1, a) &= \frac{\sqrt{2} \mathbb{G}_{1,1}^{(1,0;a)}(E) \mathbb{Q}_{1,1}^{(b)}(E)}{2} + \frac{\sqrt{2} \mathbb{G}_{1,2}^{(1,0;a)}(E) \mathbb{Q}_{1,2}^{(b)}(E)}{2} \\
\text{z49} \quad \mathbb{Q}_1^{(1,0;c)}(A_1, b) &= \frac{\sqrt{2} \mathbb{T}_{2,1}^{(1,0;a)}(E, 1) \mathbb{T}_{1,1}^{(b)}(E, a)}{2} + \frac{\sqrt{2} \mathbb{T}_{2,2}^{(1,0;a)}(E, 1) \mathbb{T}_{1,2}^{(b)}(E, a)}{2} \\
\text{z50} \quad \mathbb{Q}_1^{(1,0;c)}(A_1, c) &= \frac{\sqrt{2} \mathbb{T}_{2,1}^{(1,0;a)}(E, 1) \mathbb{T}_{1,1}^{(b)}(E, b)}{2} + \frac{\sqrt{2} \mathbb{T}_{2,2}^{(1,0;a)}(E, 1) \mathbb{T}_{1,2}^{(b)}(E, b)}{2} \\
\text{z51} \quad \mathbb{Q}_2^{(1,0;c)}(A_1) &= \mathbb{T}_2^{(1,0;a)}(A_1) \mathbb{T}_0^{(b)}(A_1) \\
\text{z52} \quad \mathbb{Q}_3^{(1,0;c)}(A_1, 2a) &= \mathbb{G}_1^{(1,0;a)}(A_2) \mathbb{Q}_3^{(b)}(A_2) \\
\text{z53} \quad \mathbb{Q}_3^{(1,0;c)}(A_1, 2b) &= \frac{\sqrt{2} \mathbb{T}_{2,1}^{(1,0;a)}(E, 2) \mathbb{T}_{1,1}^{(b)}(E, a)}{2} + \frac{\sqrt{2} \mathbb{T}_{2,2}^{(1,0;a)}(E, 2) \mathbb{T}_{1,2}^{(b)}(E, a)}{2}
\end{aligned}$$

$$\boxed{\text{z54}} \quad \mathbb{Q}_3^{(1,0;c)}(A_1, 2c) = \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} + \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z55}} \quad \mathbb{Q}_0^{(1,1;c)}(A_1, a) = \mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_0^{(b)}(A_1)$$

$$\boxed{\text{z56}} \quad \mathbb{Q}_0^{(1,1;c)}(A_1, b) = \mathbb{M}_1^{(1,1;a)}(A_2)\mathbb{M}_1^{(b)}(A_2)$$

$$\boxed{\text{z57}} \quad \mathbb{Q}_1^{(1,1;c)}(A_1, a) = \frac{\sqrt{2}\mathbb{M}_{1,1}^{(1,1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} + \frac{\sqrt{2}\mathbb{M}_{1,2}^{(1,1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z58}} \quad \mathbb{Q}_1^{(1,1;c)}(A_1, b) = \frac{\sqrt{2}\mathbb{M}_{1,1}^{(1,1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} + \frac{\sqrt{2}\mathbb{M}_{1,2}^{(1,1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z59}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1) = \mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_0^{(b)}(A_1)$$

$$\boxed{\text{z60}} \quad \mathbb{Q}_3^{(1,0;c)}(A_1) = \frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} + \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z82}} \quad \mathbb{Q}_3^{(c)}(A_2, a) = \mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_3^{(b)}(A_2)$$

$$\boxed{\text{z83}} \quad \mathbb{Q}_3^{(c)}(A_2, b) = -\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_3^{(b)}(A_2)$$

$$\boxed{\text{z84}} \quad \mathbb{Q}_3^{(c)}(A_2, c) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(b)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(b)}(E)}{2}$$

$$\boxed{\text{z85}} \quad \mathbb{Q}_4^{(c)}(A_2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} - \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z86}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_2, a) = -\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_3^{(b)}(A_2)$$

$$\boxed{\text{z87}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_2, b) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(b)}(E)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(b)}(E)}{2}$$

$$\boxed{\text{z88}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_2, c) = \frac{\sqrt{2}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} - \frac{\sqrt{2}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z89}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_2, d) = \frac{\sqrt{2}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} - \frac{\sqrt{2}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z90}} \quad \mathbb{Q}_4^{(1,-1;c)}(A_2, a) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} - \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z91}} \quad \mathbb{Q}_4^{(1,-1;c)}(A_2, b) = \mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{M}_1^{(b)}(A_2)$$

$$\boxed{\text{z92}} \quad \mathbb{Q}_3^{(1,0;c)}(A_2, a) = -\frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z93}} \quad \mathbb{Q}_3^{(1,0;c)}(A_2, b) = -\frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z94}} \quad \mathbb{Q}_3^{(1,1;c)}(A_2) = \mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_3^{(b)}(A_2)$$

$$\boxed{\text{z95}} \quad \mathbb{G}_0^{(c)}(A_2, a) = -\frac{\sqrt{2}\mathbb{M}_{1,1}^{(a)}(E)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\sqrt{2}\mathbb{M}_{1,2}^{(a)}(E)\mathbb{T}_{1,1}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z96}} \quad \mathbb{G}_0^{(c)}(A_2, b) = -\frac{\sqrt{2}\mathbb{M}_{1,1}^{(a)}(E)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\sqrt{2}\mathbb{M}_{1,2}^{(a)}(E)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z97}} \quad \mathbb{G}_1^{(c)}(A_2, a) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z98}} \quad \mathbb{G}_1^{(c)}(A_2, b) = \mathbb{M}_1^{(a)}(A_2)\mathbb{T}_0^{(b)}(A_1)$$

$$\boxed{\text{z99}} \quad \mathbb{G}_2^{(c)}(A_2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{1,2}^{(b)}(E)}{2} - \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{1,1}^{(b)}(E)}{2}$$

$$\boxed{\text{z100}} \quad \mathbb{G}_0^{(1,-1;c)}(A_2, a) = -\frac{\sqrt{2}\mathbb{M}_{1,1}^{(1,-1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\sqrt{2}\mathbb{M}_{1,2}^{(1,-1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z101}} \quad \mathbb{G}_0^{(1,-1;c)}(A_2, b) = -\frac{\sqrt{2}\mathbb{M}_{1,1}^{(1,-1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\sqrt{2}\mathbb{M}_{1,2}^{(1,-1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z102}} \quad \mathbb{G}_1^{(1,-1;c)}(A_2, a) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z103}} \quad \mathbb{G}_1^{(1,-1;c)}(A_2, b) = \mathbb{M}_1^{(1,-1;a)}(A_2)\mathbb{T}_0^{(b)}(A_1)$$

$$\boxed{\text{z104}} \quad \mathbb{G}_2^{(1,-1;c)}(A_2, a) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,2}^{(b)}(E)}{2} - \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,1}^{(b)}(E)}{2}$$

$$\boxed{\text{z105}} \quad \mathbb{G}_2^{(1,-1;c)}(A_2, b) = -\frac{\sqrt{2}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\sqrt{2}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z106}} \quad \mathbb{G}_2^{(1,-1;c)}(A_2, c) = -\frac{\sqrt{2}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\sqrt{2}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z107}} \quad \mathbb{G}_3^{(1,-1;c)}(A_2, 1) = \mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_0^{(b)}(A_1)$$

$$\boxed{\text{z108}} \quad \mathbb{G}_3^{(1,-1;c)}(A_2, 2) = \mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_0^{(b)}(A_1)$$

$$\boxed{\text{z109}} \quad \mathbb{G}_0^{(1,0;c)}(A_2) = -\frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(b)}(E)}{2} + \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(b)}(E)}{2}$$

$$\boxed{\text{z110}} \quad \mathbb{G}_1^{(1,0;c)}(A_2, a) = \mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_0^{(b)}(A_1)$$

$$\boxed{\text{z111}} \quad \mathbb{G}_1^{(1,0;c)}(A_2, b) = \mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{M}_1^{(b)}(A_2)$$

$$\boxed{\text{z112}} \quad \mathbb{G}_2^{(1,0;c)}(A_2, a) = \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} - \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z113}} \quad \mathbb{G}_2^{(1,0;c)}(A_2, b) = \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} - \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z114}} \quad \mathbb{G}_3^{(1,0;c)}(A_2, 2) = -\frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} + \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z115}} \quad \mathbb{G}_0^{(1,1;c)}(A_2, a) = -\frac{\sqrt{2}\mathbb{M}_{1,1}^{(1,1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\sqrt{2}\mathbb{M}_{1,2}^{(1,1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z116}} \quad \mathbb{G}_0^{(1,1;c)}(A_2, b) = -\frac{\sqrt{2}\mathbb{M}_{1,1}^{(1,1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\sqrt{2}\mathbb{M}_{1,2}^{(1,1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z117}} \quad \mathbb{G}_1^{(1,1;c)}(A_2) = \mathbb{M}_1^{(1,1;a)}(A_2)\mathbb{T}_0^{(b)}(A_1)$$

$$\boxed{\text{z208}} \quad \mathbb{Q}_{1,1}^{(c)}(E, a) = \frac{\sqrt{2}\mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_{1,1}^{(b)}(E)}{2}$$

$$\boxed{\text{z209}} \quad \mathbb{Q}_{1,2}^{(c)}(E, a) = \frac{\sqrt{2}\mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_{1,2}^{(b)}(E)}{2}$$

$$\begin{aligned}
\boxed{\text{z210}} \quad \mathbb{Q}_{1,1}^{(c)}(E, b) &= \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_3^{(b)}(A_2)}{2} \\
\boxed{\text{z211}} \quad \mathbb{Q}_{1,2}^{(c)}(E, b) &= -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_3^{(b)}(A_2)}{2} \\
\boxed{\text{z212}} \quad \mathbb{Q}_{1,1}^{(c)}(E, c) &= \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(b)}(E)}{14} + \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(b)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,1}^{(b)}(E)}{14} \\
\boxed{\text{z213}} \quad \mathbb{Q}_{1,2}^{(c)}(E, c) &= \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(b)}(E)}{14} - \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(b)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,2}^{(b)}(E)}{14} \\
\boxed{\text{z214}} \quad \mathbb{Q}_{1,1}^{(c)}(E, d) &= -\frac{\sqrt{2}\mathbb{M}_1^{(a)}(A_2)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} \\
\boxed{\text{z215}} \quad \mathbb{Q}_{1,2}^{(c)}(E, d) &= \frac{\sqrt{2}\mathbb{M}_1^{(a)}(A_2)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} \\
\boxed{\text{z216}} \quad \mathbb{Q}_{1,1}^{(c)}(E, e) &= -\frac{\sqrt{2}\mathbb{M}_1^{(a)}(A_2)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} \\
\boxed{\text{z217}} \quad \mathbb{Q}_{1,2}^{(c)}(E, e) &= \frac{\sqrt{2}\mathbb{M}_1^{(a)}(A_2)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} \\
\boxed{\text{z218}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 1a) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_0^{(b)}(A_1)}{2} \\
\boxed{\text{z219}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 1a) &= \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_0^{(b)}(A_1)}{2} \\
\boxed{\text{z220}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 1b) &= \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} + \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} \\
\boxed{\text{z221}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 1b) &= \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} - \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} \\
\boxed{\text{z222}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 1c) &= \frac{\sqrt{2}\mathbb{M}_{1,2}^{(a)}(E)\mathbb{M}_1^{(b)}(A_2)}{2} \\
\boxed{\text{z223}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 1c) &= -\frac{\sqrt{2}\mathbb{M}_{1,1}^{(a)}(E)\mathbb{M}_1^{(b)}(A_2)}{2}
\end{aligned}$$

$$\boxed{\text{z224}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 2a) = \frac{\sqrt{2}\mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z225}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 2a) = \frac{\sqrt{2}\mathbb{Q}_0^{(a)}(A_1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z226}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 2b) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z227}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 2b) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z228}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 2c) = -\frac{\sqrt{2}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z229}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 2c) = -\frac{\sqrt{2}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z230}} \quad \mathbb{Q}_{3,1}^{(c)}(E, 1) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(b)}(E)}{14} + \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(b)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,1}^{(b)}(E)}{7}$$

$$\boxed{\text{z231}} \quad \mathbb{Q}_{3,2}^{(c)}(E, 1) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{1,1}^{(b)}(E)}{14} - \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{1,2}^{(b)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(a)}(A_1)\mathbb{Q}_{1,2}^{(b)}(E)}{7}$$

$$\boxed{\text{z232}} \quad \mathbb{Q}_{3,1}^{(c)}(E, 2a) = -\frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_3^{(b)}(A_2)}{2}$$

$$\boxed{\text{z233}} \quad \mathbb{Q}_{3,2}^{(c)}(E, 2a) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_3^{(b)}(A_2)}{2}$$

$$\boxed{\text{z234}} \quad \mathbb{Q}_{3,1}^{(c)}(E, 2b) = \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{1,2}^{(b)}(E)}{2} + \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{1,1}^{(b)}(E)}{2}$$

$$\boxed{\text{z235}} \quad \mathbb{Q}_{3,2}^{(c)}(E, 2b) = \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{1,1}^{(b)}(E)}{2} - \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{1,2}^{(b)}(E)}{2}$$

$$\boxed{\text{z236}} \quad \mathbb{Q}_{4,1}^{(c)}(E, 2) = -\frac{\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} - \frac{\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z237}} \quad \mathbb{Q}_{4,2}^{(c)}(E, 2) = -\frac{\mathbb{Q}_{2,1}^{(a)}(E, 2)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} + \frac{\mathbb{Q}_{2,2}^{(a)}(E, 2)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\begin{aligned}
\boxed{\text{z238}} \quad \mathbb{Q}_{1,1}^{(1,-1;c)}(E,a) &= \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_3^{(b)}(A_2)}{2} \\
\boxed{\text{z239}} \quad \mathbb{Q}_{1,2}^{(1,-1;c)}(E,a) &= -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_3^{(b)}(A_2)}{2} \\
\boxed{\text{z240}} \quad \mathbb{Q}_{1,1}^{(1,-1;c)}(E,b) &= \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,2}^{(b)}(E)}{14} + \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,1}^{(b)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,1}^{(b)}(E)}{14} \\
\boxed{\text{z241}} \quad \mathbb{Q}_{1,2}^{(1,-1;c)}(E,b) &= \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,1}^{(b)}(E)}{14} - \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,2}^{(b)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,2}^{(b)}(E)}{14} \\
\boxed{\text{z242}} \quad \mathbb{Q}_{1,1}^{(1,-1;c)}(E,c) &= -\frac{\sqrt{2}\mathbb{M}_1^{(1,-1;a)}(A_2)\mathbb{T}_{1,2}^{(b)}(E,a)}{2} \\
\boxed{\text{z243}} \quad \mathbb{Q}_{1,2}^{(1,-1;c)}(E,c) &= \frac{\sqrt{2}\mathbb{M}_1^{(1,-1;a)}(A_2)\mathbb{T}_{1,1}^{(b)}(E,a)}{2} \\
\boxed{\text{z244}} \quad \mathbb{Q}_{1,1}^{(1,-1;c)}(E,d) &= -\frac{\sqrt{2}\mathbb{M}_1^{(1,-1;a)}(A_2)\mathbb{T}_{1,2}^{(b)}(E,b)}{2} \\
\boxed{\text{z245}} \quad \mathbb{Q}_{1,2}^{(1,-1;c)}(E,d) &= \frac{\sqrt{2}\mathbb{M}_1^{(1,-1;a)}(A_2)\mathbb{T}_{1,1}^{(b)}(E,b)}{2} \\
\boxed{\text{z246}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E,1a) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_0^{(b)}(A_1)}{2} \\
\boxed{\text{z247}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E,1a) &= \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_0^{(b)}(A_1)}{2} \\
\boxed{\text{z248}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E,1b) &= \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_{2,2}^{(b)}(E,2)}{2} + \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_{2,1}^{(b)}(E,2)}{2} \\
\boxed{\text{z249}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E,1b) &= \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_{2,1}^{(b)}(E,2)}{2} - \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_{2,2}^{(b)}(E,2)}{2} \\
\boxed{\text{z250}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E,1c) &= \frac{\sqrt{2}\mathbb{M}_{3,2}^{(1,-1;a)}(E,1)\mathbb{M}_1^{(b)}(A_2)}{2} \\
\boxed{\text{z251}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E,1c) &= -\frac{\sqrt{2}\mathbb{M}_{3,1}^{(1,-1;a)}(E,1)\mathbb{M}_1^{(b)}(A_2)}{2}
\end{aligned}$$

$$\boxed{\text{z252}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E, 1d) = \frac{\sqrt{2}\mathbb{M}_{1,2}^{(1,-1;a)}(E)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z253}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E, 1d) = -\frac{\sqrt{2}\mathbb{M}_{1,1}^{(1,-1;a)}(E)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z254}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E, 2a) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z255}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E, 2a) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z256}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E, 2b) = -\frac{\sqrt{2}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z257}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E, 2b) = -\frac{\sqrt{2}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z258}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E, 2c) = \frac{\sqrt{2}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z259}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E, 2c) = -\frac{\sqrt{2}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z260}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 1a) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(b)}(E)}{14} + \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(b)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,1}^{(b)}(E)}{7}$$

$$\boxed{\text{z261}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 1a) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(b)}(E)}{14} - \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(b)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,2}^{(b)}(E)}{7}$$

$$\boxed{\text{z262}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 1b) = -\frac{\sqrt{55}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{22} - \frac{\sqrt{55}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{22} - \frac{\sqrt{33}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{11}$$

$$\boxed{\text{z263}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 1b) = -\frac{\sqrt{55}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{22} + \frac{\sqrt{55}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{22} + \frac{\sqrt{33}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{11}$$

$$\boxed{\text{z264}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 1c) = -\frac{\sqrt{55}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{22} - \frac{\sqrt{55}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{22} - \frac{\sqrt{33}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{11}$$

$$\boxed{\text{z265}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 1c) = -\frac{\sqrt{55}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{22} + \frac{\sqrt{55}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{22} + \frac{\sqrt{33}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{11}$$



$$\begin{aligned}
\text{z266} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 2a) &= -\frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_3^{(b)}(A_2)}{2} \\
\text{z267} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 2a) &= \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_3^{(b)}(A_2)}{2} \\
\text{z268} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 2b) &= \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,2}^{(b)}(E)}{2} + \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,1}^{(b)}(E)}{2} \\
\text{z269} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 2b) &= \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,1}^{(b)}(E)}{2} - \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{1,2}^{(b)}(E)}{2} \\
\text{z270} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 2c) &= \frac{\sqrt{10}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{8} + \frac{\sqrt{10}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{8} + \frac{\sqrt{6}\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, a)}{8} + \frac{\sqrt{6}\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{8} \\
\text{z271} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 2c) &= \frac{\sqrt{10}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{8} - \frac{\sqrt{10}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{8} + \frac{\sqrt{6}\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, a)}{8} - \frac{\sqrt{6}\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{8} \\
\text{z272} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E, 2d) &= \frac{\sqrt{10}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{8} + \frac{\sqrt{10}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{8} + \frac{\sqrt{6}\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, b)}{8} + \frac{\sqrt{6}\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{8} \\
\text{z273} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E, 2d) &= \frac{\sqrt{10}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{8} - \frac{\sqrt{10}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{8} + \frac{\sqrt{6}\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, b)}{8} - \frac{\sqrt{6}\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{8} \\
\text{z274} \quad \mathbb{Q}_{4,1}^{(1,-1;c)}(E, 2) &= -\frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} - \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} \\
\text{z275} \quad \mathbb{Q}_{4,2}^{(1,-1;c)}(E, 2) &= -\frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} + \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} \\
\text{z276} \quad \mathbb{Q}_{1,1}^{(1,0;c)}(E, a) &= -\frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{1,2}^{(b)}(E)}{2} \\
\text{z277} \quad \mathbb{Q}_{1,2}^{(1,0;c)}(E, a) &= \frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{1,1}^{(b)}(E)}{2} \\
\text{z278} \quad \mathbb{Q}_{1,1}^{(1,0;c)}(E, b) &= \frac{\sqrt{42}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{14} + \frac{\sqrt{42}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{14} - \frac{\sqrt{14}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, a)}{14} \\
\text{z279} \quad \mathbb{Q}_{1,2}^{(1,0;c)}(E, b) &= \frac{\sqrt{42}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{14} - \frac{\sqrt{42}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{14} - \frac{\sqrt{14}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, a)}{14}
\end{aligned}$$

$$\begin{aligned}
\text{z280} \quad \mathbb{Q}_{1,1}^{(1,0;c)}(E, c) &= \frac{\sqrt{42}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{14} + \frac{\sqrt{42}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{14} - \frac{\sqrt{14}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, b)}{14} \\
\text{z281} \quad \mathbb{Q}_{1,2}^{(1,0;c)}(E, c) &= \frac{\sqrt{42}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{14} - \frac{\sqrt{42}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{14} - \frac{\sqrt{14}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, b)}{14} \\
\text{z282} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 1a) &= \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} + \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} \\
\text{z283} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 1a) &= \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} - \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} \\
\text{z284} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 1b) &= \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{T}_0^{(b)}(A_1)}{2} \\
\text{z285} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 1b) &= \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{T}_0^{(b)}(A_1)}{2} \\
\text{z286} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 1c) &= \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{M}_1^{(b)}(A_2)}{2} \\
\text{z287} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 1c) &= -\frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{M}_1^{(b)}(A_2)}{2} \\
\text{z288} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 2a) &= \frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} \\
\text{z289} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 2a) &= -\frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} \\
\text{z290} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 2b) &= \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_0^{(b)}(A_1)}{2} \\
\text{z291} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 2b) &= \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_0^{(b)}(A_1)}{2} \\
\text{z292} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 2c) &= -\frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{M}_1^{(b)}(A_2)}{2} \\
\text{z293} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 2c) &= \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{M}_1^{(b)}(A_2)}{2}
\end{aligned}$$

$$\begin{aligned}
\text{z294} \quad \mathbb{Q}_{3,1}^{(1,0;c)}(E, 1a) &= \frac{\sqrt{7}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{14} + \frac{\sqrt{7}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{14} + \frac{\sqrt{21}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, a)}{7} \\
\text{z295} \quad \mathbb{Q}_{3,2}^{(1,0;c)}(E, 1a) &= \frac{\sqrt{7}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{14} - \frac{\sqrt{7}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{14} + \frac{\sqrt{21}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, a)}{7} \\
\text{z296} \quad \mathbb{Q}_{3,1}^{(1,0;c)}(E, 1b) &= \frac{\sqrt{7}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{14} + \frac{\sqrt{7}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{14} + \frac{\sqrt{21}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, b)}{7} \\
\text{z297} \quad \mathbb{Q}_{3,2}^{(1,0;c)}(E, 1b) &= \frac{\sqrt{7}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{14} - \frac{\sqrt{7}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{14} + \frac{\sqrt{21}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, b)}{7} \\
\text{z298} \quad \mathbb{Q}_{3,1}^{(1,0;c)}(E, 2a) &= -\frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_3^{(b)}(A_2)}{2} \\
\text{z299} \quad \mathbb{Q}_{3,2}^{(1,0;c)}(E, 2a) &= \frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_3^{(b)}(A_2)}{2} \\
\text{z300} \quad \mathbb{Q}_{3,1}^{(1,0;c)}(E, 2b) &= \frac{\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} \\
\text{z301} \quad \mathbb{Q}_{3,2}^{(1,0;c)}(E, 2b) &= \frac{\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} - \frac{\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} \\
\text{z302} \quad \mathbb{Q}_{3,1}^{(1,0;c)}(E, 2c) &= \frac{\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} \\
\text{z303} \quad \mathbb{Q}_{3,2}^{(1,0;c)}(E, 2c) &= \frac{\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} - \frac{\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} \\
\text{z304} \quad \mathbb{Q}_{1,1}^{(1,1;c)}(E, a) &= \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{1,1}^{(b)}(E)}{2} \\
\text{z305} \quad \mathbb{Q}_{1,2}^{(1,1;c)}(E, a) &= \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{1,2}^{(b)}(E)}{2} \\
\text{z306} \quad \mathbb{Q}_{1,1}^{(1,1;c)}(E, b) &= -\frac{\sqrt{2}\mathbb{M}_1^{(1,1;a)}(A_2)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} \\
\text{z307} \quad \mathbb{Q}_{1,2}^{(1,1;c)}(E, b) &= \frac{\sqrt{2}\mathbb{M}_1^{(1,1;a)}(A_2)\mathbb{T}_{1,1}^{(b)}(E, a)}{2}
\end{aligned}$$

$$\boxed{\text{z308}} \quad \mathbb{Q}_{1,1}^{(1,1;c)}(E, c) = -\frac{\sqrt{2}\mathbb{M}_1^{(1,1;a)}(A_2)\mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z309}} \quad \mathbb{Q}_{1,2}^{(1,1;c)}(E, c) = \frac{\sqrt{2}\mathbb{M}_1^{(1,1;a)}(A_2)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z310}} \quad \mathbb{Q}_{2,1}^{(1,1;c)}(E, 1) = \frac{\sqrt{2}\mathbb{M}_{1,2}^{(1,1;a)}(E)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z311}} \quad \mathbb{Q}_{2,2}^{(1,1;c)}(E, 1) = -\frac{\sqrt{2}\mathbb{M}_{1,1}^{(1,1;a)}(E)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z312}} \quad \mathbb{Q}_{2,1}^{(1,1;c)}(E, 2) = \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z313}} \quad \mathbb{Q}_{2,2}^{(1,1;c)}(E, 2) = \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z314}} \quad \mathbb{G}_{1,1}^{(c)}(E) = \frac{\sqrt{2}\mathbb{M}_{1,1}^{(a)}(E)\mathbb{T}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z315}} \quad \mathbb{G}_{1,2}^{(c)}(E) = \frac{\sqrt{2}\mathbb{M}_{1,2}^{(a)}(E)\mathbb{T}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z316}} \quad \mathbb{G}_{2,1}^{(c)}(E, 2a) = \frac{\mathbb{M}_{1,1}^{(a)}(E)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\mathbb{M}_{1,2}^{(a)}(E)\mathbb{T}_{1,1}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z317}} \quad \mathbb{G}_{2,2}^{(c)}(E, 2a) = \frac{\mathbb{M}_{1,1}^{(a)}(E)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} - \frac{\mathbb{M}_{1,2}^{(a)}(E)\mathbb{T}_{1,2}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z318}} \quad \mathbb{G}_{2,1}^{(c)}(E, 2b) = \frac{\mathbb{M}_{1,1}^{(a)}(E)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\mathbb{M}_{1,2}^{(a)}(E)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z319}} \quad \mathbb{G}_{2,2}^{(c)}(E, 2b) = \frac{\mathbb{M}_{1,1}^{(a)}(E)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} - \frac{\mathbb{M}_{1,2}^{(a)}(E)\mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z320}} \quad \mathbb{G}_{1,1}^{(1,-1;c)}(E) = \frac{\sqrt{2}\mathbb{M}_{1,1}^{(1,-1;a)}(E)\mathbb{T}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z321}} \quad \mathbb{G}_{1,2}^{(1,-1;c)}(E) = \frac{\sqrt{2}\mathbb{M}_{1,2}^{(1,-1;a)}(E)\mathbb{T}_0^{(b)}(A_1)}{2}$$

$$\begin{aligned}
\boxed{\text{z322}} \quad \mathbb{G}_{2,1}^{(1,-1;c)}(E, 1a) &= \frac{\sqrt{66}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{22} + \frac{\sqrt{66}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{22} - \frac{\sqrt{110}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{22} \\
\boxed{\text{z323}} \quad \mathbb{G}_{2,2}^{(1,-1;c)}(E, 1a) &= \frac{\sqrt{66}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{22} - \frac{\sqrt{66}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{22} + \frac{\sqrt{110}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{22} \\
\boxed{\text{z324}} \quad \mathbb{G}_{2,1}^{(1,-1;c)}(E, 1b) &= \frac{\sqrt{66}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{22} + \frac{\sqrt{66}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{22} - \frac{\sqrt{110}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{22} \\
\boxed{\text{z325}} \quad \mathbb{G}_{2,2}^{(1,-1;c)}(E, 1b) &= \frac{\sqrt{66}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{22} - \frac{\sqrt{66}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{22} + \frac{\sqrt{110}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{22} \\
\boxed{\text{z326}} \quad \mathbb{G}_{2,1}^{(1,-1;c)}(E, 2a) &= -\frac{\sqrt{6}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{8} - \frac{\sqrt{6}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{8} + \frac{\sqrt{10}\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, a)}{8} + \frac{\sqrt{10}\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{8} \\
\boxed{\text{z327}} \quad \mathbb{G}_{2,2}^{(1,-1;c)}(E, 2a) &= -\frac{\sqrt{6}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{8} + \frac{\sqrt{6}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{8} + \frac{\sqrt{10}\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, a)}{8} - \frac{\sqrt{10}\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{8} \\
\boxed{\text{z328}} \quad \mathbb{G}_{2,1}^{(1,-1;c)}(E, 2b) &= -\frac{\sqrt{6}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{8} - \frac{\sqrt{6}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{8} + \frac{\sqrt{10}\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, b)}{8} + \frac{\sqrt{10}\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{8} \\
\boxed{\text{z329}} \quad \mathbb{G}_{2,2}^{(1,-1;c)}(E, 2b) &= -\frac{\sqrt{6}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{8} + \frac{\sqrt{6}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{8} + \frac{\sqrt{10}\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, b)}{8} - \frac{\sqrt{10}\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{8} \\
\boxed{\text{z330}} \quad \mathbb{G}_{2,1}^{(1,-1;c)}(E, 2c) &= \frac{\mathbb{M}_{1,1}^{(1,-1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\mathbb{M}_{1,2}^{(1,-1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} \\
\boxed{\text{z331}} \quad \mathbb{G}_{2,2}^{(1,-1;c)}(E, 2c) &= \frac{\mathbb{M}_{1,1}^{(1,-1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} - \frac{\mathbb{M}_{1,2}^{(1,-1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} \\
\boxed{\text{z332}} \quad \mathbb{G}_{2,1}^{(1,-1;c)}(E, 2d) &= \frac{\mathbb{M}_{1,1}^{(1,-1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\mathbb{M}_{1,2}^{(1,-1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} \\
\boxed{\text{z333}} \quad \mathbb{G}_{2,2}^{(1,-1;c)}(E, 2d) &= \frac{\mathbb{M}_{1,1}^{(1,-1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} - \frac{\mathbb{M}_{1,2}^{(1,-1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} \\
\boxed{\text{z334}} \quad \mathbb{G}_{3,1}^{(1,-1;c)}(E, 1) &= \frac{\sqrt{2}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 1)\mathbb{T}_0^{(b)}(A_1)}{2} \\
\boxed{\text{z335}} \quad \mathbb{G}_{3,2}^{(1,-1;c)}(E, 1) &= \frac{\sqrt{2}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 1)\mathbb{T}_0^{(b)}(A_1)}{2}
\end{aligned}$$

$$\begin{aligned}
\text{z336} \quad \mathbb{G}_{3,1}^{(1,-1;c)}(E, 2) &= \frac{\sqrt{2}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_0^{(b)}(A_1)}{2} \\
\text{z337} \quad \mathbb{G}_{3,2}^{(1,-1;c)}(E, 2) &= \frac{\sqrt{2}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_0^{(b)}(A_1)}{2} \\
\text{z338} \quad \mathbb{G}_{4,1}^{(1,-1;c)}(E, 2a) &= \frac{\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} - \frac{\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} \\
\text{z339} \quad \mathbb{G}_{4,2}^{(1,-1;c)}(E, 2a) &= \frac{\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} \\
\text{z340} \quad \mathbb{G}_{4,1}^{(1,-1;c)}(E, 2b) &= \frac{\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} - \frac{\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} \\
\text{z341} \quad \mathbb{G}_{4,2}^{(1,-1;c)}(E, 2b) &= \frac{\mathbb{M}_3^{(1,-1;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} \\
\text{z342} \quad \mathbb{G}_{1,1}^{(1,0;c)}(E) &= \frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_0^{(b)}(A_1)}{2} \\
\text{z343} \quad \mathbb{G}_{1,2}^{(1,0;c)}(E) &= \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_0^{(b)}(A_1)}{2} \\
\text{z344} \quad \mathbb{G}_{2,1}^{(1,0;c)}(E, 2) &= \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(b)}(E)}{2} + \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(b)}(E)}{2} \\
\text{z345} \quad \mathbb{G}_{2,2}^{(1,0;c)}(E, 2) &= \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(b)}(E)}{2} - \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(b)}(E)}{2} \\
\text{z346} \quad \mathbb{G}_{1,1}^{(1,1;c)}(E) &= \frac{\sqrt{2}\mathbb{M}_{1,1}^{(1,1;a)}(E)\mathbb{T}_0^{(b)}(A_1)}{2} \\
\text{z347} \quad \mathbb{G}_{1,2}^{(1,1;c)}(E) &= \frac{\sqrt{2}\mathbb{M}_{1,2}^{(1,1;a)}(E)\mathbb{T}_0^{(b)}(A_1)}{2} \\
\text{z348} \quad \mathbb{G}_{2,1}^{(1,1;c)}(E, 2a) &= \frac{\mathbb{M}_{1,1}^{(1,1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\mathbb{M}_{1,2}^{(1,1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} \\
\text{z349} \quad \mathbb{G}_{2,2}^{(1,1;c)}(E, 2a) &= \frac{\mathbb{M}_{1,1}^{(1,1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} - \frac{\mathbb{M}_{1,2}^{(1,1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, a)}{2}
\end{aligned}$$

$$\boxed{\text{z350}} \quad \mathbb{G}_{2,1}^{(1,1;c)}(E, 2b) = \frac{\mathbb{M}_{1,1}^{(1,1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\mathbb{M}_{1,2}^{(1,1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z351}} \quad \mathbb{G}_{2,2}^{(1,1;c)}(E, 2b) = \frac{\mathbb{M}_{1,1}^{(1,1;a)}(E)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} - \frac{\mathbb{M}_{1,2}^{(1,1;a)}(E)\mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$

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### Atomic SAMB

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- bra:  $\langle p_x, \uparrow |, \langle p_x, \downarrow |, \langle p_y, \uparrow |, \langle p_y, \downarrow |, \langle p_z, \uparrow |, \langle p_z, \downarrow |$
- ket:  $|p_x, \uparrow \rangle, |p_x, \downarrow \rangle, |p_y, \uparrow \rangle, |p_y, \downarrow \rangle, |p_z, \uparrow \rangle, |p_z, \downarrow \rangle$

$$\boxed{\text{x1}} \quad \mathbb{Q}_0^{(a)}(A_1) = \begin{bmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \end{bmatrix}$$

$$\boxed{\text{x2}} \quad \mathbb{Q}_2^{(a)}(A_1) = \begin{bmatrix} -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{3} \end{bmatrix}$$

$$\boxed{\text{x3}} \quad \mathbb{Q}_{2,1}^{(a)}(E, 1) = \begin{bmatrix} 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x4}} \quad \mathbb{Q}_{2,2}^{(a)}(E, 1) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1}{2} \\ 0 & 0 & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x5}} \quad \mathbb{Q}_{2,1}^{(a)}(E, 2) = \begin{bmatrix} 0 & 0 & \frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{1}{2} & 0 & 0 \\ \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x6}} \quad \mathbb{Q}_{2,2}^{(a)}(E, 2) = \begin{bmatrix} \frac{1}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & -\frac{1}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1}{2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x7}} \quad \mathbb{Q}_2^{(1,-1;a)}(A_1) = \begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & \frac{\sqrt{6}}{12} & 0 \\ \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{12} \\ 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & \frac{\sqrt{6}i}{12} & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x8}} \quad \mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1) = \begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x9}} \quad \mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1) = \begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x10}} \quad \mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$$



$$\boxed{\text{x11}} \quad \mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x12}} \quad \mathbb{Q}_0^{(1,1;a)}(A_1) = \begin{bmatrix} 0 & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & 0 & 0 & \frac{\sqrt{3}i}{6} & -\frac{\sqrt{3}}{6} & 0 \\ \frac{\sqrt{3}i}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 \\ \frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x13}} \quad \mathbb{G}_1^{(1,0;a)}(A_2) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x14}} \quad \mathbb{G}_{1,1}^{(1,0;a)}(E) = \begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} \\ 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x15}} \quad \mathbb{G}_{1,2}^{(1,0;a)}(E) = \begin{bmatrix} 0 & 0 & 0 & -\frac{\sqrt{2}}{4} & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{2}}{4} & 0 & 0 & 0 & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x16}} \quad \mathbb{M}_1^{(a)}(A_2) = \begin{bmatrix} 0 & 0 & -\frac{i}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{i}{2} & 0 & 0 \\ \frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x17}} \quad \mathbb{M}_{1,1}^{(a)}(E) = \begin{bmatrix} 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ \frac{i}{2} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{i}{2} & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x18}} \quad \mathbb{M}_{1,2}^{(a)}(E) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -\frac{i}{2} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{i}{2} \\ 0 & 0 & \frac{i}{2} & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{i}{2} & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x19}} \quad \mathbb{M}_3^{(1,-1;a)}(A_1) = \begin{bmatrix} 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & -\frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x20}} \quad \mathbb{M}_1^{(1,-1;a)}(A_2) = \begin{bmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \\ 0 & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \end{bmatrix}$$

$$\boxed{\text{x21}} \quad \mathbb{M}_3^{(1,-1;a)}(A_2, 1) = \begin{bmatrix} -\frac{\sqrt{5}}{10} & 0 & 0 & 0 & 0 & -\frac{\sqrt{5}}{10} \\ 0 & \frac{\sqrt{5}}{10} & 0 & 0 & -\frac{\sqrt{5}}{10} & 0 \\ 0 & 0 & -\frac{\sqrt{5}}{10} & 0 & 0 & \frac{\sqrt{5}i}{10} \\ 0 & 0 & 0 & \frac{\sqrt{5}}{10} & -\frac{\sqrt{5}i}{10} & 0 \\ 0 & -\frac{\sqrt{5}}{10} & 0 & \frac{\sqrt{5}i}{10} & \frac{\sqrt{5}}{5} & 0 \\ -\frac{\sqrt{5}}{10} & 0 & -\frac{\sqrt{5}i}{10} & 0 & 0 & -\frac{\sqrt{5}}{5} \end{bmatrix}$$

$$\boxed{\text{x22}} \quad \mathbb{M}_3^{(1,-1;a)}(A_2, 2) = \begin{bmatrix} 0 & -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{2}}{4} & 0 & \frac{\sqrt{2}i}{4} & 0 & 0 \\ \frac{\sqrt{2}}{4} & 0 & -\frac{\sqrt{2}i}{4} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x23}} \quad \mathbb{M}_{1,1}^{(1,-1;a)}(E) = \begin{bmatrix} 0 & \frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}i}{6} & 0 & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{6}i}{6} & 0 \end{bmatrix}$$

$$\boxed{\text{x24}} \quad \mathbb{M}_{1,2}^{(1,-1;a)}(E) = \begin{bmatrix} 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 \\ \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ 0 & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{6} & 0 \end{bmatrix}$$

$$\boxed{\text{x25}} \quad \mathbb{M}_{3,1}^{(1,-1;a)}(E, 1) = \begin{bmatrix} 0 & -\frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{30}}{60} & 0 & 0 \\ \frac{\sqrt{30}i}{60} & 0 & \frac{\sqrt{30}}{60} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{30}}{60} & 0 & -\frac{\sqrt{30}i}{20} & -\frac{\sqrt{30}}{15} & 0 \\ \frac{\sqrt{30}}{60} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & \frac{\sqrt{30}}{15} \\ 0 & 0 & -\frac{\sqrt{30}}{15} & 0 & 0 & \frac{\sqrt{30}i}{15} \\ 0 & 0 & 0 & \frac{\sqrt{30}}{15} & -\frac{\sqrt{30}i}{15} & 0 \end{bmatrix}$$

$$\boxed{\text{x26}} \quad \mathbb{M}_{3,2}^{(1,-1;a)}(E, 1) = \begin{bmatrix} 0 & -\frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{60} & \frac{\sqrt{30}}{15} & 0 \\ -\frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{60} & 0 & 0 & -\frac{\sqrt{30}}{15} \\ 0 & \frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 \\ -\frac{\sqrt{30}i}{60} & 0 & -\frac{\sqrt{30}}{60} & 0 & 0 & 0 \\ \frac{\sqrt{30}}{15} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}i}{15} \\ 0 & -\frac{\sqrt{30}}{15} & 0 & 0 & \frac{\sqrt{30}i}{15} & 0 \end{bmatrix}$$

$$\boxed{\text{x27}} \quad \mathbb{M}_{3,1}^{(1,-1;a)}(E, 2) = \begin{bmatrix} -\frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{3}}{6} \\ 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}}{6} & 0 \\ 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & \frac{\sqrt{3}i}{6} & 0 \\ 0 & -\frac{\sqrt{3}}{6} & 0 & -\frac{\sqrt{3}i}{6} & 0 & 0 \\ -\frac{\sqrt{3}}{6} & 0 & \frac{\sqrt{3}i}{6} & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x28}} \quad \mathbb{M}_{3,2}^{(1,-1;a)}(E, 2) = \begin{bmatrix} 0 & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & -\frac{\sqrt{3}i}{6} \\ 0 & 0 & 0 & -\frac{\sqrt{3}}{6} & \frac{\sqrt{3}i}{6} & 0 \\ \frac{\sqrt{3}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{3}}{6} \\ 0 & -\frac{\sqrt{3}}{6} & 0 & 0 & \frac{\sqrt{3}}{6} & 0 \\ 0 & -\frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 \\ \frac{\sqrt{3}i}{6} & 0 & \frac{\sqrt{3}}{6} & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x29}} \quad \mathbb{M}_1^{(1,1;a)}(A_2) = \begin{bmatrix} -\frac{\sqrt{30}}{30} & 0 & 0 & 0 & 0 & \frac{\sqrt{30}}{20} \\ 0 & \frac{\sqrt{30}}{30} & 0 & 0 & \frac{\sqrt{30}}{20} & 0 \\ 0 & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & -\frac{\sqrt{30}i}{20} \\ 0 & 0 & 0 & \frac{\sqrt{30}}{30} & \frac{\sqrt{30}i}{20} & 0 \\ 0 & \frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{15} & 0 \\ \frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{15} \end{bmatrix}$$

$$\boxed{\text{x30}} \quad \mathbb{M}_{1,1}^{(1,1;a)}(E) = \begin{bmatrix} 0 & -\frac{\sqrt{30}i}{30} & 0 & -\frac{\sqrt{30}}{20} & 0 & 0 \\ \frac{\sqrt{30}i}{30} & 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{30}}{20} & 0 & \frac{\sqrt{30}i}{15} & -\frac{\sqrt{30}}{20} & 0 \\ -\frac{\sqrt{30}}{20} & 0 & -\frac{\sqrt{30}i}{15} & 0 & 0 & \frac{\sqrt{30}}{20} \\ 0 & 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}i}{30} \\ 0 & 0 & 0 & \frac{\sqrt{30}}{20} & \frac{\sqrt{30}i}{30} & 0 \end{bmatrix}$$

$$\boxed{\text{x31}} \quad \mathbb{M}_{1,2}^{(1,1;a)}(E) = \begin{bmatrix} 0 & \frac{\sqrt{30}}{15} & 0 & -\frac{\sqrt{30}i}{20} & \frac{\sqrt{30}}{20} & 0 \\ \frac{\sqrt{30}}{15} & 0 & \frac{\sqrt{30}i}{20} & 0 & 0 & -\frac{\sqrt{30}}{20} \\ 0 & -\frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 \\ \frac{\sqrt{30}i}{20} & 0 & -\frac{\sqrt{30}}{30} & 0 & 0 & 0 \\ \frac{\sqrt{30}}{20} & 0 & 0 & 0 & 0 & -\frac{\sqrt{30}}{30} \\ 0 & -\frac{\sqrt{30}}{20} & 0 & 0 & -\frac{\sqrt{30}}{30} & 0 \end{bmatrix}$$

$$\boxed{\text{x32}} \quad \mathbb{T}_2^{(1,0;a)}(A_1) = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}i}{4} \\ 0 & 0 & 0 & 0 & -\frac{\sqrt{2}i}{4} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} \\ 0 & 0 & 0 & 0 & \frac{\sqrt{2}}{4} & 0 \\ 0 & \frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 \\ -\frac{\sqrt{2}i}{4} & 0 & \frac{\sqrt{2}}{4} & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x33}} \quad \mathbb{T}_{2,1}^{(1,0;a)}(E, 1) = \begin{bmatrix} 0 & \frac{\sqrt{6}i}{6} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ -\frac{\sqrt{6}i}{6} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \\ 0 & \frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 \\ \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} \\ 0 & 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}i}{6} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{12} & \frac{\sqrt{6}i}{6} & 0 \end{bmatrix}$$

$$\boxed{\text{x34}} \quad \mathbb{T}_{2,2}^{(1,0;a)}(E, 1) = \begin{bmatrix} 0 & 0 & 0 & \frac{\sqrt{6}i}{12} & \frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 \\ -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{6} & 0 & 0 & 0 \\ \frac{\sqrt{6}}{12} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{6} \\ 0 & -\frac{\sqrt{6}}{12} & 0 & 0 & -\frac{\sqrt{6}}{6} & 0 \end{bmatrix}$$

$$\boxed{\text{x35}} \quad \mathbb{T}_{2,1}^{(1,0;a)}(E, 2) = \begin{bmatrix} \frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & -\frac{\sqrt{6}}{12} \\ 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}}{12} & 0 \\ 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}i}{12} & 0 \\ 0 & -\frac{\sqrt{6}}{12} & 0 & -\frac{\sqrt{6}i}{12} & 0 & 0 \\ -\frac{\sqrt{6}}{12} & 0 & \frac{\sqrt{6}i}{12} & 0 & 0 & 0 \end{bmatrix}$$

$$\boxed{\text{x36}} \quad \mathbb{T}_{2,2}^{(1,0;a)}(E, 2) = \begin{bmatrix} 0 & 0 & -\frac{\sqrt{6}}{6} & 0 & 0 & -\frac{\sqrt{6}i}{12} \\ 0 & 0 & 0 & \frac{\sqrt{6}}{6} & \frac{\sqrt{6}i}{12} & 0 \\ -\frac{\sqrt{6}}{6} & 0 & 0 & 0 & 0 & \frac{\sqrt{6}}{12} \\ 0 & \frac{\sqrt{6}}{6} & 0 & 0 & \frac{\sqrt{6}}{12} & 0 \\ 0 & -\frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 \\ \frac{\sqrt{6}i}{12} & 0 & \frac{\sqrt{6}}{12} & 0 & 0 & 0 \end{bmatrix}$$

- Site cluster

\*\* Wyckoff: 9b

$$\boxed{\text{y1}} \quad \mathbb{Q}_0^{(s)}(A_1) = \left[ \frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3}, \frac{\sqrt{3}}{3} \right]$$

$$\boxed{\text{y2}} \quad \mathbb{Q}_{1,1}^{(s)}(E) = \left[ \frac{\sqrt{2}}{2}, 0, -\frac{\sqrt{2}}{2} \right]$$

$$\boxed{\text{y3}} \quad \mathbb{Q}_{1,2}^{(s)}(E) = \left[ -\frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{3}, -\frac{\sqrt{6}}{6} \right]$$

\*\* Wyckoff: 18c

$$\boxed{\text{y4}} \quad \mathbb{Q}_0^{(s)}(A_1) = \left[ \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6} \right]$$

$$\boxed{\text{y5}} \quad \mathbb{Q}_3^{(s)}(A_2) = \left[ \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, -\frac{\sqrt{6}}{6}, -\frac{\sqrt{6}}{6}, -\frac{\sqrt{6}}{6} \right]$$

$$\boxed{\text{y6}} \quad \mathbb{Q}_{1,1}^{(s)}(E) = \left[ \frac{5\sqrt{21}}{42}, -\frac{2\sqrt{21}}{21}, -\frac{\sqrt{21}}{42}, \frac{\sqrt{21}}{42}, -\frac{5\sqrt{21}}{42}, \frac{2\sqrt{21}}{21} \right]$$

$$\boxed{\text{y7}} \quad \mathbb{Q}_{1,2}^{(s)}(E) = \left[ \frac{\sqrt{7}}{14}, \frac{\sqrt{7}}{7}, -\frac{3\sqrt{7}}{14}, -\frac{3\sqrt{7}}{14}, \frac{\sqrt{7}}{14}, \frac{\sqrt{7}}{7} \right]$$

$$\boxed{\text{y8}} \quad \mathbb{Q}_{2,1}^{(s)}(E, 2) = \left[ -\frac{\sqrt{7}}{14}, -\frac{\sqrt{7}}{7}, \frac{3\sqrt{7}}{14}, -\frac{3\sqrt{7}}{14}, \frac{\sqrt{7}}{14}, \frac{\sqrt{7}}{7} \right]$$

$$\boxed{\text{y9}} \quad \mathbb{Q}_{2,2}^{(s)}(E, 2) = \left[ \frac{5\sqrt{21}}{42}, -\frac{2\sqrt{21}}{21}, -\frac{\sqrt{21}}{42}, -\frac{\sqrt{21}}{42}, \frac{5\sqrt{21}}{42}, -\frac{2\sqrt{21}}{21} \right]$$

- Bond cluster

\*\* Wyckoff: 18a@18c

$$\boxed{\text{y10}} \quad \mathbb{Q}_0^{(s)}(A_1) = \left[ \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6} \right]$$

$$\boxed{\text{y11}} \quad \mathbb{T}_0^{(s)}(A_1) = \left[ \frac{\sqrt{6}i}{6}, \frac{\sqrt{6}i}{6}, \frac{\sqrt{6}i}{6}, \frac{\sqrt{6}i}{6}, \frac{\sqrt{6}i}{6}, \frac{\sqrt{6}i}{6} \right]$$

$$\boxed{\text{y12}} \quad \mathbb{M}_1^{(s)}(A_2) = \left[ \frac{\sqrt{6}i}{6}, \frac{\sqrt{6}i}{6}, \frac{\sqrt{6}i}{6}, -\frac{\sqrt{6}i}{6}, -\frac{\sqrt{6}i}{6}, -\frac{\sqrt{6}i}{6} \right]$$

$$\boxed{\text{y13}} \quad \mathbb{Q}_3^{(s)}(A_2) = \left[ \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, \frac{\sqrt{6}}{6}, -\frac{\sqrt{6}}{6}, -\frac{\sqrt{6}}{6}, -\frac{\sqrt{6}}{6} \right]$$

$$\boxed{\text{y14}} \quad \mathbb{Q}_{1,1}^{(s)}(E) = \left[ \frac{5\sqrt{21}}{42}, -\frac{2\sqrt{21}}{21}, -\frac{\sqrt{21}}{42}, \frac{\sqrt{21}}{42}, -\frac{5\sqrt{21}}{42}, \frac{2\sqrt{21}}{21} \right]$$

$$\boxed{\text{y15}} \quad \mathbb{Q}_{1,2}^{(s)}(E) = \left[ \frac{\sqrt{7}}{14}, \frac{\sqrt{7}}{7}, -\frac{3\sqrt{7}}{14}, -\frac{3\sqrt{7}}{14}, \frac{\sqrt{7}}{14}, \frac{\sqrt{7}}{7} \right]$$

$$\boxed{\text{y16}} \quad \mathbb{T}_{1,1}^{(s)}(E, a) = \left[ \frac{5\sqrt{21}i}{42}, -\frac{2\sqrt{21}i}{21}, -\frac{\sqrt{21}i}{42}, \frac{\sqrt{21}i}{42}, -\frac{5\sqrt{21}i}{42}, \frac{2\sqrt{21}i}{21} \right]$$

$$\boxed{\text{y17}} \quad \mathbb{T}_{1,2}^{(s)}(E, a) = \left[ \frac{\sqrt{7}i}{14}, \frac{\sqrt{7}i}{7}, -\frac{3\sqrt{7}i}{14}, -\frac{3\sqrt{7}i}{14}, \frac{\sqrt{7}i}{14}, \frac{\sqrt{7}i}{7} \right]$$

$$\boxed{\text{y18}} \quad \mathbb{T}_{1,1}^{(s)}(E, b) = \left[ -\frac{\sqrt{7}i}{14}, -\frac{\sqrt{7}i}{7}, \frac{3\sqrt{7}i}{14}, -\frac{3\sqrt{7}i}{14}, \frac{\sqrt{7}i}{14}, \frac{\sqrt{7}i}{7} \right]$$

$$\boxed{\text{y19}} \quad \mathbb{T}_{1,2}^{(s)}(E, b) = \left[ \frac{5\sqrt{21}i}{42}, -\frac{2\sqrt{21}i}{21}, -\frac{\sqrt{21}i}{42}, -\frac{\sqrt{21}i}{42}, \frac{5\sqrt{21}i}{42}, -\frac{2\sqrt{21}i}{21} \right]$$

$$\boxed{\text{y20}} \quad \mathbb{Q}_{2,1}^{(s)}(E, 2) = \left[ -\frac{\sqrt{7}}{14}, -\frac{\sqrt{7}}{7}, \frac{3\sqrt{7}}{14}, -\frac{3\sqrt{7}}{14}, \frac{\sqrt{7}}{14}, \frac{\sqrt{7}}{7} \right]$$

$$\boxed{\text{y21}} \quad \mathbb{Q}_{2,2}^{(s)}(E, 2) = \left[ \frac{5\sqrt{21}}{42}, -\frac{2\sqrt{21}}{21}, -\frac{\sqrt{21}}{42}, -\frac{\sqrt{21}}{42}, \frac{5\sqrt{21}}{42}, -\frac{2\sqrt{21}}{21} \right]$$

Table 5: Orbital of each site

#	site	orbital
1	A	$ p_x, \uparrow\rangle,  p_x, \downarrow\rangle,  p_y, \uparrow\rangle,  p_y, \downarrow\rangle,  p_z, \uparrow\rangle,  p_z, \downarrow\rangle$
2	B	$ p_x, \uparrow\rangle,  p_x, \downarrow\rangle,  p_y, \uparrow\rangle,  p_y, \downarrow\rangle,  p_z, \uparrow\rangle,  p_z, \downarrow\rangle$

Table 6: Neighbor and bra-ket of each bond

#	head	tail	neighbor	head (bra)	tail (ket)
1	A	B	[1]	[p]	[p]

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**Site in Unit Cell**


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Sites in (conventional) cell (no plus set), SL = sublattice

Table 7: 'A' (#1) site cluster (9b), .m

SL	position ( $\mathbf{s}$ )	mapping
1	[ 0.16667, 0.83333, 0.33333]	[1,4]
2	[ 0.16667, 0.33333, 0.33333]	[2,6]

*continued ...*



Table 7

SL	position ( $\mathbf{s}$ )	mapping
3	[ 0.66667, 0.83333, 0.33333]	[3,5]

Table 8: 'B' (#2) site cluster (18c), 1

SL	position ( $\mathbf{s}$ )	mapping
1	[ 0.83333, 0.00000, 0.66667]	[1]
2	[ 0.00000, 0.83333, 0.66667]	[2]
3	[ 0.16667, 0.16667, 0.66667]	[3]
4	[ 0.00000, 0.16667, 0.66667]	[4]
5	[ 0.16667, 0.00000, 0.66667]	[5]
6	[ 0.83333, 0.83333, 0.66667]	[6]

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**Bond in Unit Cell**


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Bonds in (conventional) cell (no plus set): tail, head = (SL, plus set), (N)D = (non)directional (listed up to 5th neighbor at most)

Table 9: 1-th 'A'-'B' [1] (#1) bond cluster (18a@18c), D,  $|v|=0.16667$  (cartesian)

SL	vector ( $v$ )	center ( $c$ )	mapping	head	tail	$R$ (primitive)
1	[ 0.00000, 0.16667, -0.00000]	[ 0.83333, 0.08333, 0.66667]	[1]	(1,2)	(1,1)	[-1,1,-1]
2	[-0.16667, -0.16667, -0.00000]	[ 0.91667, 0.75000, 0.66667]	[2]	(2,2)	(2,1)	[0,-1,0]
3	[ 0.16667, -0.00000, -0.00000]	[ 0.25000, 0.16667, 0.66667]	[3]	(3,2)	(3,1)	[0,0,-1]
4	[-0.16667, -0.00000, -0.00000]	[ 0.91667, 0.16667, 0.66667]	[4]	(1,2)	(4,1)	[0,0,-1]
5	[ 0.16667, 0.16667, -0.00000]	[ 0.25000, 0.08333, 0.66667]	[5]	(3,2)	(5,1)	[0,0,-1]
6	[ 0.00000, -0.16667, -0.00000]	[ 0.83333, 0.75000, 0.66667]	[6]	(2,2)	(6,1)	[-1,0,0]