

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**

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:
 $+ [0, 0, 0], + [\frac{2}{3}, \frac{1}{3}, \frac{1}{3}], + [\frac{1}{3}, \frac{2}{3}, \frac{2}{3}]$

Symmetry Operation

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 | $\{m_{010} 0\}$ | | | | | | | | |

Harmonics

Table 2: Harmonics

| # | symbol | irrep. | rank | X | multiplicity | component | symmetry |
|---|------------------------|--------|------|--------|--------------|-----------|--|
| 1 | $\mathbb{Q}_0(A_1)$ | A_1 | 0 | Q, T | - | - | 1 |
| 2 | $\mathbb{Q}_1(A_1)$ | A_1 | 1 | Q, T | - | - | z |
| 3 | $\mathbb{Q}_2(A_1)$ | A_1 | 2 | Q, T | - | - | $-\frac{x^2}{2} - \frac{y^2}{2} + z^2$ |
| 4 | $\mathbb{G}_3(A_1)$ | A_1 | 3 | G, M | - | - | $\frac{\sqrt{10}x(x^2-3y^2)}{4}$ |
| 5 | $\mathbb{Q}_3(A_1, 1)$ | A_1 | 3 | Q, T | 1 | - | $-\frac{z(3x^2+3y^2-2z^2)}{2}$ |
| 6 | $\mathbb{Q}_3(A_1, 2)$ | A_1 | 3 | Q, T | 2 | - | $\frac{\sqrt{10}y(3x^2-y^2)}{4}$ |
| 7 | $\mathbb{Q}_4(A_1, 2)$ | A_1 | 4 | Q, T | 2 | - | $\frac{\sqrt{70}yz(3x^2-y^2)}{4}$ |

continued ...

Table 2

| # | symbol | irrep. | rank | X | multiplicity | component | symmetry |
|----|--------------------------|--------|------|--------|--------------|-----------|--|
| 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 | $\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$ |
| 28 | $\mathbb{G}_{3,2}(E, 1)$ | | | | | 2 | $-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$ |

continued ...

Table 2

| # | symbol | irrep. | rank | X | multiplicity | component | symmetry |
|----|--------------------------|--------|------|--------|--------------|-----------|---|
| 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)$ |
| 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)$ |

continued ...

Table 3

| # | orbital@atom(SL) | # | orbital@atom(SL) | # | orbital@atom(SL) | # | orbital@atom(SL) | # | orbital@atom(SL) |
|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|
| 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 |

SAMB: 351 (all 351)

- **A** : '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**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\begin{aligned}
\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} \\
\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}
\end{aligned}$$

$$\boxed{\text{z132}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E,1) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z133}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E,1) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z134}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E,2) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z135}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E,2) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_0^{(s)}(A_1)}{2}$$

$$\boxed{\text{z136}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E,1) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{7}$$

$$\boxed{\text{z137}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E,1) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{7}$$

$$\boxed{\text{z138}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E,2) = \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_{1,2}^{(s)}(E)}{2} + \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z139}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E,2) = \frac{\mathbb{Q}_{2,1}^{(1,-1;a)}(E,1)\mathbb{Q}_{1,1}^{(s)}(E)}{2} - \frac{\mathbb{Q}_{2,2}^{(1,-1;a)}(E,1)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z140}} \quad \mathbb{Q}_{1,1}^{(1,0;c)}(E) = -\frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z141}} \quad \mathbb{Q}_{1,2}^{(1,0;c)}(E) = \frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

$$\boxed{\text{z142}} \quad \mathbb{Q}_{1,1}^{(1,1;c)}(E) = \frac{\sqrt{2}\mathbb{Q}_0^{(1,1;a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{2}$$

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

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

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

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

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

• **B : '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**

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

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

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

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

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

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

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

$$\boxed{\text{z17}} \quad \mathbb{Q}_1^{(1,-1;c)}(A_1) = \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1) \mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1) \mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z18}} \quad \mathbb{Q}_2^{(1,-1;c)}(A_1) = \mathbb{Q}_2^{(1,-1;a)}(A_1) \mathbb{Q}_0^{(s)}(A_1)$$

$$\boxed{\text{z19}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1, 2) = \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2) \mathbb{Q}_{1,1}^{(s)}(E)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2) \mathbb{Q}_{1,2}^{(s)}(E)}{2}$$

$$\boxed{\text{z20}} \quad \mathbb{Q}_4^{(1,-1;c)}(A_1, 2) = \frac{\sqrt{2} \mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1) \mathbb{Q}_{2,1}^{(s)}(E, 2)}{2} + \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1) \mathbb{Q}_{2,2}^{(s)}(E, 2)}{2}$$

$$\begin{aligned}
\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} \\
\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}
\end{aligned}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\begin{aligned}
\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}
\end{aligned}$$

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

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

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

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

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

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

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

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

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

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

$$\boxed{\text{z182}} \quad \mathbb{Q}_{2,1}^{(1,-1;c)}(E,2b) = -\frac{\sqrt{2}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{2,1}^{(s)}(E,2)}{2}$$

$$\boxed{\text{z183}} \quad \mathbb{Q}_{2,2}^{(1,-1;c)}(E,2b) = -\frac{\sqrt{2}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{2,2}^{(s)}(E,2)}{2}$$

$$\boxed{\text{z184}} \quad \mathbb{Q}_{3,1}^{(1,-1;c)}(E,1) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,1}^{(s)}(E)}{7}$$

$$\boxed{\text{z185}} \quad \mathbb{Q}_{3,2}^{(1,-1;c)}(E,1) = \frac{\sqrt{7}\mathbb{Q}_{2,1}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,1}^{(s)}(E)}{14} - \frac{\sqrt{7}\mathbb{Q}_{2,2}^{(1,-1;a)}(E,2)\mathbb{Q}_{1,2}^{(s)}(E)}{14} + \frac{\sqrt{21}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,2}^{(s)}(E)}{7}$$

$$\begin{aligned}
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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}
\end{aligned}$$

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

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

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

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

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

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

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

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

• **B;A_001_1** : '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**

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

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

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

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

$$\begin{aligned}
\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} \\
\boxed{\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) \\
\boxed{\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) \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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}
\end{aligned}$$

$$\boxed{\text{z44}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1, 2b) = -\frac{\sqrt{2}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} - \frac{\sqrt{2}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z45}} \quad \mathbb{Q}_3^{(1,-1;c)}(A_1, 2c) = -\frac{\sqrt{2}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} - \frac{\sqrt{2}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z46}} \quad \mathbb{Q}_4^{(1,-1;c)}(A_1, 2a) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} + \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z47}} \quad \mathbb{Q}_4^{(1,-1;c)}(A_1, 2b) = \mathbb{M}_3^{(1,-1;a)}(A_2, 2)\mathbb{M}_1^{(b)}(A_2)$$

$$\boxed{\text{z48}} \quad \mathbb{Q}_1^{(1,0;c)}(A_1, a) = \frac{\sqrt{2}\mathbb{G}_{1,1}^{(1,0;a)}(E)\mathbb{Q}_{1,1}^{(b)}(E)}{2} + \frac{\sqrt{2}\mathbb{G}_{1,2}^{(1,0;a)}(E)\mathbb{Q}_{1,2}^{(b)}(E)}{2}$$

$$\boxed{\text{z49}} \quad \mathbb{Q}_1^{(1,0;c)}(A_1, b) = \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} + \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z50}} \quad \mathbb{Q}_1^{(1,0;c)}(A_1, c) = \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{2} + \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z51}} \quad \mathbb{Q}_2^{(1,0;c)}(A_1) = \mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_0^{(b)}(A_1)$$

$$\boxed{\text{z52}} \quad \mathbb{Q}_3^{(1,0;c)}(A_1, 2a) = \mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_3^{(b)}(A_2)$$

$$\boxed{\text{z53}} \quad \mathbb{Q}_3^{(1,0;c)}(A_1, 2b) = \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{2} + \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{2}$$

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

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

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

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

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

$$\begin{aligned}
\text{z59} \quad \mathbb{G}_3^{(1,-1;c)}(A_1) &= \mathbb{M}_3^{(1,-1;a)}(A_1) \mathbb{T}_0^{(b)}(A_1) \\
\text{z60} \quad \mathbb{G}_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} \\
\text{z82} \quad \mathbb{Q}_3^{(c)}(A_2, a) &= \mathbb{Q}_0^{(a)}(A_1) \mathbb{Q}_3^{(b)}(A_2) \\
\text{z83} \quad \mathbb{Q}_3^{(c)}(A_2, b) &= -\mathbb{Q}_2^{(a)}(A_1) \mathbb{Q}_3^{(b)}(A_2) \\
\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} \\
\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} \\
\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) \\
\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} \\
\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} \\
\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} \\
\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} \\
\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) \\
\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} \\
\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} \\
\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)
\end{aligned}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\boxed{\text{z210}} \quad \mathbb{Q}_{1,1}^{(c)}(E, b) = \frac{\sqrt{2} \mathbb{Q}_{2,2}^{(a)}(E, 2) \mathbb{Q}_3^{(b)}(A_2)}{2}$$

$$\boxed{\text{z211}} \quad \mathbb{Q}_{1,2}^{(c)}(E, b) = -\frac{\sqrt{2} \mathbb{Q}_{2,1}^{(a)}(E, 2) \mathbb{Q}_3^{(b)}(A_2)}{2}$$

$$\boxed{\text{z212}} \quad \mathbb{Q}_{1,1}^{(c)}(E, c) = \frac{\sqrt{42} \mathbb{Q}_{2,1}^{(a)}(E, 2) \mathbb{Q}_{1,2}^{(b)}(E)}{14} + \frac{\sqrt{42} \mathbb{Q}_{2,2}^{(a)}(E, 2) \mathbb{Q}_{1,1}^{(b)}(E)}{14} - \frac{\sqrt{14} \mathbb{Q}_2^{(a)}(A_1) \mathbb{Q}_{1,1}^{(b)}(E)}{14}$$

$$\boxed{\text{z213}} \quad \mathbb{Q}_{1,2}^{(c)}(E, c) = \frac{\sqrt{42} \mathbb{Q}_{2,1}^{(a)}(E, 2) \mathbb{Q}_{1,1}^{(b)}(E)}{14} - \frac{\sqrt{42} \mathbb{Q}_{2,2}^{(a)}(E, 2) \mathbb{Q}_{1,2}^{(b)}(E)}{14} - \frac{\sqrt{14} \mathbb{Q}_2^{(a)}(A_1) \mathbb{Q}_{1,2}^{(b)}(E)}{14}$$

$$\boxed{\text{z214}} \quad \mathbb{Q}_{1,1}^{(c)}(E, d) = -\frac{\sqrt{2}\mathbb{M}_1^{(a)}(A_2)\mathbb{T}_{1,2}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z215}} \quad \mathbb{Q}_{1,2}^{(c)}(E, d) = \frac{\sqrt{2}\mathbb{M}_1^{(a)}(A_2)\mathbb{T}_{1,1}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z216}} \quad \mathbb{Q}_{1,1}^{(c)}(E, e) = -\frac{\sqrt{2}\mathbb{M}_1^{(a)}(A_2)\mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z217}} \quad \mathbb{Q}_{1,2}^{(c)}(E, e) = \frac{\sqrt{2}\mathbb{M}_1^{(a)}(A_2)\mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z218}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 1a) = \frac{\sqrt{2}\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z219}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 1a) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z220}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 1b) = \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2} + \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z221}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 1b) = \frac{\mathbb{Q}_{2,1}^{(a)}(E, 1)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2} - \frac{\mathbb{Q}_{2,2}^{(a)}(E, 1)\mathbb{Q}_{2,2}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z222}} \quad \mathbb{Q}_{2,1}^{(c)}(E, 1c) = \frac{\sqrt{2}\mathbb{M}_{1,2}^{(a)}(E)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z223}} \quad \mathbb{Q}_{2,2}^{(c)}(E, 1c) = -\frac{\sqrt{2}\mathbb{M}_{1,1}^{(a)}(E)\mathbb{M}_1^{(b)}(A_2)}{2}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\boxed{\text{z238}} \quad \mathbb{Q}_{1,1}^{(1,-1;c)}(E, a) = \frac{\sqrt{2}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_3^{(b)}(A_2)}{2}$$

$$\boxed{\text{z239}} \quad \mathbb{Q}_{1,2}^{(1,-1;c)}(E, a) = -\frac{\sqrt{2}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_3^{(b)}(A_2)}{2}$$

$$\boxed{\text{z240}} \quad \mathbb{Q}_{1,1}^{(1,-1;c)}(E, b) = \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(b)}(E)}{14} + \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(b)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,1}^{(b)}(E)}{14}$$

$$\boxed{\text{z241}} \quad \mathbb{Q}_{1,2}^{(1,-1;c)}(E, b) = \frac{\sqrt{42}\mathbb{Q}_{2,1}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,1}^{(b)}(E)}{14} - \frac{\sqrt{42}\mathbb{Q}_{2,2}^{(1,-1;a)}(E, 2)\mathbb{Q}_{1,2}^{(b)}(E)}{14} - \frac{\sqrt{14}\mathbb{Q}_2^{(1,-1;a)}(A_1)\mathbb{Q}_{1,2}^{(b)}(E)}{14}$$

$$\begin{aligned}
\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} \\
\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}
\end{aligned}$$

$$\begin{aligned}
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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}
\end{aligned}$$

$$\begin{aligned}
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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} \\
\boxed{\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}
\end{aligned}$$

$$\boxed{\text{z284}} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 1b) = \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{T}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z285}} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 1b) = \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{T}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z286}} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 1c) = \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 1)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z287}} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 1c) = -\frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 1)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z288}} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 2a) = \frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{2,2}(E, 2)}{2}$$

$$\boxed{\text{z289}} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 2a) = -\frac{\sqrt{2}\mathbb{G}_1^{(1,0;a)}(A_2)\mathbb{Q}_{2,1}^{(b)}(E, 2)}{2}$$

$$\boxed{\text{z290}} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 2b) = \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z291}} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 2b) = \frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z292}} \quad \mathbb{Q}_{2,1}^{(1,0;c)}(E, 2c) = -\frac{\sqrt{2}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z293}} \quad \mathbb{Q}_{2,2}^{(1,0;c)}(E, 2c) = \frac{\sqrt{2}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{M}_1^{(b)}(A_2)}{2}$$

$$\boxed{\text{z294}} \quad \mathbb{Q}_{3,1}^{(1,0;c)}(E, 1a) = \frac{\sqrt{7}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{14} + \frac{\sqrt{7}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{14} + \frac{\sqrt{21}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, a)}{7}$$

$$\boxed{\text{z295}} \quad \mathbb{Q}_{3,2}^{(1,0;c)}(E, 1a) = \frac{\sqrt{7}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{14} - \frac{\sqrt{7}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{14} + \frac{\sqrt{21}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, a)}{7}$$

$$\boxed{\text{z296}} \quad \mathbb{Q}_{3,1}^{(1,0;c)}(E, 1b) = \frac{\sqrt{7}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{14} + \frac{\sqrt{7}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{14} + \frac{\sqrt{21}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,1}^{(b)}(E, b)}{7}$$

$$\boxed{\text{z297}} \quad \mathbb{Q}_{3,2}^{(1,0;c)}(E, 1b) = \frac{\sqrt{7}\mathbb{T}_{2,1}^{(1,0;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{14} - \frac{\sqrt{7}\mathbb{T}_{2,2}^{(1,0;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{14} + \frac{\sqrt{21}\mathbb{T}_2^{(1,0;a)}(A_1)\mathbb{T}_{1,2}^{(b)}(E, b)}{7}$$

$$\begin{aligned}
\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} \\
\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} \\
\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} \\
\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} \\
\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}
\end{aligned}$$

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

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

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

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

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

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

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

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

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

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

$$\boxed{\text{z322}} \quad \mathbb{G}_{2,1}^{(1,-1;c)}(E, 1a) = \frac{\sqrt{66}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{22} + \frac{\sqrt{66}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{22} - \frac{\sqrt{110}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,2}^{(b)}(E, a)}{22}$$

$$\boxed{\text{z323}} \quad \mathbb{G}_{2,2}^{(1,-1;c)}(E, 1a) = \frac{\sqrt{66}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, a)}{22} - \frac{\sqrt{66}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, a)}{22} + \frac{\sqrt{110}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,1}^{(b)}(E, a)}{22}$$

$$\boxed{\text{z324}} \quad \mathbb{G}_{2,1}^{(1,-1;c)}(E, 1b) = \frac{\sqrt{66}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{22} + \frac{\sqrt{66}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{22} - \frac{\sqrt{110}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,2}^{(b)}(E, b)}{22}$$

$$\boxed{\text{z325}} \quad \mathbb{G}_{2,2}^{(1,-1;c)}(E, 1b) = \frac{\sqrt{66}\mathbb{M}_{3,1}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,1}^{(b)}(E, b)}{22} - \frac{\sqrt{66}\mathbb{M}_{3,2}^{(1,-1;a)}(E, 2)\mathbb{T}_{1,2}^{(b)}(E, b)}{22} + \frac{\sqrt{110}\mathbb{M}_3^{(1,-1;a)}(A_2, 1)\mathbb{T}_{1,1}^{(b)}(E, b)}{22}$$

$$\begin{aligned}
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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} \\
\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}
\end{aligned}$$

$$\boxed{\text{z340}} \quad \mathbb{G}_{4,1}^{(1,-1;c)}(E, 2b) = \frac{\mathbb{M}_3^{(1,-1;a)}(A_1) \mathbb{T}_{1,1}^{(b)}(E, b)}{2} - \frac{\mathbb{M}_3^{(1,-1;a)}(A_2, 2) \mathbb{T}_{1,2}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z341}} \quad \mathbb{G}_{4,2}^{(1,-1;c)}(E, 2b) = \frac{\mathbb{M}_3^{(1,-1;a)}(A_1) \mathbb{T}_{1,2}^{(b)}(E, b)}{2} + \frac{\mathbb{M}_3^{(1,-1;a)}(A_2, 2) \mathbb{T}_{1,1}^{(b)}(E, b)}{2}$$

$$\boxed{\text{z342}} \quad \mathbb{G}_{1,1}^{(1,0;c)}(E) = \frac{\sqrt{2} \mathbb{G}_{1,1}^{(1,0;a)}(E) \mathbb{Q}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z343}} \quad \mathbb{G}_{1,2}^{(1,0;c)}(E) = \frac{\sqrt{2} \mathbb{G}_{1,2}^{(1,0;a)}(E) \mathbb{Q}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z344}} \quad \mathbb{G}_{2,1}^{(1,0;c)}(E, 2) = \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E) \mathbb{Q}_{1,2}^{(b)}(E)}{2} + \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E) \mathbb{Q}_{1,1}^{(b)}(E)}{2}$$

$$\boxed{\text{z345}} \quad \mathbb{G}_{2,2}^{(1,0;c)}(E, 2) = \frac{\mathbb{G}_{1,1}^{(1,0;a)}(E) \mathbb{Q}_{1,1}^{(b)}(E)}{2} - \frac{\mathbb{G}_{1,2}^{(1,0;a)}(E) \mathbb{Q}_{1,2}^{(b)}(E)}{2}$$

$$\boxed{\text{z346}} \quad \mathbb{G}_{1,1}^{(1,1;c)}(E) = \frac{\sqrt{2} \mathbb{M}_{1,1}^{(1,1;a)}(E) \mathbb{T}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z347}} \quad \mathbb{G}_{1,2}^{(1,1;c)}(E) = \frac{\sqrt{2} \mathbb{M}_{1,2}^{(1,1;a)}(E) \mathbb{T}_0^{(b)}(A_1)}{2}$$

$$\boxed{\text{z348}} \quad \mathbb{G}_{2,1}^{(1,1;c)}(E, 2a) = \frac{\mathbb{M}_{1,1}^{(1,1;a)}(E) \mathbb{T}_{1,2}^{(b)}(E, a)}{2} + \frac{\mathbb{M}_{1,2}^{(1,1;a)}(E) \mathbb{T}_{1,1}^{(b)}(E, a)}{2}$$

$$\boxed{\text{z349}} \quad \mathbb{G}_{2,2}^{(1,1;c)}(E, 2a) = \frac{\mathbb{M}_{1,1}^{(1,1;a)}(E) \mathbb{T}_{1,1}^{(b)}(E, a)}{2} - \frac{\mathbb{M}_{1,2}^{(1,1;a)}(E) \mathbb{T}_{1,2}^{(b)}(E, a)}{2}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- 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] |

Site in Unit Cell

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

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

| SL | position (s) | mapping |
|----|------------------------------|---------|
| 1 | [0.16667, 0.83333, 0.33333] | [1,4] |
| 2 | [0.16667, 0.33333, 0.33333] | [2,6] |
| 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] |

— Bond in Unit Cell —

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, $|\mathbf{v}| = 0.16667$ (cartesian)

| SL | vector (\mathbf{v}) | center (\mathbf{c}) | mapping | head | tail | \mathbf{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] |