# $Ba_5AlIr_2O_{11}$ Structure: AB5C2D11_oP76_62_c_5c_2c_5c3d-001

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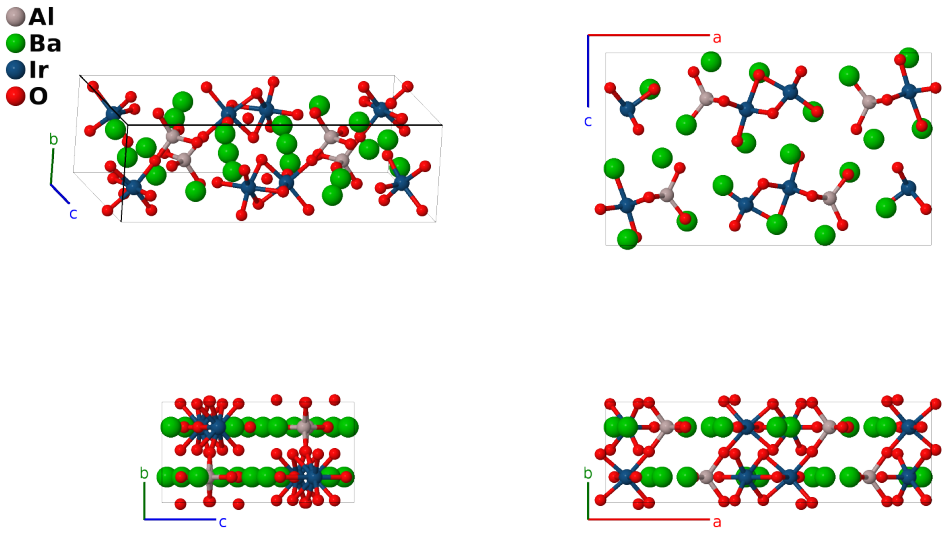
https://aflow.org/p/CZW8

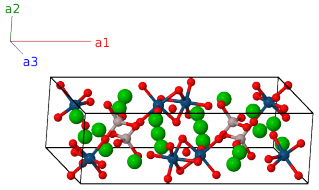
https://aflow.org/p/AB5C2D11_oP76_62_c_5c_2c_5c3d-001




| | |
|---|---|
| **Prototype** | $AlBa_5Ir_2O_{11}$ |
| **AFLOW prototype label** | AB5C2D11_oP76_62_c_5c_2c_5c3d-001 |
| **ICSD** | 67143 |
| **Pearson symbol** | oP76 |
| **Space group number** | 62 |
| **Space group symbol** | *Pnma* |
| **AFLOW prototype command** | `aflow --proto=AB5C2D11_oP76_62_c_5c_2c_5c3d-001 --params=`$a, b/a, c/a, x_1, z_1, x_2, z_2, x_3, z_3, x_4, z_4, x_5, z_5, x_6, z_6, x_7, z_7, x_8, z_8, x_9, z_9, x_{10}, z_{10}, x_{11}, z_{11}, x_{12}, z_{12}, x_{13}, z_{13}, x_{14}, y_{14}, z_{14}, x_{15}, y_{15}, z_{15}, x_{16}, y_{16}, z_{16}$ |

## Simple Orthorhombic primitive vectors

$$\mathbf{a_1} = a\,\hat{\mathbf{x}}$$
$$\mathbf{a_2} = b\,\hat{\mathbf{y}}$$
$$\mathbf{a_3} = c\,\hat{\mathbf{z}}$$




## Basis vectors

| | | Lattice coordinates | | Cartesian coordinates | Wyckoff position | Atom type |
|---|---|---|---|---|---|---|
| $\mathbf{B_1}$ | = | $x_1\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2+z_1\,\mathbf{a}_3$ | = | $ax_1\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_1\,\hat{\mathbf{z}}$ | (4c) | Al I |
| $\mathbf{B_2}$ | = | $-\left(x_1-\frac{1}{2}\right)\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2+\left(z_1+\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_1-\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}+c\left(z_1+\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Al I |
| $\mathbf{B_3}$ | = | $-x_1\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2-z_1\,\mathbf{a}_3$ | = | $-ax_1\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_1\,\hat{\mathbf{z}}$ | (4c) | Al I |
| $\mathbf{B_4}$ | = | $\left(x_1+\frac{1}{2}\right)\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2-\left(z_1-\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_1+\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}-c\left(z_1-\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Al I |
| $\mathbf{B_5}$ | = | $x_2\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2+z_2\,\mathbf{a}_3$ | = | $ax_2\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_2\,\hat{\mathbf{z}}$ | (4c) | Ba I |
| $\mathbf{B_6}$ | = | $-\left(x_2-\frac{1}{2}\right)\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2+\left(z_2+\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_2-\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}+c\left(z_2+\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ba I |
| $\mathbf{B_7}$ | = | $-x_2\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2-z_2\,\mathbf{a}_3$ | = | $-ax_2\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_2\,\hat{\mathbf{z}}$ | (4c) | Ba I |
| $\mathbf{B_8}$ | = | $\left(x_2+\frac{1}{2}\right)\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2-\left(z_2-\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_2+\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}-c\left(z_2-\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ba I |
| $\mathbf{B_9}$ | = | $x_3\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2+z_3\,\mathbf{a}_3$ | = | $ax_3\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_3\,\hat{\mathbf{z}}$ | (4c) | Ba II |
| $\mathbf{B_{10}}$ | = | $-\left(x_3-\frac{1}{2}\right)\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2+\left(z_3+\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_3-\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}+c\left(z_3+\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ba II |
| $\mathbf{B_{11}}$ | = | $-x_3\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2-z_3\,\mathbf{a}_3$ | = | $-ax_3\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_3\,\hat{\mathbf{z}}$ | (4c) | Ba II |
| $\mathbf{B_{12}}$ | = | $\left(x_3+\frac{1}{2}\right)\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2-\left(z_3-\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_3+\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}-c\left(z_3-\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ba II |
| $\mathbf{B_{13}}$ | = | $x_4\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2+z_4\,\mathbf{a}_3$ | = | $ax_4\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_4\,\hat{\mathbf{z}}$ | (4c) | Ba III |
| $\mathbf{B_{14}}$ | = | $-\left(x_4-\frac{1}{2}\right)\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2+\left(z_4+\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_4-\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}+c\left(z_4+\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ba III |
| $\mathbf{B_{15}}$ | = | $-x_4\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2-z_4\,\mathbf{a}_3$ | = | $-ax_4\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_4\,\hat{\mathbf{z}}$ | (4c) | Ba III |
| $\mathbf{B_{16}}$ | = | $\left(x_4+\frac{1}{2}\right)\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2-\left(z_4-\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_4+\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}-c\left(z_4-\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ba III |
| $\mathbf{B_{17}}$ | = | $x_5\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2+z_5\,\mathbf{a}_3$ | = | $ax_5\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_5\,\hat{\mathbf{z}}$ | (4c) | Ba IV |
| $\mathbf{B_{18}}$ | = | $-\left(x_5-\frac{1}{2}\right)\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2+\left(z_5+\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_5-\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}+c\left(z_5+\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ba IV |
| $\mathbf{B_{19}}$ | = | $-x_5\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2-z_5\,\mathbf{a}_3$ | = | $-ax_5\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_5\,\hat{\mathbf{z}}$ | (4c) | Ba IV |
| $\mathbf{B_{20}}$ | = | $\left(x_5+\frac{1}{2}\right)\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2-\left(z_5-\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_5+\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}-c\left(z_5-\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ba IV |
| $\mathbf{B_{21}}$ | = | $x_6\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2+z_6\,\mathbf{a}_3$ | = | $ax_6\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_6\,\hat{\mathbf{z}}$ | (4c) | Ba V |
| $\mathbf{B_{22}}$ | = | $-\left(x_6-\frac{1}{2}\right)\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2+\left(z_6+\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_6-\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}+c\left(z_6+\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ba V |
| $\mathbf{B_{23}}$ | = | $-x_6\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2-z_6\,\mathbf{a}_3$ | = | $-ax_6\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_6\,\hat{\mathbf{z}}$ | (4c) | Ba V |
| $\mathbf{B_{24}}$ | = | $\left(x_6+\frac{1}{2}\right)\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2-\left(z_6-\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_6+\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}-c\left(z_6-\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ba V |
| $\mathbf{B_{25}}$ | = | $x_7\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2+z_7\,\mathbf{a}_3$ | = | $ax_7\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_7\,\hat{\mathbf{z}}$ | (4c) | Ir I |
| $\mathbf{B_{26}}$ | = | $-\left(x_7-\frac{1}{2}\right)\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2+\left(z_7+\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_7-\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}+c\left(z_7+\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ir I |
| $\mathbf{B_{27}}$ | = | $-x_7\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2-z_7\,\mathbf{a}_3$ | = | $-ax_7\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}}$ | (4c) | Ir I |
| $\mathbf{B_{28}}$ | = | $\left(x_7+\frac{1}{2}\right)\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2-\left(z_7-\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_7+\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}-c\left(z_7-\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ir I |
| $\mathbf{B_{29}}$ | = | $x_8\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2+z_8\,\mathbf{a}_3$ | = | $ax_8\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_8\,\hat{\mathbf{z}}$ | (4c) | Ir II |
| $\mathbf{B_{30}}$ | = | $-\left(x_8-\frac{1}{2}\right)\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2+\left(z_8+\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_8-\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}+c\left(z_8+\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ir II |
| $\mathbf{B_{31}}$ | = | $-x_8\,\mathbf{a}_1+\frac{3}{4}\,\mathbf{a}_2-z_8\,\mathbf{a}_3$ | = | $-ax_8\,\hat{\mathbf{x}}+\frac{3}{4}b\,\hat{\mathbf{y}}-cz_8\,\hat{\mathbf{z}}$ | (4c) | Ir II |
| $\mathbf{B_{32}}$ | = | $\left(x_8+\frac{1}{2}\right)\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2-\left(z_8-\frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_8+\frac{1}{2}\right)\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}-c\left(z_8-\frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Ir II |
| $\mathbf{B_{33}}$ | = | $x_9\,\mathbf{a}_1+\frac{1}{4}\,\mathbf{a}_2+z_9\,\mathbf{a}_3$ | = | $ax_9\,\hat{\mathbf{x}}+\frac{1}{4}b\,\hat{\mathbf{y}}+cz_9\,\hat{\mathbf{z}}$ | (4c) | O I |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\mathbf{B_{34}}$ | $=$ | $-\left(x_9-\frac{1}{2}\right)\mathbf{a}_1+\frac{3}{4}\mathbf{a}_2+\left(z_9+\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_9-\frac{1}{2}\right)\hat{\mathbf{x}}+\frac{3}{4}b\hat{\mathbf{y}}+c\left(z_9+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | O I |
| $\mathbf{B_{35}}$ | $=$ | $-x_9\,\mathbf{a}_1+\frac{3}{4}\mathbf{a}_2-z_9\,\mathbf{a}_3$ | $=$ | $-ax_9\,\hat{\mathbf{x}}+\frac{3}{4}b\hat{\mathbf{y}}-cz_9\,\hat{\mathbf{z}}$ | (4c) | O I |
| $\mathbf{B_{36}}$ | $=$ | $\left(x_9+\frac{1}{2}\right)\mathbf{a}_1+\frac{1}{4}\mathbf{a}_2-\left(z_9-\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_9+\frac{1}{2}\right)\hat{\mathbf{x}}+\frac{1}{4}b\hat{\mathbf{y}}-c\left(z_9-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | O I |
| $\mathbf{B_{37}}$ | $=$ | $x_{10}\,\mathbf{a}_1+\frac{1}{4}\mathbf{a}_2+z_{10}\,\mathbf{a}_3$ | $=$ | $ax_{10}\,\hat{\mathbf{x}}+\frac{1}{4}b\hat{\mathbf{y}}+cz_{10}\,\hat{\mathbf{z}}$ | (4c) | O II |
| $\mathbf{B_{38}}$ | $=$ | $-\left(x_{10}-\frac{1}{2}\right)\mathbf{a}_1+\frac{3}{4}\mathbf{a}_2+\left(z_{10}+\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{10}-\frac{1}{2}\right)\hat{\mathbf{x}}+\frac{3}{4}b\hat{\mathbf{y}}+c\left(z_{10}+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | O II |
| $\mathbf{B_{39}}$ | $=$ | $-x_{10}\,\mathbf{a}_1+\frac{3}{4}\mathbf{a}_2-z_{10}\,\mathbf{a}_3$ | $=$ | $-ax_{10}\,\hat{\mathbf{x}}+\frac{3}{4}b\hat{\mathbf{y}}-cz_{10}\,\hat{\mathbf{z}}$ | (4c) | O II |
| $\mathbf{B_{40}}$ | $=$ | $\left(x_{10}+\frac{1}{2}\right)\mathbf{a}_1+\frac{1}{4}\mathbf{a}_2-\left(z_{10}-\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_{10}+\frac{1}{2}\right)\hat{\mathbf{x}}+\frac{1}{4}b\hat{\mathbf{y}}-c\left(z_{10}-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | O II |
| $\mathbf{B_{41}}$ | $=$ | $x_{11}\,\mathbf{a}_1+\frac{1}{4}\mathbf{a}_2+z_{11}\,\mathbf{a}_3$ | $=$ | $ax_{11}\,\hat{\mathbf{x}}+\frac{1}{4}b\hat{\mathbf{y}}+cz_{11}\,\hat{\mathbf{z}}$ | (4c) | O III |
| $\mathbf{B_{42}}$ | $=$ | $-\left(x_{11}-\frac{1}{2}\right)\mathbf{a}_1+\frac{3}{4}\mathbf{a}_2+\left(z_{11}+\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{11}-\frac{1}{2}\right)\hat{\mathbf{x}}+\frac{3}{4}b\hat{\mathbf{y}}+c\left(z_{11}+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | O III |
| $\mathbf{B_{43}}$ | $=$ | $-x_{11}\,\mathbf{a}_1+\frac{3}{4}\mathbf{a}_2-z_{11}\,\mathbf{a}_3$ | $=$ | $-ax_{11}\,\hat{\mathbf{x}}+\frac{3}{4}b\hat{\mathbf{y}}-cz_{11}\,\hat{\mathbf{z}}$ | (4c) | O III |
| $\mathbf{B_{44}}$ | $=$ | $\left(x_{11}+\frac{1}{2}\right)\mathbf{a}_1+\frac{1}{4}\mathbf{a}_2-\left(z_{11}-\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_{11}+\frac{1}{2}\right)\hat{\mathbf{x}}+\frac{1}{4}b\hat{\mathbf{y}}-c\left(z_{11}-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | O III |
| $\mathbf{B_{45}}$ | $=$ | $x_{12}\,\mathbf{a}_1+\frac{1}{4}\mathbf{a}_2+z_{12}\,\mathbf{a}_3$ | $=$ | $ax_{12}\,\hat{\mathbf{x}}+\frac{1}{4}b\hat{\mathbf{y}}+cz_{12}\,\hat{\mathbf{z}}$ | (4c) | O IV |
| $\mathbf{B_{46}}$ | $=$ | $-\left(x_{12}-\frac{1}{2}\right)\mathbf{a}_1+\frac{3}{4}\mathbf{a}_2+\left(z_{12}+\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{12}-\frac{1}{2}\right)\hat{\mathbf{x}}+\frac{3}{4}b\hat{\mathbf{y}}+c\left(z_{12}+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | O IV |
| $\mathbf{B_{47}}$ | $=$ | $-x_{12}\,\mathbf{a}_1+\frac{3}{4}\mathbf{a}_2-z_{12}\,\mathbf{a}_3$ | $=$ | $-ax_{12}\,\hat{\mathbf{x}}+\frac{3}{4}b\hat{\mathbf{y}}-cz_{12}\,\hat{\mathbf{z}}$ | (4c) | O IV |
| $\mathbf{B_{48}}$ | $=$ | $\left(x_{12}+\frac{1}{2}\right)\mathbf{a}_1+\frac{1}{4}\mathbf{a}_2-\left(z_{12}-\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_{12}+\frac{1}{2}\right)\hat{\mathbf{x}}+\frac{1}{4}b\hat{\mathbf{y}}-c\left(z_{12}-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | O IV |
| $\mathbf{B_{49}}$ | $=$ | $x_{13}\,\mathbf{a}_1+\frac{1}{4}\mathbf{a}_2+z_{13}\,\mathbf{a}_3$ | $=$ | $ax_{13}\,\hat{\mathbf{x}}+\frac{1}{4}b\hat{\mathbf{y}}+cz_{13}\,\hat{\mathbf{z}}$ | (4c) | O V |
| $\mathbf{B_{50}}$ | $=$ | $-\left(x_{13}-\frac{1}{2}\right)\mathbf{a}_1+\frac{3}{4}\mathbf{a}_2+\left(z_{13}+\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{13}-\frac{1}{2}\right)\hat{\mathbf{x}}+\frac{3}{4}b\hat{\mathbf{y}}+c\left(z_{13}+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | O V |
| $\mathbf{B_{51}}$ | $=$ | $-x_{13}\,\mathbf{a}_1+\frac{3}{4}\mathbf{a}_2-z_{13}\,\mathbf{a}_3$ | $=$ | $-ax_{13}\,\hat{\mathbf{x}}+\frac{3}{4}b\hat{\mathbf{y}}-cz_{13}\,\hat{\mathbf{z}}$ | (4c) | O V |
| $\mathbf{B_{52}}$ | $=$ | $\left(x_{13}+\frac{1}{2}\right)\mathbf{a}_1+\frac{1}{4}\mathbf{a}_2-\left(z_{13}-\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_{13}+\frac{1}{2}\right)\hat{\mathbf{x}}+\frac{1}{4}b\hat{\mathbf{y}}-c\left(z_{13}-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | O V |
| $\mathbf{B_{53}}$ | $=$ | $x_{14}\,\mathbf{a}_1+y_{14}\,\mathbf{a}_2+z_{14}\,\mathbf{a}_3$ | $=$ | $ax_{14}\,\hat{\mathbf{x}}+by_{14}\,\hat{\mathbf{y}}+cz_{14}\,\hat{\mathbf{z}}$ | (8d) | O VI |
| $\mathbf{B_{54}}$ | $=$ | $-\left(x_{14}-\frac{1}{2}\right)\mathbf{a}_1-y_{14}\,\mathbf{a}_2+\left(z_{14}+\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{14}-\frac{1}{2}\right)\hat{\mathbf{x}}-by_{14}\,\hat{\mathbf{y}}+c\left(z_{14}+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VI |
| $\mathbf{B_{55}}$ | $=$ | $-x_{14}\,\mathbf{a}_1+\left(y_{14}+\frac{1}{2}\right)\mathbf{a}_2-z_{14}\,\mathbf{a}_3$ | $=$ | $-ax_{14}\,\hat{\mathbf{x}}+b\left(y_{14}+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_{14}\,\hat{\mathbf{z}}$ | (8d) | O VI |
| $\mathbf{B_{56}}$ | $=$ | $\left(x_{14}+\frac{1}{2}\right)\mathbf{a}_1-\left(y_{14}-\frac{1}{2}\right)\mathbf{a}_2-\left(z_{14}-\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_{14}+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{14}-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{14}-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VI |
| $\mathbf{B_{57}}$ | $=$ | $-x_{14}\,\mathbf{a}_1-y_{14}\,\mathbf{a}_2-z_{14}\,\mathbf{a}_3$ | $=$ | $-ax_{14}\,\hat{\mathbf{x}}-by_{14}\,\hat{\mathbf{y}}-cz_{14}\,\hat{\mathbf{z}}$ | (8d) | O VI |
| $\mathbf{B_{58}}$ | $=$ | $\left(x_{14}+\frac{1}{2}\right)\mathbf{a}_1+y_{14}\,\mathbf{a}_2-\left(z_{14}-\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_{14}+\frac{1}{2}\right)\hat{\mathbf{x}}+by_{14}\,\hat{\mathbf{y}}-c\left(z_{14}-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VI |
| $\mathbf{B_{59}}$ | $=$ | $x_{14}\,\mathbf{a}_1-\left(y_{14}-\frac{1}{2}\right)\mathbf{a}_2+z_{14}\,\mathbf{a}_3$ | $=$ | $ax_{14}\,\hat{\mathbf{x}}-b\left(y_{14}-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_{14}\,\hat{\mathbf{z}}$ | (8d) | O VI |
| $\mathbf{B_{60}}$ | $=$ | $-\left(x_{14}-\frac{1}{2}\right)\mathbf{a}_1+\left(y_{14}+\frac{1}{2}\right)\mathbf{a}_2+\left(z_{14}+\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{14}-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{14}+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{14}+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VI |
| $\mathbf{B_{61}}$ | $=$ | $x_{15}\,\mathbf{a}_1+y_{15}\,\mathbf{a}_2+z_{15}\,\mathbf{a}_3$ | $=$ | $ax_{15}\,\hat{\mathbf{x}}+by_{15}\,\hat{\mathbf{y}}+cz_{15}\,\hat{\mathbf{z}}$ | (8d) | O VII |
| $\mathbf{B_{62}}$ | $=$ | $-\left(x_{15}-\frac{1}{2}\right)\mathbf{a}_1-y_{15}\,\mathbf{a}_2+\left(z_{15}+\frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{15}-\frac{1}{2}\right)\hat{\mathbf{x}}-by_{15}\,\hat{\mathbf{y}}+c\left(z_{15}+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VII |
| $\mathbf{B_{63}}$ | $=$ | $-x_{15}\,\mathbf{a}_1+\left(y_{15}+\frac{1}{2}\right)\mathbf{a}_2-z_{15}\,\mathbf{a}_3$ | $=$ | $-ax_{15}\,\hat{\mathbf{x}}+b\left(y_{15}+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_{15}\,\hat{\mathbf{z}}$ | (8d) | O VII |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\mathbf{B_{64}}$ | = | $\left(x_{15}+\frac{1}{2}\right)\mathbf{a}_1-\left(y_{15}-\frac{1}{2}\right)\mathbf{a}_2-\left(z_{15}-\frac{1}{2}\right)\mathbf{a}_3$ | = | $a\left(x_{15}+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{15}-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{15}-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VII |
| $\mathbf{B_{65}}$ | = | $-x_{15}\mathbf{a}_1-y_{15}\mathbf{a}_2-z_{15}\mathbf{a}_3$ | = | $-ax_{15}\hat{\mathbf{x}}-by_{15}\hat{\mathbf{y}}-cz_{15}\hat{\mathbf{z}}$ | (8d) | O VII |
| $\mathbf{B_{66}}$ | = | $\left(x_{15}+\frac{1}{2}\right)\mathbf{a}_1+y_{15}\mathbf{a}_2-\left(z_{15}-\frac{1}{2}\right)\mathbf{a}_3$ | = | $a\left(x_{15}+\frac{1}{2}\right)\hat{\mathbf{x}}+by_{15}\hat{\mathbf{y}}-c\left(z_{15}-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VII |
| $\mathbf{B_{67}}$ | = | $x_{15}\mathbf{a}_1-\left(y_{15}-\frac{1}{2}\right)\mathbf{a}_2+z_{15}\mathbf{a}_3$ | = | $ax_{15}\hat{\mathbf{x}}-b\left(y_{15}-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_{15}\hat{\mathbf{z}}$ | (8d) | O VII |
| $\mathbf{B_{68}}$ | = | $-\left(x_{15}-\frac{1}{2}\right)\mathbf{a}_1+\left(y_{15}+\frac{1}{2}\right)\mathbf{a}_2+\left(z_{15}+\frac{1}{2}\right)\mathbf{a}_3$ | = | $-a\left(x_{15}-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{15}+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{15}+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VII |
| $\mathbf{B_{69}}$ | = | $x_{16}\mathbf{a}_1+y_{16}\mathbf{a}_2+z_{16}\mathbf{a}_3$ | = | $ax_{16}\hat{\mathbf{x}}+by_{16}\hat{\mathbf{y}}+cz_{16}\hat{\mathbf{z}}$ | (8d) | O VIII |
| $\mathbf{B_{70}}$ | = | $-\left(x_{16}-\frac{1}{2}\right)\mathbf{a}_1-y_{16}\mathbf{a}_2+\left(z_{16}+\frac{1}{2}\right)\mathbf{a}_3$ | = | $-a\left(x_{16}-\frac{1}{2}\right)\hat{\mathbf{x}}-by_{16}\hat{\mathbf{y}}+c\left(z_{16}+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VIII |
| $\mathbf{B_{71}}$ | = | $-x_{16}\mathbf{a}_1+\left(y_{16}+\frac{1}{2}\right)\mathbf{a}_2-z_{16}\mathbf{a}_3$ | = | $-ax_{16}\hat{\mathbf{x}}+b\left(y_{16}+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_{16}\hat{\mathbf{z}}$ | (8d) | O VIII |
| $\mathbf{B_{72}}$ | = | $\left(x_{16}+\frac{1}{2}\right)\mathbf{a}_1-\left(y_{16}-\frac{1}{2}\right)\mathbf{a}_2-\left(z_{16}-\frac{1}{2}\right)\mathbf{a}_3$ | = | $a\left(x_{16}+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{16}-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{16}-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VIII |
| $\mathbf{B_{73}}$ | = | $-x_{16}\mathbf{a}_1-y_{16}\mathbf{a}_2-z_{16}\mathbf{a}_3$ | = | $-ax_{16}\hat{\mathbf{x}}-by_{16}\hat{\mathbf{y}}-cz_{16}\hat{\mathbf{z}}$ | (8d) | O VIII |
| $\mathbf{B_{74}}$ | = | $\left(x_{16}+\frac{1}{2}\right)\mathbf{a}_1+y_{16}\mathbf{a}_2-\left(z_{16}-\frac{1}{2}\right)\mathbf{a}_3$ | = | $a\left(x_{16}+\frac{1}{2}\right)\hat{\mathbf{x}}+by_{16}\hat{\mathbf{y}}-c\left(z_{16}-\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VIII |
| $\mathbf{B_{75}}$ | = | $x_{16}\mathbf{a}_1-\left(y_{16}-\frac{1}{2}\right)\mathbf{a}_2+z_{16}\mathbf{a}_3$ | = | $ax_{16}\hat{\mathbf{x}}-b\left(y_{16}-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_{16}\hat{\mathbf{z}}$ | (8d) | O VIII |
| $\mathbf{B_{76}}$ | = | $-\left(x_{16}-\frac{1}{2}\right)\mathbf{a}_1+\left(y_{16}+\frac{1}{2}\right)\mathbf{a}_2+\left(z_{16}+\frac{1}{2}\right)\mathbf{a}_3$ | = | $-a\left(x_{16}-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{16}+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{16}+\frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | O VIII |

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