# $Al_3Mn$ Structure: A9B4_oP156_62_5c11d_6c3d-001

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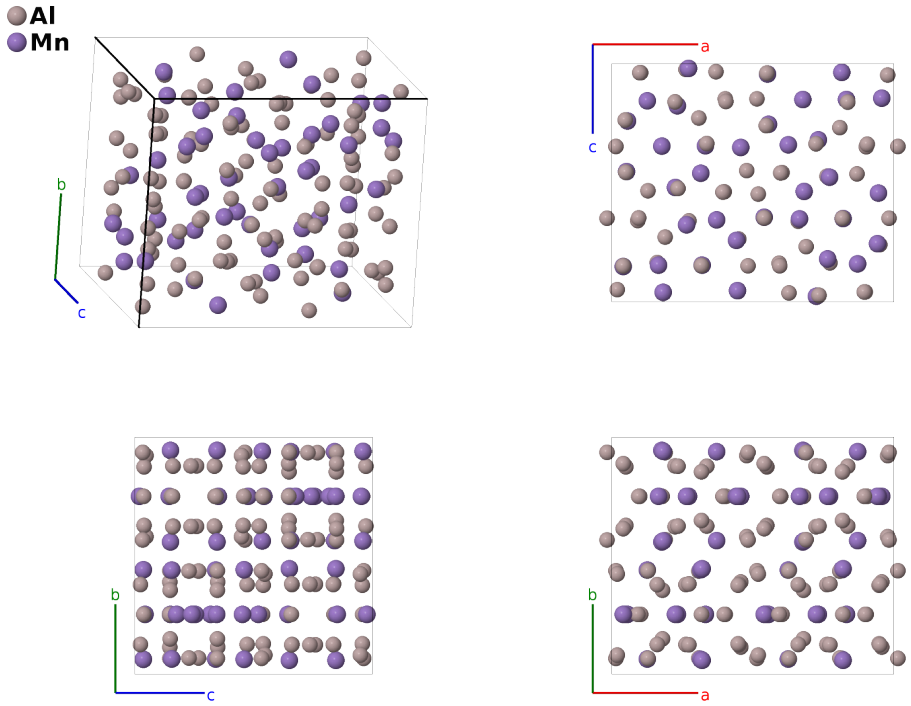
https://aflow.org/p/WUDY

https://aflow.org/p/A9B4_oP156_62_5c11d_6c3d-001

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|---|---|
| **Prototype** | $Al_3Mn$ |
| **AFLOW prototype label** | A9B4_oP156_62_5c11d_6c3d-001 |
| **ICSD** | 105512 |
| **Pearson symbol** | oP156 |
| **Space group number** | 62 |
| **Space group symbol** | *Pnma* |
| **AFLOW prototype command** | `aflow --proto=A9B4_oP156_62_5c11d_6c3d-001 --params=`$a, b/a, c/a, x_1, z_1, x_2, z_2, x_3, z_3, x_4, z_4, x_5, z_5, x_6, z_6, x_7, z_7, x_8, z_8, x_9, z_9, x_{10}, z_{10}, x_{11}, z_{11}, x_{12}, y_{12}, z_{12}, x_{13}, y_{13}, z_{13}, x_{14}, y_{14}, z_{14}, x_{15}, y_{15}, z_{15}, x_{16}, y_{16}, z_{16}, x_{17}, y_{17}, z_{17}, x_{18}, y_{18}, z_{18}, x_{19}, y_{19}, z_{19}, x_{20}, y_{20}, z_{20}, x_{21}, y_{21}, z_{21}, x_{22}, y_{22}, z_{22}, x_{23}, y_{23}, z_{23}, x_{24}, y_{24}, z_{24}, x_{25}, y_{25}, z_{25}$ |

- While all sites are fully occupied, there is some mixing of aluminum and manganese atoms:
  - The Mn-V site is 70% Mn and 30% Al,
  - The Mn-VI site is 80% Mn and 20% Al,

- The Al-VI site is 10% Mn and 90% Al,
- The Mn-VIII site is 50% Mn and 50% Al, and
- The Mn-IX site is 60% Mn and 40% Al.

- This gives a final composition of $Al_{2.94}Mn$.

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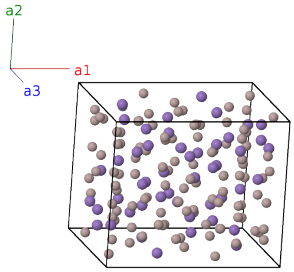
**Simple Orthorhombic primitive vectors**

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

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**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) | Al II |
| $\mathbf{B_6}$ | = | $-\left(x_2 - \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 + \left(z_2 + \frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_2 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} + c\left(z_2 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Al II |
| $\mathbf{B_7}$ | = | $-x_2\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 - z_2\,\mathbf{a}_3$ | = | $-ax_2\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} - cz_2\,\hat{\mathbf{z}}$ | (4c) | Al II |
| $\mathbf{B_8}$ | = | $\left(x_2 + \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 - \left(z_2 - \frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_2 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} - c\left(z_2 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Al II |
| $\mathbf{B_9}$ | = | $x_3\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 + z_3\,\mathbf{a}_3$ | = | $ax_3\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} + cz_3\,\hat{\mathbf{z}}$ | (4c) | Al III |
| $\mathbf{B_{10}}$ | = | $-\left(x_3 - \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 + \left(z_3 + \frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_3 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} + c\left(z_3 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Al III |
| $\mathbf{B_{11}}$ | = | $-x_3\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 - z_3\,\mathbf{a}_3$ | = | $-ax_3\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} - cz_3\,\hat{\mathbf{z}}$ | (4c) | Al III |
| $\mathbf{B_{12}}$ | = | $\left(x_3 + \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 - \left(z_3 - \frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_3 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} - c\left(z_3 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Al III |
| $\mathbf{B_{13}}$ | = | $x_4\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 + z_4\,\mathbf{a}_3$ | = | $ax_4\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} + cz_4\,\hat{\mathbf{z}}$ | (4c) | Al IV |
| $\mathbf{B_{14}}$ | = | $-\left(x_4 - \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 + \left(z_4 + \frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_4 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} + c\left(z_4 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Al IV |
| $\mathbf{B_{15}}$ | = | $-x_4\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 - z_4\,\mathbf{a}_3$ | = | $-ax_4\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} - cz_4\,\hat{\mathbf{z}}$ | (4c) | Al IV |
| $\mathbf{B_{16}}$ | = | $\left(x_4 + \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 - \left(z_4 - \frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_4 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} - c\left(z_4 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Al IV |
| $\mathbf{B_{17}}$ | = | $x_5\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 + z_5\,\mathbf{a}_3$ | = | $ax_5\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}}$ | (4c) | Al V |
| $\mathbf{B_{18}}$ | = | $-\left(x_5 - \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 + \left(z_5 + \frac{1}{2}\right)\,\mathbf{a}_3$ | = | $-a\left(x_5 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} + c\left(z_5 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Al V |
| $\mathbf{B_{19}}$ | = | $-x_5\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 - z_5\,\mathbf{a}_3$ | = | $-ax_5\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} - cz_5\,\hat{\mathbf{z}}$ | (4c) | Al V |
| $\mathbf{B_{20}}$ | = | $\left(x_5 + \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 - \left(z_5 - \frac{1}{2}\right)\,\mathbf{a}_3$ | = | $a\left(x_5 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} - c\left(z_5 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$ | (4c) | Al V |
| $\mathbf{B_{21}}$ | = | $x_6\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 + z_6\,\mathbf{a}_3$ | = | $ax_6\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} + cz_6\,\hat{\mathbf{z}}$ | (4c) | Mn I |

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|---|---|---|---|---|---|---|
| $\mathbf{B_{22}}$ | $= -\left(x_6 - \frac{1}{2}\right)\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 + \left(z_6 + \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_6 - \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} + c\left(z_6 + \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn I |
| $\mathbf{B_{23}}$ | $= -x_6\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 - z_6\mathbf{a}_3$ | $=$ | $-ax_6\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} - cz_6\hat{\mathbf{z}}$ | (4c) | Mn I |
| $\mathbf{B_{24}}$ | $= \left(x_6 + \frac{1}{2}\right)\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 - \left(z_6 - \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_6 + \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} - c\left(z_6 - \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn I |
| $\mathbf{B_{25}}$ | $= x_7\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 + z_7\mathbf{a}_3$ | $=$ | $ax_7\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} + cz_7\hat{\mathbf{z}}$ | (4c) | Mn II |
| $\mathbf{B_{26}}$ | $= -\left(x_7 - \frac{1}{2}\right)\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 + \left(z_7 + \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_7 - \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} + c\left(z_7 + \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn II |
| $\mathbf{B_{27}}$ | $= -x_7\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 - z_7\mathbf{a}_3$ | $=$ | $-ax_7\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} - cz_7\hat{\mathbf{z}}$ | (4c) | Mn II |
| $\mathbf{B_{28}}$ | $= \left(x_7 + \frac{1}{2}\right)\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 - \left(z_7 - \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_7 + \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} - c\left(z_7 - \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn II |
| $\mathbf{B_{29}}$ | $= x_8\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 + z_8\mathbf{a}_3$ | $=$ | $ax_8\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} + cz_8\hat{\mathbf{z}}$ | (4c) | Mn III |
| $\mathbf{B_{30}}$ | $= -\left(x_8 - \frac{1}{2}\right)\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 + \left(z_8 + \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_8 - \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} + c\left(z_8 + \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn III |
| $\mathbf{B_{31}}$ | $= -x_8\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 - z_8\mathbf{a}_3$ | $=$ | $-ax_8\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} - cz_8\hat{\mathbf{z}}$ | (4c) | Mn III |
| $\mathbf{B_{32}}$ | $= \left(x_8 + \frac{1}{2}\right)\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 - \left(z_8 - \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_8 + \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} - c\left(z_8 - \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn III |
| $\mathbf{B_{33}}$ | $= x_9\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 + z_9\mathbf{a}_3$ | $=$ | $ax_9\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} + cz_9\hat{\mathbf{z}}$ | (4c) | Mn IV |
| $\mathbf{B_{34}}$ | $= -\left(x_9 - \frac{1}{2}\right)\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 + \left(z_9 + \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_9 - \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} + c\left(z_9 + \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn IV |
| $\mathbf{B_{35}}$ | $= -x_9\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 - z_9\mathbf{a}_3$ | $=$ | $-ax_9\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} - cz_9\hat{\mathbf{z}}$ | (4c) | Mn IV |
| $\mathbf{B_{36}}$ | $= \left(x_9 + \frac{1}{2}\right)\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 - \left(z_9 - \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_9 + \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} - c\left(z_9 - \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn IV |
| $\mathbf{B_{37}}$ | $= x_{10}\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 + z_{10}\mathbf{a}_3$ | $=$ | $ax_{10}\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} + cz_{10}\hat{\mathbf{z}}$ | (4c) | Mn V |
| $\mathbf{B_{38}}$ | $= -\left(x_{10} - \frac{1}{2}\right)\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 + \left(z_{10} + \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{10} - \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} + c\left(z_{10} + \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn V |
| $\mathbf{B_{39}}$ | $= -x_{10}\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 - z_{10}\mathbf{a}_3$ | $=$ | $-ax_{10}\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} - cz_{10}\hat{\mathbf{z}}$ | (4c) | Mn V |
| $\mathbf{B_{40}}$ | $= \left(x_{10} + \frac{1}{2}\right)\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 - \left(z_{10} - \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_{10} + \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} - c\left(z_{10} - \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn V |
| $\mathbf{B_{41}}$ | $= x_{11}\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 + z_{11}\mathbf{a}_3$ | $=$ | $ax_{11}\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} + cz_{11}\hat{\mathbf{z}}$ | (4c) | Mn VI |
| $\mathbf{B_{42}}$ | $= -\left(x_{11} - \frac{1}{2}\right)\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 + \left(z_{11} + \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{11} - \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} + c\left(z_{11} + \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn VI |
| $\mathbf{B_{43}}$ | $= -x_{11}\mathbf{a}_1 + \frac{3}{4}\mathbf{a}_2 - z_{11}\mathbf{a}_3$ | $=$ | $-ax_{11}\hat{\mathbf{x}} + \frac{3}{4}b\hat{\mathbf{y}} - cz_{11}\hat{\mathbf{z}}$ | (4c) | Mn VI |
| $\mathbf{B_{44}}$ | $= \left(x_{11} + \frac{1}{2}\right)\mathbf{a}_1 + \frac{1}{4}\mathbf{a}_2 - \left(z_{11} - \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_{11} + \frac{1}{2}\right)\hat{\mathbf{x}} + \frac{1}{4}b\hat{\mathbf{y}} - c\left(z_{11} - \frac{1}{2}\right)\hat{\mathbf{z}}$ | (4c) | Mn VI |
| $\mathbf{B_{45}}$ | $= x_{12}\mathbf{a}_1 + y_{12}\mathbf{a}_2 + z_{12}\mathbf{a}_3$ | $=$ | $ax_{12}\hat{\mathbf{x}} + by_{12}\hat{\mathbf{y}} + cz_{12}\hat{\mathbf{z}}$ | (8d) | Al VI |
| $\mathbf{B_{46}}$ | $= -\left(x_{12} - \frac{1}{2}\right)\mathbf{a}_1 - y_{12}\mathbf{a}_2 + \left(z_{12} + \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{12} - \frac{1}{2}\right)\hat{\mathbf{x}} - by_{12}\hat{\mathbf{y}} + c\left(z_{12} + \frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | Al VI |
| $\mathbf{B_{47}}$ | $= -x_{12}\mathbf{a}_1 + \left(y_{12} + \frac{1}{2}\right)\mathbf{a}_2 - z_{12}\mathbf{a}_3$ | $=$ | $-ax_{12}\hat{\mathbf{x}} + b\left(y_{12} + \frac{1}{2}\right)\hat{\mathbf{y}} - cz_{12}\hat{\mathbf{z}}$ | (8d) | Al VI |
| $\mathbf{B_{48}}$ | $= \left(x_{12} + \frac{1}{2}\right)\mathbf{a}_1 - \left(y_{12} - \frac{1}{2}\right)\mathbf{a}_2 - \left(z_{12} - \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_{12} + \frac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{12} - \frac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{12} - \frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | Al VI |
| $\mathbf{B_{49}}$ | $= -x_{12}\mathbf{a}_1 - y_{12}\mathbf{a}_2 - z_{12}\mathbf{a}_3$ | $=$ | $-ax_{12}\hat{\mathbf{x}} - by_{12}\hat{\mathbf{y}} - cz_{12}\hat{\mathbf{z}}$ | (8d) | Al VI |
| $\mathbf{B_{50}}$ | $= \left(x_{12} + \frac{1}{2}\right)\mathbf{a}_1 + y_{12}\mathbf{a}_2 - \left(z_{12} - \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $a\left(x_{12} + \frac{1}{2}\right)\hat{\mathbf{x}} + by_{12}\hat{\mathbf{y}} - c\left(z_{12} - \frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | Al VI |
| $\mathbf{B_{51}}$ | $= x_{12}\mathbf{a}_1 - \left(y_{12} - \frac{1}{2}\right)\mathbf{a}_2 + z_{12}\mathbf{a}_3$ | $=$ | $ax_{12}\hat{\mathbf{x}} - b\left(y_{12} - \frac{1}{2}\right)\hat{\mathbf{y}} + cz_{12}\hat{\mathbf{z}}$ | (8d) | Al VI |
| $\mathbf{B_{52}}$ | $= -\left(x_{12} - \frac{1}{2}\right)\mathbf{a}_1 + \left(y_{12} + \frac{1}{2}\right)\mathbf{a}_2 + \left(z_{12} + \frac{1}{2}\right)\mathbf{a}_3$ | $=$ | $-a\left(x_{12} - \frac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{12} + \frac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{12} + \frac{1}{2}\right)\hat{\mathbf{z}}$ | (8d) | Al VI |
| $\mathbf{B_{53}}$ | $= x_{13}\mathbf{a}_1 + y_{13}\mathbf{a}_2 + z_{13}\mathbf{a}_3$ | $=$ | $ax_{13}\hat{\mathbf{x}} + by_{13}\hat{\mathbf{y}} + cz_{13}\hat{\mathbf{z}}$ | (8d) | Al VII |

$$\mathbf{B_{54}} = -\left(x_{13}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{13}\,\mathbf{a}_2 + \left(z_{13}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{13}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{13}\,\hat{\mathbf{y}} + c\left(z_{13}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al VII}$$

$$\mathbf{B_{55}} = -x_{13}\,\mathbf{a}_1 + \left(y_{13}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{13}\,\mathbf{a}_3 = -ax_{13}\,\hat{\mathbf{x}} + b\left(y_{13}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{13}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al VII}$$

$$\mathbf{B_{56}} = \left(x_{13}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{13}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{13}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{13}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{13}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{13}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al VII}$$

$$\mathbf{B_{57}} = -x_{13}\,\mathbf{a}_1 - y_{13}\,\mathbf{a}_2 - z_{13}\,\mathbf{a}_3 = -ax_{13}\,\hat{\mathbf{x}} - by_{13}\,\hat{\mathbf{y}} - cz_{13}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al VII}$$

$$\mathbf{B_{58}} = \left(x_{13}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{13}\,\mathbf{a}_2 - \left(z_{13}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{13}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{13}\,\hat{\mathbf{y}} - c\left(z_{13}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al VII}$$

$$\mathbf{B_{59}} = x_{13}\,\mathbf{a}_1 - \left(y_{13}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{13}\,\mathbf{a}_3 = ax_{13}\,\hat{\mathbf{x}} - b\left(y_{13}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{13}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al VII}$$

$$\mathbf{B_{60}} = -\left(x_{13}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{13}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{13}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{13}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{13}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{13}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al VII}$$

$$\mathbf{B_{61}} = x_{14}\,\mathbf{a}_1 + y_{14}\,\mathbf{a}_2 + z_{14}\,\mathbf{a}_3 = ax_{14}\,\hat{\mathbf{x}} + by_{14}\,\hat{\mathbf{y}} + cz_{14}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al VIII}$$

$$\mathbf{B_{62}} = -\left(x_{14}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{14}\,\mathbf{a}_2 + \left(z_{14}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{14}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{14}\,\hat{\mathbf{y}} + c\left(z_{14}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al VIII}$$

$$\mathbf{B_{63}} = -x_{14}\,\mathbf{a}_1 + \left(y_{14}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{14}\,\mathbf{a}_3 = -ax_{14}\,\hat{\mathbf{x}} + b\left(y_{14}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{14}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al VIII}$$

$$\mathbf{B_{64}} = \left(x_{14}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{14}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{14}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{14}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{14}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{14}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al VIII}$$

$$\mathbf{B_{65}} = -x_{14}\,\mathbf{a}_1 - y_{14}\,\mathbf{a}_2 - z_{14}\,\mathbf{a}_3 = -ax_{14}\,\hat{\mathbf{x}} - by_{14}\,\hat{\mathbf{y}} - cz_{14}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al VIII}$$

$$\mathbf{B_{66}} = \left(x_{14}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{14}\,\mathbf{a}_2 - \left(z_{14}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{14}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{14}\,\hat{\mathbf{y}} - c\left(z_{14}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al VIII}$$

$$\mathbf{B_{67}} = x_{14}\,\mathbf{a}_1 - \left(y_{14}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{14}\,\mathbf{a}_3 = ax_{14}\,\hat{\mathbf{x}} - b\left(y_{14}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{14}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al VIII}$$

$$\mathbf{B_{68}} = -\left(x_{14}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{14}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{14}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{14}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{14}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{14}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al VIII}$$

$$\mathbf{B_{69}} = x_{15}\,\mathbf{a}_1 + y_{15}\,\mathbf{a}_2 + z_{15}\,\mathbf{a}_3 = ax_{15}\,\hat{\mathbf{x}} + by_{15}\,\hat{\mathbf{y}} + cz_{15}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al IX}$$

$$\mathbf{B_{70}} = -\left(x_{15}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{15}\,\mathbf{a}_2 + \left(z_{15}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{15}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{15}\,\hat{\mathbf{y}} + c\left(z_{15}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al IX}$$

$$\mathbf{B_{71}} = -x_{15}\,\mathbf{a}_1 + \left(y_{15}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{15}\,\mathbf{a}_3 = -ax_{15}\,\hat{\mathbf{x}} + b\left(y_{15}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{15}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al IX}$$

$$\mathbf{B_{72}} = \left(x_{15}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{15}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{15}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{15}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{15}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{15}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al IX}$$

$$\mathbf{B_{73}} = -x_{15}\,\mathbf{a}_1 - y_{15}\,\mathbf{a}_2 - z_{15}\,\mathbf{a}_3 = -ax_{15}\,\hat{\mathbf{x}} - by_{15}\,\hat{\mathbf{y}} - cz_{15}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al IX}$$

$$\mathbf{B_{74}} = \left(x_{15}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{15}\,\mathbf{a}_2 - \left(z_{15}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{15}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{15}\,\hat{\mathbf{y}} - c\left(z_{15}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al IX}$$

$$\mathbf{B_{75}} = x_{15}\,\mathbf{a}_1 - \left(y_{15}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{15}\,\mathbf{a}_3 = ax_{15}\,\hat{\mathbf{x}} - b\left(y_{15}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{15}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al IX}$$

$$\mathbf{B_{76}} = -\left(x_{15}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{15}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{15}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{15}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{15}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{15}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al IX}$$

$$\mathbf{B_{77}} = x_{16}\,\mathbf{a}_1 + y_{16}\,\mathbf{a}_2 + z_{16}\,\mathbf{a}_3 = ax_{16}\,\hat{\mathbf{x}} + by_{16}\,\hat{\mathbf{y}} + cz_{16}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al X}$$

$$\mathbf{B_{78}} = -\left(x_{16}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{16}\,\mathbf{a}_2 + \left(z_{16}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{16}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{16}\,\hat{\mathbf{y}} + c\left(z_{16}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al X}$$

$$\mathbf{B_{79}} = -x_{16}\,\mathbf{a}_1 + \left(y_{16}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{16}\,\mathbf{a}_3 = -ax_{16}\,\hat{\mathbf{x}} + b\left(y_{16}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{16}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al X}$$

$$\mathbf{B_{80}} = \left(x_{16}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{16}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{16}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{16}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{16}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{16}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al X}$$

$$\mathbf{B_{81}} = -x_{16}\,\mathbf{a}_1 - y_{16}\,\mathbf{a}_2 - z_{16}\,\mathbf{a}_3 = -ax_{16}\,\hat{\mathbf{x}} - by_{16}\,\hat{\mathbf{y}} - cz_{16}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al X}$$

$$\mathbf{B_{82}} = \left(x_{16}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{16}\,\mathbf{a}_2 - \left(z_{16}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{16}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{16}\,\hat{\mathbf{y}} - c\left(z_{16}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al X}$$

$$\mathbf{B_{83}} = x_{16}\,\mathbf{a}_1 - \left(y_{16}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{16}\,\mathbf{a}_3 = ax_{16}\,\hat{\mathbf{x}} - b\left(y_{16}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{16}\,\hat{\mathbf{z}} \quad (8d) \quad \text{Al X}$$

$$\mathbf{B_{84}} = -\left(x_{16}-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_{16}+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_{16}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{16}-\tfrac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{16}+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{16}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al X}$$

$$\mathbf{B_{85}} = x_{17}\mathbf{a}_1+y_{17}\mathbf{a}_2+z_{17}\mathbf{a}_3 = ax_{17}\hat{\mathbf{x}}+by_{17}\hat{\mathbf{y}}+cz_{17}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XI}$$

$$\mathbf{B_{86}} = -\left(x_{17}-\tfrac{1}{2}\right)\mathbf{a}_1-y_{17}\mathbf{a}_2+\left(z_{17}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{17}-\tfrac{1}{2}\right)\hat{\mathbf{x}}-by_{17}\hat{\mathbf{y}}+c\left(z_{17}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XI}$$

$$\mathbf{B_{87}} = -x_{17}\mathbf{a}_1+\left(y_{17}+\tfrac{1}{2}\right)\mathbf{a}_2-z_{17}\mathbf{a}_3 = -ax_{17}\hat{\mathbf{x}}+b\left(y_{17}+\tfrac{1}{2}\right)\hat{\mathbf{y}}-cz_{17}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XI}$$

$$\mathbf{B_{88}} = \left(x_{17}+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_{17}-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_{17}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{17}+\tfrac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{17}-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{17}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XI}$$

$$\mathbf{B_{89}} = -x_{17}\mathbf{a}_1-y_{17}\mathbf{a}_2-z_{17}\mathbf{a}_3 = -ax_{17}\hat{\mathbf{x}}-by_{17}\hat{\mathbf{y}}-cz_{17}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XI}$$

$$\mathbf{B_{90}} = \left(x_{17}+\tfrac{1}{2}\right)\mathbf{a}_1+y_{17}\mathbf{a}_2-\left(z_{17}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{17}+\tfrac{1}{2}\right)\hat{\mathbf{x}}+by_{17}\hat{\mathbf{y}}-c\left(z_{17}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XI}$$

$$\mathbf{B_{91}} = x_{17}\mathbf{a}_1-\left(y_{17}-\tfrac{1}{2}\right)\mathbf{a}_2+z_{17}\mathbf{a}_3 = ax_{17}\hat{\mathbf{x}}-b\left(y_{17}-\tfrac{1}{2}\right)\hat{\mathbf{y}}+cz_{17}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XI}$$

$$\mathbf{B_{92}} = -\left(x_{17}-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_{17}+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_{17}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{17}-\tfrac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{17}+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{17}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XI}$$

$$\mathbf{B_{93}} = x_{18}\mathbf{a}_1+y_{18}\mathbf{a}_2+z_{18}\mathbf{a}_3 = ax_{18}\hat{\mathbf{x}}+by_{18}\hat{\mathbf{y}}+cz_{18}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XII}$$

$$\mathbf{B_{94}} = -\left(x_{18}-\tfrac{1}{2}\right)\mathbf{a}_1-y_{18}\mathbf{a}_2+\left(z_{18}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{18}-\tfrac{1}{2}\right)\hat{\mathbf{x}}-by_{18}\hat{\mathbf{y}}+c\left(z_{18}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XII}$$

$$\mathbf{B_{95}} = -x_{18}\mathbf{a}_1+\left(y_{18}+\tfrac{1}{2}\right)\mathbf{a}_2-z_{18}\mathbf{a}_3 = -ax_{18}\hat{\mathbf{x}}+b\left(y_{18}+\tfrac{1}{2}\right)\hat{\mathbf{y}}-cz_{18}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XII}$$

$$\mathbf{B_{96}} = \left(x_{18}+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_{18}-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_{18}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{18}+\tfrac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{18}-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{18}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XII}$$

$$\mathbf{B_{97}} = -x_{18}\mathbf{a}_1-y_{18}\mathbf{a}_2-z_{18}\mathbf{a}_3 = -ax_{18}\hat{\mathbf{x}}-by_{18}\hat{\mathbf{y}}-cz_{18}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XII}$$

$$\mathbf{B_{98}} = \left(x_{18}+\tfrac{1}{2}\right)\mathbf{a}_1+y_{18}\mathbf{a}_2-\left(z_{18}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{18}+\tfrac{1}{2}\right)\hat{\mathbf{x}}+by_{18}\hat{\mathbf{y}}-c\left(z_{18}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XII}$$

$$\mathbf{B_{99}} = x_{18}\mathbf{a}_1-\left(y_{18}-\tfrac{1}{2}\right)\mathbf{a}_2+z_{18}\mathbf{a}_3 = ax_{18}\hat{\mathbf{x}}-b\left(y_{18}-\tfrac{1}{2}\right)\hat{\mathbf{y}}+cz_{18}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XII}$$

$$\mathbf{B_{100}} = -\left(x_{18}-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_{18}+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_{18}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{18}-\tfrac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{18}+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{18}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XII}$$

$$\mathbf{B_{101}} = x_{19}\mathbf{a}_1+y_{19}\mathbf{a}_2+z_{19}\mathbf{a}_3 = ax_{19}\hat{\mathbf{x}}+by_{19}\hat{\mathbf{y}}+cz_{19}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIII}$$

$$\mathbf{B_{102}} = -\left(x_{19}-\tfrac{1}{2}\right)\mathbf{a}_1-y_{19}\mathbf{a}_2+\left(z_{19}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{19}-\tfrac{1}{2}\right)\hat{\mathbf{x}}-by_{19}\hat{\mathbf{y}}+c\left(z_{19}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIII}$$

$$\mathbf{B_{103}} = -x_{19}\mathbf{a}_1+\left(y_{19}+\tfrac{1}{2}\right)\mathbf{a}_2-z_{19}\mathbf{a}_3 = -ax_{19}\hat{\mathbf{x}}+b\left(y_{19}+\tfrac{1}{2}\right)\hat{\mathbf{y}}-cz_{19}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIII}$$

$$\mathbf{B_{104}} = \left(x_{19}+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_{19}-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_{19}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{19}+\tfrac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{19}-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{19}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIII}$$

$$\mathbf{B_{105}} = -x_{19}\mathbf{a}_1-y_{19}\mathbf{a}_2-z_{19}\mathbf{a}_3 = -ax_{19}\hat{\mathbf{x}}-by_{19}\hat{\mathbf{y}}-cz_{19}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIII}$$

$$\mathbf{B_{106}} = \left(x_{19}+\tfrac{1}{2}\right)\mathbf{a}_1+y_{19}\mathbf{a}_2-\left(z_{19}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{19}+\tfrac{1}{2}\right)\hat{\mathbf{x}}+by_{19}\hat{\mathbf{y}}-c\left(z_{19}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIII}$$

$$\mathbf{B_{107}} = x_{19}\mathbf{a}_1-\left(y_{19}-\tfrac{1}{2}\right)\mathbf{a}_2+z_{19}\mathbf{a}_3 = ax_{19}\hat{\mathbf{x}}-b\left(y_{19}-\tfrac{1}{2}\right)\hat{\mathbf{y}}+cz_{19}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIII}$$

$$\mathbf{B_{108}} = -\left(x_{19}-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_{19}+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_{19}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{19}-\tfrac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{19}+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{19}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIII}$$

$$\mathbf{B_{109}} = x_{20}\mathbf{a}_1+y_{20}\mathbf{a}_2+z_{20}\mathbf{a}_3 = ax_{20}\hat{\mathbf{x}}+by_{20}\hat{\mathbf{y}}+cz_{20}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIV}$$

$$\mathbf{B_{110}} = -\left(x_{20}-\tfrac{1}{2}\right)\mathbf{a}_1-y_{20}\mathbf{a}_2+\left(z_{20}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{20}-\tfrac{1}{2}\right)\hat{\mathbf{x}}-by_{20}\hat{\mathbf{y}}+c\left(z_{20}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIV}$$

$$\mathbf{B_{111}} = -x_{20}\mathbf{a}_1+\left(y_{20}+\tfrac{1}{2}\right)\mathbf{a}_2-z_{20}\mathbf{a}_3 = -ax_{20}\hat{\mathbf{x}}+b\left(y_{20}+\tfrac{1}{2}\right)\hat{\mathbf{y}}-cz_{20}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIV}$$

$$\mathbf{B_{112}} = \left(x_{20}+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_{20}-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_{20}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{20}+\tfrac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{20}-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{20}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIV}$$

$$\mathbf{B_{113}} = -x_{20}\mathbf{a}_1-y_{20}\mathbf{a}_2-z_{20}\mathbf{a}_3 = -ax_{20}\hat{\mathbf{x}}-by_{20}\hat{\mathbf{y}}-cz_{20}\hat{\mathbf{z}} \quad (8d) \quad \text{Al XIV}$$

$$\mathbf{B_{114}} = \left(x_{20}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{20}\,\mathbf{a}_2 - \left(z_{20}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{20}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{20}\,\hat{\mathbf{y}} - c\left(z_{20}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XIV}$$

$$\mathbf{B_{115}} = x_{20}\,\mathbf{a}_1 - \left(y_{20}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{20}\,\mathbf{a}_3 = ax_{20}\,\hat{\mathbf{x}} - b\left(y_{20}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{20}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XIV}$$

$$\mathbf{B_{116}} = -\left(x_{20}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{20}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{20}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{20}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{20}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{20}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XIV}$$

$$\mathbf{B_{117}} = x_{21}\,\mathbf{a}_1 + y_{21}\,\mathbf{a}_2 + z_{21}\,\mathbf{a}_3 = ax_{21}\,\hat{\mathbf{x}} + by_{21}\,\hat{\mathbf{y}} + cz_{21}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XV}$$

$$\mathbf{B_{118}} = -\left(x_{21}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{21}\,\mathbf{a}_2 + \left(z_{21}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{21}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{21}\,\hat{\mathbf{y}} + c\left(z_{21}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XV}$$

$$\mathbf{B_{119}} = -x_{21}\,\mathbf{a}_1 + \left(y_{21}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{21}\,\mathbf{a}_3 = -ax_{21}\,\hat{\mathbf{x}} + b\left(y_{21}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{21}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XV}$$

$$\mathbf{B_{120}} = \left(x_{21}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{21}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{21}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{21}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{21}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{21}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XV}$$

$$\mathbf{B_{121}} = -x_{21}\,\mathbf{a}_1 - y_{21}\,\mathbf{a}_2 - z_{21}\,\mathbf{a}_3 = -ax_{21}\,\hat{\mathbf{x}} - by_{21}\,\hat{\mathbf{y}} - cz_{21}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XV}$$

$$\mathbf{B_{122}} = \left(x_{21}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{21}\,\mathbf{a}_2 - \left(z_{21}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{21}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{21}\,\hat{\mathbf{y}} - c\left(z_{21}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XV}$$

$$\mathbf{B_{123}} = x_{21}\,\mathbf{a}_1 - \left(y_{21}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{21}\,\mathbf{a}_3 = ax_{21}\,\hat{\mathbf{x}} - b\left(y_{21}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{21}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XV}$$

$$\mathbf{B_{124}} = -\left(x_{21}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{21}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{21}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{21}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{21}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{21}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XV}$$

$$\mathbf{B_{125}} = x_{22}\,\mathbf{a}_1 + y_{22}\,\mathbf{a}_2 + z_{22}\,\mathbf{a}_3 = ax_{22}\,\hat{\mathbf{x}} + by_{22}\,\hat{\mathbf{y}} + cz_{22}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XVI}$$

$$\mathbf{B_{126}} = -\left(x_{22}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{22}\,\mathbf{a}_2 + \left(z_{22}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{22}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{22}\,\hat{\mathbf{y}} + c\left(z_{22}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XVI}$$

$$\mathbf{B_{127}} = -x_{22}\,\mathbf{a}_1 + \left(y_{22}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{22}\,\mathbf{a}_3 = -ax_{22}\,\hat{\mathbf{x}} + b\left(y_{22}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{22}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XVI}$$

$$\mathbf{B_{128}} = \left(x_{22}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{22}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{22}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{22}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{22}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{22}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XVI}$$

$$\mathbf{B_{129}} = -x_{22}\,\mathbf{a}_1 - y_{22}\,\mathbf{a}_2 - z_{22}\,\mathbf{a}_3 = -ax_{22}\,\hat{\mathbf{x}} - by_{22}\,\hat{\mathbf{y}} - cz_{22}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XVI}$$

$$\mathbf{B_{130}} = \left(x_{22}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{22}\,\mathbf{a}_2 - \left(z_{22}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{22}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{22}\,\hat{\mathbf{y}} - c\left(z_{22}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XVI}$$

$$\mathbf{B_{131}} = x_{22}\,\mathbf{a}_1 - \left(y_{22}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{22}\,\mathbf{a}_3 = ax_{22}\,\hat{\mathbf{x}} - b\left(y_{22}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{22}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XVI}$$

$$\mathbf{B_{132}} = -\left(x_{22}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{22}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{22}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{22}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{22}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{22}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Al XVI}$$

$$\mathbf{B_{133}} = x_{23}\,\mathbf{a}_1 + y_{23}\,\mathbf{a}_2 + z_{23}\,\mathbf{a}_3 = ax_{23}\,\hat{\mathbf{x}} + by_{23}\,\hat{\mathbf{y}} + cz_{23}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VII}$$

$$\mathbf{B_{134}} = -\left(x_{23}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{23}\,\mathbf{a}_2 + \left(z_{23}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{23}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{23}\,\hat{\mathbf{y}} + c\left(z_{23}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VII}$$

$$\mathbf{B_{135}} = -x_{23}\,\mathbf{a}_1 + \left(y_{23}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{23}\,\mathbf{a}_3 = -ax_{23}\,\hat{\mathbf{x}} + b\left(y_{23}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{23}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VII}$$

$$\mathbf{B_{136}} = \left(x_{23}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{23}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{23}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{23}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{23}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{23}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VII}$$

$$\mathbf{B_{137}} = -x_{23}\,\mathbf{a}_1 - y_{23}\,\mathbf{a}_2 - z_{23}\,\mathbf{a}_3 = -ax_{23}\,\hat{\mathbf{x}} - by_{23}\,\hat{\mathbf{y}} - cz_{23}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VII}$$

$$\mathbf{B_{138}} = \left(x_{23}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{23}\,\mathbf{a}_2 - \left(z_{23}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{23}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{23}\,\hat{\mathbf{y}} - c\left(z_{23}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VII}$$

$$\mathbf{B_{139}} = x_{23}\,\mathbf{a}_1 - \left(y_{23}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{23}\,\mathbf{a}_3 = ax_{23}\,\hat{\mathbf{x}} - b\left(y_{23}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{23}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VII}$$

$$\mathbf{B_{140}} = -\left(x_{23}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{23}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{23}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{23}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{23}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{23}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VII}$$

$$\mathbf{B_{141}} = x_{24}\,\mathbf{a}_1 + y_{24}\,\mathbf{a}_2 + z_{24}\,\mathbf{a}_3 = ax_{24}\,\hat{\mathbf{x}} + by_{24}\,\hat{\mathbf{y}} + cz_{24}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VIII}$$

$$\mathbf{B_{142}} = -\left(x_{24}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{24}\,\mathbf{a}_2 + \left(z_{24}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{24}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{24}\,\hat{\mathbf{y}} + c\left(z_{24}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VIII}$$

$$\mathbf{B_{143}} = -x_{24}\,\mathbf{a}_1 + \left(y_{24}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{24}\,\mathbf{a}_3 = -ax_{24}\,\hat{\mathbf{x}} + b\left(y_{24}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{24}\,\hat{\mathbf{z}} \quad \text{(8d)} \quad \text{Mn VIII}$$

$$\mathbf{B_{144}} = \left(x_{24}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{24}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{24}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{24}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{24}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{24}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Mn VIII}$$

$$\mathbf{B_{145}} = -x_{24}\mathbf{a}_1 - y_{24}\mathbf{a}_2 - z_{24}\mathbf{a}_3 = -ax_{24}\hat{\mathbf{x}} - by_{24}\hat{\mathbf{y}} - cz_{24}\hat{\mathbf{z}} \quad (8d) \quad \text{Mn VIII}$$

$$\mathbf{B_{146}} = \left(x_{24}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{24}\mathbf{a}_2 - \left(z_{24}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{24}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{24}\hat{\mathbf{y}} - c\left(z_{24}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Mn VIII}$$

$$\mathbf{B_{147}} = x_{24}\mathbf{a}_1 - \left(y_{24}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{24}\mathbf{a}_3 = ax_{24}\hat{\mathbf{x}} - b\left(y_{24}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{24}\hat{\mathbf{z}} \quad (8d) \quad \text{Mn VIII}$$

$$\mathbf{B_{148}} = -\left(x_{24}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{24}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{24}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{24}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{24}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{24}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Mn VIII}$$

$$\mathbf{B_{149}} = x_{25}\mathbf{a}_1 + y_{25}\mathbf{a}_2 + z_{25}\mathbf{a}_3 = ax_{25}\hat{\mathbf{x}} + by_{25}\hat{\mathbf{y}} + cz_{25}\hat{\mathbf{z}} \quad (8d) \quad \text{Mn IX}$$

$$\mathbf{B_{150}} = -\left(x_{25}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{25}\mathbf{a}_2 + \left(z_{25}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{25}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{25}\hat{\mathbf{y}} + c\left(z_{25}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Mn IX}$$

$$\mathbf{B_{151}} = -x_{25}\mathbf{a}_1 + \left(y_{25}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{25}\mathbf{a}_3 = -ax_{25}\hat{\mathbf{x}} + b\left(y_{25}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{25}\hat{\mathbf{z}} \quad (8d) \quad \text{Mn IX}$$

$$\mathbf{B_{152}} = \left(x_{25}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{25}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{25}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{25}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{25}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{25}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Mn IX}$$

$$\mathbf{B_{153}} = -x_{25}\mathbf{a}_1 - y_{25}\mathbf{a}_2 - z_{25}\mathbf{a}_3 = -ax_{25}\hat{\mathbf{x}} - by_{25}\hat{\mathbf{y}} - cz_{25}\hat{\mathbf{z}} \quad (8d) \quad \text{Mn IX}$$

$$\mathbf{B_{154}} = \left(x_{25}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{25}\mathbf{a}_2 - \left(z_{25}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{25}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{25}\hat{\mathbf{y}} - c\left(z_{25}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Mn IX}$$

$$\mathbf{B_{155}} = x_{25}\mathbf{a}_1 - \left(y_{25}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{25}\mathbf{a}_3 = ax_{25}\hat{\mathbf{x}} - b\left(y_{25}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{25}\hat{\mathbf{z}} \quad (8d) \quad \text{Mn IX}$$

$$\mathbf{B_{156}} = -\left(x_{25}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{25}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{25}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{25}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{25}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{25}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{Mn IX}$$

## References


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