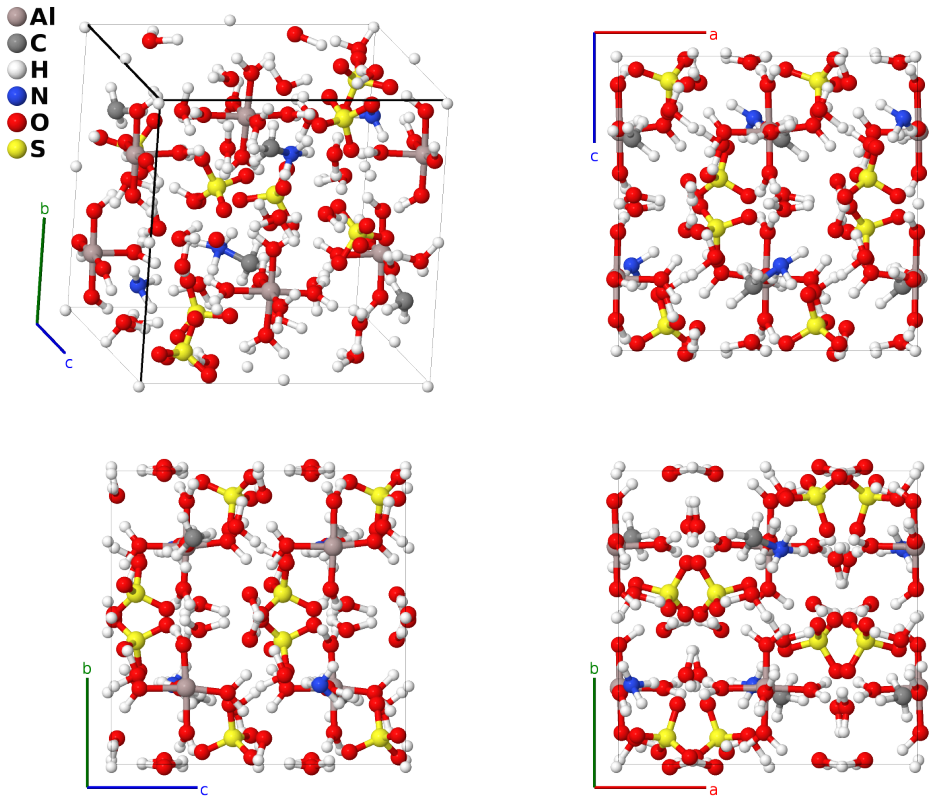
Low Temperature $(NH_3CH_3)Al(SO_4)_2 \cdot 12H_2O$ Structure: ABC30DE20F2_oP220_29_a_a_30a_a_20a_2a-001

This structure originally had the label `ABC30DE20F2_oP220_29_a_a_30a_a_20a_2a`. Calls to that address will be redirected here.

Cite this page as: D. Hicks, M. J. Mehl, M. Esters, C. Oses, O. Levy, G. L. W. Hart, C. Toher, and S. Curtarolo, *The AFLOW Library of Crystallographic Prototypes: Part 3*, Comput. Mater. Sci. **199**, 110450 (2021), doi: 10.1016/j.commatsci.2021.110450.

https://aflow.org/p/2B7C

https://aflow.org/p/ABC30DE20F2_oP220_29_a_a_30a_a_20a_2a-001

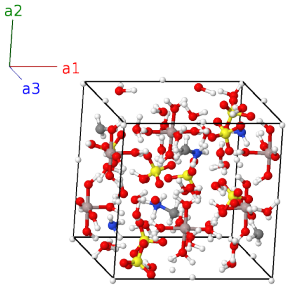


Prototype	$AlCH_{30}NO_{20}S_2$
AFLOW prototype label	ABC30DE20F2_oP220_29_a_a_30a_a_20a_2a-001
ICSD	108970
Pearson symbol	oP220
Space group number	29
Space group symbol	$Pca2_1$
AFLOW prototype command	`aflow --proto=ABC30DE20F2_oP220_29_a_a_30a_a_20a_2a-001 --params=`$a, b/a, c/a, x_1, y_1, z_1, x_2, y_2, z_2, x_3, y_3, z_3, x_4, y_4, z_4, x_5, y_5, z_5, x_6, y_6, z_6, x_7, y_7, z_7, x_8, y_8, z_8, x_9, y_9, z_9, x_{10}, y_{10}, z_{10}, x_{11}, y_{11}, z_{11}, x_{12}, y_{12}, z_{12}, x_{13}, y_{13}, z_{13}, x_{14}, y_{14}, z_{14}, x_{15}, y_{15}, z_{15}, x_{16}, y_{16}, z_{16}, x_{17}, y_{17}, z_{17}, x_{18}, y_{18}, z_{18}, x_{19}, y_{19}, z_{19}, x_{20}, y_{20}, z_{20}, x_{21}, y_{21}, z_{21}, x_{22}, y_{22}, z_{22}, x_{23}, y_{23}, z_{23}, x_{24}, y_{24}, z_{24}, x_{25}, y_{25}, z_{25}, x_{26}, y_{26}, z_{26}, x_{27}, y_{27}, z_{27}, x_{28}, y_{28}, z_{28}, x_{29}, y_{29}, z_{29}, x_{30}, y_{30}, z_{30}, x_{31}, y_{31}, z_{31}, x_{32}, y_{32}, z_{32}, x_{33}, y_{33}, z_{33}, x_{34}, y_{34}, z_{34}, x_{35}, y_{35}, z_{35}, x_{36}, y_{36}, z_{36}, x_{37}, y_{37}, z_{37}, x_{38}, y_{38}, z_{38}, x_{39}, y_{39}, z_{39}, x_{40}, y_{40}, z_{40}, x_{41}, y_{41}, z_{41}, x_{42}, y_{42}, z_{42}, x_{43}, y_{43}, z_{43}, x_{44}, y_{44}, z_{44}, x_{45}, y_{45}, z_{45}, x_{46}, y_{46}, z_{46}, x_{47}, y_{47}, z_{47}, x_{48}, y_{48}, z_{48}, x_{49}, y_{49}, z_{49}, x_{50}, y_{50}, z_{50}, x_{51}, y_{51}, z_{51}, x_{52}, y_{52}, z_{52}, x_{53}, y_{53}, z_{53}, x_{54}, y_{54}, z_{54}, x_{55}, y_{55}, z_{55}$

- The alums have the general formula $AB(XO_4)_2 \cdot 12H_2O$, where A is a monovalent ion, B is a trivalent ion, and X is a chalcogen. In most cases atom B is aluminum and atom X is sulfur, leading to the name alum.
- All alums have their room-temperature form in space group $Pa\overline{3}$ #205, but the bonding between the A and B ions and the XO_4 complex can be quite different.
- (Lipson, 1935abc) described three general forms of alum based on the sizes of the monovalent ions. Each of these forms was given a *Strukturbericht* designation by (Gottfried, 1937):
  - α-alum, with intermediate sized ions, prototype $KAl(SO_4)_2 \cdot 12H_2O$, $H4_{13}$,
  - β-alum, with large ions, prototype $(NH_3CH_3)Al(SO_4)_2 \cdot 12H_2O$, $H4_{14}$, and
  - γ-alum, with small ions, prototype $NaAl(SO_4)_2 \cdot 12H_2O$, $H4_{15}$.
- This classification scheme is not compete, *e.g.*, (Ledsham, 1968) points out that $NaCr(SO_4)_2 \cdot 12H_2O$ does not fit into any of these categories, and that the actual structure depends on the combination of monovalent and trivalent ions.
- As noted above, the $Pa\overline{3}$ structures of alum are the room temperature form. As the temperature decreases the alum structure may transform. For example, in the temperature range 150-170K the β-alum $(NH_3CH_3)Al(SO_4)_2 \cdot 12H_2O$ transforms into this orthorhombic structure with fully ordered NH_3CH_3 ions.
- The data presented here was taken at 113K.

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
$\mathbf{B_1}$	=	$x_1\,\mathbf{a}_1 + y_1\,\mathbf{a}_2 + z_1\,\mathbf{a}_3$	=	$ax_1\,\hat{\mathbf{x}} + by_1\,\hat{\mathbf{y}} + cz_1\,\hat{\mathbf{z}}$	(4a)	Al I
$\mathbf{B_2}$	=	$-x_1\,\mathbf{a}_1 - y_1\,\mathbf{a}_2 + \left(z_1 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ax_1\,\hat{\mathbf{x}} - by_1\,\hat{\mathbf{y}} + c\left(z_1 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4a)	Al I
$\mathbf{B_3}$	=	$\left(x_1 + \frac{1}{2}\right)\,\mathbf{a}_1 - y_1\,\mathbf{a}_2 + z_1\,\mathbf{a}_3$	=	$a\left(x_1 + \frac{1}{2}\right)\,\hat{\mathbf{x}} - by_1\,\hat{\mathbf{y}} + cz_1\,\hat{\mathbf{z}}$	(4a)	Al I
$\mathbf{B_4}$	=	$-\left(x_1 - \frac{1}{2}\right)\,\mathbf{a}_1 + y_1\,\mathbf{a}_2 + \left(z_1 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_1 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + by_1\,\hat{\mathbf{y}} + c\left(z_1 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4a)	Al I
$\mathbf{B_5}$	=	$x_2\,\mathbf{a}_1 + y_2\,\mathbf{a}_2 + z_2\,\mathbf{a}_3$	=	$ax_2\,\hat{\mathbf{x}} + by_2\,\hat{\mathbf{y}} + cz_2\,\hat{\mathbf{z}}$	(4a)	C I
$\mathbf{B_6}$	=	$-x_2\,\mathbf{a}_1 - y_2\,\mathbf{a}_2 + \left(z_2 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ax_2\,\hat{\mathbf{x}} - by_2\,\hat{\mathbf{y}} + c\left(z_2 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4a)	C I
$\mathbf{B_7}$	=	$\left(x_2 + \frac{1}{2}\right)\,\mathbf{a}_1 - y_2\,\mathbf{a}_2 + z_2\,\mathbf{a}_3$	=	$a\left(x_2 + \frac{1}{2}\right)\,\hat{\mathbf{x}} - by_2\,\hat{\mathbf{y}} + cz_2\,\hat{\mathbf{z}}$	(4a)	C I
$\mathbf{B_8}$	=	$-\left(x_2 - \frac{1}{2}\right)\,\mathbf{a}_1 + y_2\,\mathbf{a}_2 + \left(z_2 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_2 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + by_2\,\hat{\mathbf{y}} + c\left(z_2 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4a)	C I
$\mathbf{B_9}$	=	$x_3\,\mathbf{a}_1 + y_3\,\mathbf{a}_2 + z_3\,\mathbf{a}_3$	=	$ax_3\,\hat{\mathbf{x}} + by_3\,\hat{\mathbf{y}} + cz_3\,\hat{\mathbf{z}}$	(4a)	H I
$\mathbf{B_{10}}$	=	$-x_3\,\mathbf{a}_1 - y_3\,\mathbf{a}_2 + \left(z_3 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}} - by_3\,\hat{\mathbf{y}} + c\left(z_3 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4a)	H I
$\mathbf{B_{11}}$	=	$\left(x_3 + \frac{1}{2}\right)\,\mathbf{a}_1 - y_3\,\mathbf{a}_2 + z_3\,\mathbf{a}_3$	=	$a\left(x_3 + \frac{1}{2}\right)\,\hat{\mathbf{x}} - by_3\,\hat{\mathbf{y}} + cz_3\,\hat{\mathbf{z}}$	(4a)	H I

$$\mathbf{B_{12}} = -\left(x_3 - \tfrac{1}{2}\right)\mathbf{a}_1 + y_3\,\mathbf{a}_2 + \left(z_3 + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_3 - \tfrac{1}{2}\right)\hat{\mathbf{x}} + by_3\,\hat{\mathbf{y}} + c\left(z_3 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H I}$$

$$\mathbf{B_{13}} = x_4\,\mathbf{a}_1 + y_4\,\mathbf{a}_2 + z_4\,\mathbf{a}_3 = ax_4\,\hat{\mathbf{x}} + by_4\,\hat{\mathbf{y}} + cz_4\,\hat{\mathbf{z}} \quad (4a) \quad \text{H II}$$

$$\mathbf{B_{14}} = -x_4\,\mathbf{a}_1 - y_4\,\mathbf{a}_2 + \left(z_4 + \tfrac{1}{2}\right)\mathbf{a}_3 = -ax_4\,\hat{\mathbf{x}} - by_4\,\hat{\mathbf{y}} + c\left(z_4 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H II}$$

$$\mathbf{B_{15}} = \left(x_4 + \tfrac{1}{2}\right)\mathbf{a}_1 - y_4\,\mathbf{a}_2 + z_4\,\mathbf{a}_3 = a\left(x_4 + \tfrac{1}{2}\right)\hat{\mathbf{x}} - by_4\,\hat{\mathbf{y}} + cz_4\,\hat{\mathbf{z}} \quad (4a) \quad \text{H II}$$

$$\mathbf{B_{16}} = -\left(x_4 - \tfrac{1}{2}\right)\mathbf{a}_1 + y_4\,\mathbf{a}_2 + \left(z_4 + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_4 - \tfrac{1}{2}\right)\hat{\mathbf{x}} + by_4\,\hat{\mathbf{y}} + c\left(z_4 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H II}$$

$$\mathbf{B_{17}} = x_5\,\mathbf{a}_1 + y_5\,\mathbf{a}_2 + z_5\,\mathbf{a}_3 = ax_5\,\hat{\mathbf{x}} + by_5\,\hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}} \quad (4a) \quad \text{H III}$$

$$\mathbf{B_{18}} = -x_5\,\mathbf{a}_1 - y_5\,\mathbf{a}_2 + \left(z_5 + \tfrac{1}{2}\right)\mathbf{a}_3 = -ax_5\,\hat{\mathbf{x}} - by_5\,\hat{\mathbf{y}} + c\left(z_5 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H III}$$

$$\mathbf{B_{19}} = \left(x_5 + \tfrac{1}{2}\right)\mathbf{a}_1 - y_5\,\mathbf{a}_2 + z_5\,\mathbf{a}_3 = a\left(x_5 + \tfrac{1}{2}\right)\hat{\mathbf{x}} - by_5\,\hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}} \quad (4a) \quad \text{H III}$$

$$\mathbf{B_{20}} = -\left(x_5 - \tfrac{1}{2}\right)\mathbf{a}_1 + y_5\,\mathbf{a}_2 + \left(z_5 + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_5 - \tfrac{1}{2}\right)\hat{\mathbf{x}} + by_5\,\hat{\mathbf{y}} + c\left(z_5 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H III}$$

$$\mathbf{B_{21}} = x_6\,\mathbf{a}_1 + y_6\,\mathbf{a}_2 + z_6\,\mathbf{a}_3 = ax_6\,\hat{\mathbf{x}} + by_6\,\hat{\mathbf{y}} + cz_6\,\hat{\mathbf{z}} \quad (4a) \quad \text{H IV}$$

$$\mathbf{B_{22}} = -x_6\,\mathbf{a}_1 - y_6\,\mathbf{a}_2 + \left(z_6 + \tfrac{1}{2}\right)\mathbf{a}_3 = -ax_6\,\hat{\mathbf{x}} - by_6\,\hat{\mathbf{y}} + c\left(z_6 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H IV}$$

$$\mathbf{B_{23}} = \left(x_6 + \tfrac{1}{2}\right)\mathbf{a}_1 - y_6\,\mathbf{a}_2 + z_6\,\mathbf{a}_3 = a\left(x_6 + \tfrac{1}{2}\right)\hat{\mathbf{x}} - by_6\,\hat{\mathbf{y}} + cz_6\,\hat{\mathbf{z}} \quad (4a) \quad \text{H IV}$$

$$\mathbf{B_{24}} = -\left(x_6 - \tfrac{1}{2}\right)\mathbf{a}_1 + y_6\,\mathbf{a}_2 + \left(z_6 + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_6 - \tfrac{1}{2}\right)\hat{\mathbf{x}} + by_6\,\hat{\mathbf{y}} + c\left(z_6 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H IV}$$

$$\mathbf{B_{25}} = x_7\,\mathbf{a}_1 + y_7\,\mathbf{a}_2 + z_7\,\mathbf{a}_3 = ax_7\,\hat{\mathbf{x}} + by_7\,\hat{\mathbf{y}} + cz_7\,\hat{\mathbf{z}} \quad (4a) \quad \text{H V}$$

$$\mathbf{B_{26}} = -x_7\,\mathbf{a}_1 - y_7\,\mathbf{a}_2 + \left(z_7 + \tfrac{1}{2}\right)\mathbf{a}_3 = -ax_7\,\hat{\mathbf{x}} - by_7\,\hat{\mathbf{y}} + c\left(z_7 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H V}$$

$$\mathbf{B_{27}} = \left(x_7 + \tfrac{1}{2}\right)\mathbf{a}_1 - y_7\,\mathbf{a}_2 + z_7\,\mathbf{a}_3 = a\left(x_7 + \tfrac{1}{2}\right)\hat{\mathbf{x}} - by_7\,\hat{\mathbf{y}} + cz_7\,\hat{\mathbf{z}} \quad (4a) \quad \text{H V}$$

$$\mathbf{B_{28}} = -\left(x_7 - \tfrac{1}{2}\right)\mathbf{a}_1 + y_7\,\mathbf{a}_2 + \left(z_7 + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_7 - \tfrac{1}{2}\right)\hat{\mathbf{x}} + by_7\,\hat{\mathbf{y}} + c\left(z_7 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H V}$$

$$\mathbf{B_{29}} = x_8\,\mathbf{a}_1 + y_8\,\mathbf{a}_2 + z_8\,\mathbf{a}_3 = ax_8\,\hat{\mathbf{x}} + by_8\,\hat{\mathbf{y}} + cz_8\,\hat{\mathbf{z}} \quad (4a) \quad \text{H VI}$$

$$\mathbf{B_{30}} = -x_8\,\mathbf{a}_1 - y_8\,\mathbf{a}_2 + \left(z_8 + \tfrac{1}{2}\right)\mathbf{a}_3 = -ax_8\,\hat{\mathbf{x}} - by_8\,\hat{\mathbf{y}} + c\left(z_8 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H VI}$$

$$\mathbf{B_{31}} = \left(x_8 + \tfrac{1}{2}\right)\mathbf{a}_1 - y_8\,\mathbf{a}_2 + z_8\,\mathbf{a}_3 = a\left(x_8 + \tfrac{1}{2}\right)\hat{\mathbf{x}} - by_8\,\hat{\mathbf{y}} + cz_8\,\hat{\mathbf{z}} \quad (4a) \quad \text{H VI}$$

$$\mathbf{B_{32}} = -\left(x_8 - \tfrac{1}{2}\right)\mathbf{a}_1 + y_8\,\mathbf{a}_2 + \left(z_8 + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_8 - \tfrac{1}{2}\right)\hat{\mathbf{x}} + by_8\,\hat{\mathbf{y}} + c\left(z_8 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H VI}$$

$$\mathbf{B_{33}} = x_9\,\mathbf{a}_1 + y_9\,\mathbf{a}_2 + z_9\,\mathbf{a}_3 = ax_9\,\hat{\mathbf{x}} + by_9\,\hat{\mathbf{y}} + cz_9\,\hat{\mathbf{z}} \quad (4a) \quad \text{H VII}$$

$$\mathbf{B_{34}} = -x_9\,\mathbf{a}_1 - y_9\,\mathbf{a}_2 + \left(z_9 + \tfrac{1}{2}\right)\mathbf{a}_3 = -ax_9\,\hat{\mathbf{x}} - by_9\,\hat{\mathbf{y}} + c\left(z_9 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H VII}$$

$$\mathbf{B_{35}} = \left(x_9 + \tfrac{1}{2}\right)\mathbf{a}_1 - y_9\,\mathbf{a}_2 + z_9\,\mathbf{a}_3 = a\left(x_9 + \tfrac{1}{2}\right)\hat{\mathbf{x}} - by_9\,\hat{\mathbf{y}} + cz_9\,\hat{\mathbf{z}} \quad (4a) \quad \text{H VII}$$

$$\mathbf{B_{36}} = -\left(x_9 - \tfrac{1}{2}\right)\mathbf{a}_1 + y_9\,\mathbf{a}_2 + \left(z_9 + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_9 - \tfrac{1}{2}\right)\hat{\mathbf{x}} + by_9\,\hat{\mathbf{y}} + c\left(z_9 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H VII}$$

$$\mathbf{B_{37}} = x_{10}\,\mathbf{a}_1 + y_{10}\,\mathbf{a}_2 + z_{10}\,\mathbf{a}_3 = ax_{10}\,\hat{\mathbf{x}} + by_{10}\,\hat{\mathbf{y}} + cz_{10}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H VIII}$$

$$\mathbf{B_{38}} = -x_{10}\,\mathbf{a}_1 - y_{10}\,\mathbf{a}_2 + \left(z_{10} + \tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{10}\,\hat{\mathbf{x}} - by_{10}\,\hat{\mathbf{y}} + c\left(z_{10} + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H VIII}$$

$$\mathbf{B_{39}} = \left(x_{10} + \tfrac{1}{2}\right)\mathbf{a}_1 - y_{10}\,\mathbf{a}_2 + z_{10}\,\mathbf{a}_3 = a\left(x_{10} + \tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{10}\,\hat{\mathbf{y}} + cz_{10}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H VIII}$$

$$\mathbf{B_{40}} = -\left(x_{10} - \tfrac{1}{2}\right)\mathbf{a}_1 + y_{10}\,\mathbf{a}_2 + \left(z_{10} + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{10} - \tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{10}\,\hat{\mathbf{y}} + c\left(z_{10} + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H VIII}$$

$$\mathbf{B_{41}} = x_{11}\,\mathbf{a}_1 + y_{11}\,\mathbf{a}_2 + z_{11}\,\mathbf{a}_3 = ax_{11}\,\hat{\mathbf{x}} + by_{11}\,\hat{\mathbf{y}} + cz_{11}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H IX}$$

$$\mathbf{B_{42}} = -x_{11}\,\mathbf{a}_1 - y_{11}\,\mathbf{a}_2 + \left(z_{11} + \tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{11}\,\hat{\mathbf{x}} - by_{11}\,\hat{\mathbf{y}} + c\left(z_{11} + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H IX}$$

$$\mathbf{B_{43}} = \left(x_{11} + \tfrac{1}{2}\right)\mathbf{a}_1 - y_{11}\,\mathbf{a}_2 + z_{11}\,\mathbf{a}_3 = a\left(x_{11} + \tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{11}\,\hat{\mathbf{y}} + cz_{11}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H IX}$$

$$\mathbf{B_{44}} = -\left(x_{11} - \tfrac{1}{2}\right)\mathbf{a}_1 + y_{11}\,\mathbf{a}_2 + \left(z_{11} + \tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{11} - \tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{11}\,\hat{\mathbf{y}} + c\left(z_{11} + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H IX}$$

$$\mathbf{B_{45}} = x_{12}\,\mathbf{a}_1 + y_{12}\,\mathbf{a}_2 + z_{12}\,\mathbf{a}_3 = ax_{12}\,\hat{\mathbf{x}} + by_{12}\,\hat{\mathbf{y}} + cz_{12}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H X}$$

$$\mathbf{B_{46}} = -x_{12}\,\mathbf{a}_1 - y_{12}\,\mathbf{a}_2 + \left(z_{12}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{12}\,\hat{\mathbf{x}} - by_{12}\,\hat{\mathbf{y}} + c\left(z_{12}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H X}$$

$$\mathbf{B_{47}} = \left(x_{12}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{12}\,\mathbf{a}_2 + z_{12}\,\mathbf{a}_3 = a\left(x_{12}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{12}\,\hat{\mathbf{y}} + cz_{12}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H X}$$

$$\mathbf{B_{48}} = -\left(x_{12}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{12}\,\mathbf{a}_2 + \left(z_{12}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{12}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{12}\,\hat{\mathbf{y}} + c\left(z_{12}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H X}$$

$$\mathbf{B_{49}} = x_{13}\,\mathbf{a}_1 + y_{13}\,\mathbf{a}_2 + z_{13}\,\mathbf{a}_3 = ax_{13}\,\hat{\mathbf{x}} + by_{13}\,\hat{\mathbf{y}} + cz_{13}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XI}$$

$$\mathbf{B_{50}} = -x_{13}\,\mathbf{a}_1 - y_{13}\,\mathbf{a}_2 + \left(z_{13}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{13}\,\hat{\mathbf{x}} - by_{13}\,\hat{\mathbf{y}} + c\left(z_{13}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XI}$$

$$\mathbf{B_{51}} = \left(x_{13}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{13}\,\mathbf{a}_2 + z_{13}\,\mathbf{a}_3 = a\left(x_{13}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{13}\,\hat{\mathbf{y}} + cz_{13}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XI}$$

$$\mathbf{B_{52}} = -\left(x_{13}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{13}\,\mathbf{a}_2 + \left(z_{13}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{13}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{13}\,\hat{\mathbf{y}} + c\left(z_{13}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XI}$$

$$\mathbf{B_{53}} = x_{14}\,\mathbf{a}_1 + y_{14}\,\mathbf{a}_2 + z_{14}\,\mathbf{a}_3 = ax_{14}\,\hat{\mathbf{x}} + by_{14}\,\hat{\mathbf{y}} + cz_{14}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XII}$$

$$\mathbf{B_{54}} = -x_{14}\,\mathbf{a}_1 - y_{14}\,\mathbf{a}_2 + \left(z_{14}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{14}\,\hat{\mathbf{x}} - by_{14}\,\hat{\mathbf{y}} + c\left(z_{14}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XII}$$

$$\mathbf{B_{55}} = \left(x_{14}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{14}\,\mathbf{a}_2 + z_{14}\,\mathbf{a}_3 = a\left(x_{14}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{14}\,\hat{\mathbf{y}} + cz_{14}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XII}$$

$$\mathbf{B_{56}} = -\left(x_{14}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{14}\,\mathbf{a}_2 + \left(z_{14}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{14}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{14}\,\hat{\mathbf{y}} + c\left(z_{14}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XII}$$

$$\mathbf{B_{57}} = x_{15}\,\mathbf{a}_1 + y_{15}\,\mathbf{a}_2 + z_{15}\,\mathbf{a}_3 = ax_{15}\,\hat{\mathbf{x}} + by_{15}\,\hat{\mathbf{y}} + cz_{15}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XIII}$$

$$\mathbf{B_{58}} = -x_{15}\,\mathbf{a}_1 - y_{15}\,\mathbf{a}_2 + \left(z_{15}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{15}\,\hat{\mathbf{x}} - by_{15}\,\hat{\mathbf{y}} + c\left(z_{15}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XIII}$$

$$\mathbf{B_{59}} = \left(x_{15}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{15}\,\mathbf{a}_2 + z_{15}\,\mathbf{a}_3 = a\left(x_{15}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{15}\,\hat{\mathbf{y}} + cz_{15}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XIII}$$

$$\mathbf{B_{60}} = -\left(x_{15}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{15}\,\mathbf{a}_2 + \left(z_{15}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{15}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{15}\,\hat{\mathbf{y}} + c\left(z_{15}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XIII}$$

$$\mathbf{B_{61}} = x_{16}\,\mathbf{a}_1 + y_{16}\,\mathbf{a}_2 + z_{16}\,\mathbf{a}_3 = ax_{16}\,\hat{\mathbf{x}} + by_{16}\,\hat{\mathbf{y}} + cz_{16}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XIV}$$

$$\mathbf{B_{62}} = -x_{16}\,\mathbf{a}_1 - y_{16}\,\mathbf{a}_2 + \left(z_{16}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{16}\,\hat{\mathbf{x}} - by_{16}\,\hat{\mathbf{y}} + c\left(z_{16}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XIV}$$

$$\mathbf{B_{63}} = \left(x_{16}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{16}\,\mathbf{a}_2 + z_{16}\,\mathbf{a}_3 = a\left(x_{16}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{16}\,\hat{\mathbf{y}} + cz_{16}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XIV}$$

$$\mathbf{B_{64}} = -\left(x_{16}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{16}\,\mathbf{a}_2 + \left(z_{16}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{16}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{16}\,\hat{\mathbf{y}} + c\left(z_{16}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XIV}$$

$$\mathbf{B_{65}} = x_{17}\,\mathbf{a}_1 + y_{17}\,\mathbf{a}_2 + z_{17}\,\mathbf{a}_3 = ax_{17}\,\hat{\mathbf{x}} + by_{17}\,\hat{\mathbf{y}} + cz_{17}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XV}$$

$$\mathbf{B_{66}} = -x_{17}\,\mathbf{a}_1 - y_{17}\,\mathbf{a}_2 + \left(z_{17}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{17}\,\hat{\mathbf{x}} - by_{17}\,\hat{\mathbf{y}} + c\left(z_{17}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XV}$$

$$\mathbf{B_{67}} = \left(x_{17}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{17}\,\mathbf{a}_2 + z_{17}\,\mathbf{a}_3 = a\left(x_{17}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{17}\,\hat{\mathbf{y}} + cz_{17}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XV}$$

$$\mathbf{B_{68}} = -\left(x_{17}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{17}\,\mathbf{a}_2 + \left(z_{17}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{17}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{17}\,\hat{\mathbf{y}} + c\left(z_{17}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XV}$$

$$\mathbf{B_{69}} = x_{18}\,\mathbf{a}_1 + y_{18}\,\mathbf{a}_2 + z_{18}\,\mathbf{a}_3 = ax_{18}\,\hat{\mathbf{x}} + by_{18}\,\hat{\mathbf{y}} + cz_{18}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVI}$$

$$\mathbf{B_{70}} = -x_{18}\,\mathbf{a}_1 - y_{18}\,\mathbf{a}_2 + \left(z_{18}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{18}\,\hat{\mathbf{x}} - by_{18}\,\hat{\mathbf{y}} + c\left(z_{18}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVI}$$

$$\mathbf{B_{71}} = \left(x_{18}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{18}\,\mathbf{a}_2 + z_{18}\,\mathbf{a}_3 = a\left(x_{18}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{18}\,\hat{\mathbf{y}} + cz_{18}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVI}$$

$$\mathbf{B_{72}} = -\left(x_{18}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{18}\,\mathbf{a}_2 + \left(z_{18}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{18}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{18}\,\hat{\mathbf{y}} + c\left(z_{18}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVI}$$

$$\mathbf{B_{73}} = x_{19}\,\mathbf{a}_1 + y_{19}\,\mathbf{a}_2 + z_{19}\,\mathbf{a}_3 = ax_{19}\,\hat{\mathbf{x}} + by_{19}\,\hat{\mathbf{y}} + cz_{19}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVII}$$

$$\mathbf{B_{74}} = -x_{19}\,\mathbf{a}_1 - y_{19}\,\mathbf{a}_2 + \left(z_{19}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{19}\,\hat{\mathbf{x}} - by_{19}\,\hat{\mathbf{y}} + c\left(z_{19}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVII}$$

$$\mathbf{B_{75}} = \left(x_{19}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{19}\,\mathbf{a}_2 + z_{19}\,\mathbf{a}_3 = a\left(x_{19}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{19}\,\hat{\mathbf{y}} + cz_{19}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVII}$$

$$\mathbf{B_{76}} = -\left(x_{19}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{19}\,\mathbf{a}_2 + \left(z_{19}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{19}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{19}\,\hat{\mathbf{y}} + c\left(z_{19}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVII}$$

$$\mathbf{B_{77}} = x_{20}\,\mathbf{a}_1 + y_{20}\,\mathbf{a}_2 + z_{20}\,\mathbf{a}_3 = ax_{20}\,\hat{\mathbf{x}} + by_{20}\,\hat{\mathbf{y}} + cz_{20}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVIII}$$

$$\mathbf{B_{78}} = -x_{20}\,\mathbf{a}_1 - y_{20}\,\mathbf{a}_2 + \left(z_{20}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{20}\,\hat{\mathbf{x}} - by_{20}\,\hat{\mathbf{y}} + c\left(z_{20}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVIII}$$

$$\mathbf{B_{79}} = \left(x_{20}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{20}\,\mathbf{a}_2 + z_{20}\,\mathbf{a}_3 = a\left(x_{20}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{20}\,\hat{\mathbf{y}} + cz_{20}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XVIII}$$

$$\mathbf{B_{80}} = -\left(x_{20}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{20}\,\mathbf{a}_2 + \left(z_{20}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{20}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{20}\,\hat{\mathbf{y}} + c\left(z_{20}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XVIII}$$

$$\mathbf{B_{81}} = x_{21}\,\mathbf{a}_1 + y_{21}\,\mathbf{a}_2 + z_{21}\,\mathbf{a}_3 = ax_{21}\,\hat{\mathbf{x}} + by_{21}\,\hat{\mathbf{y}} + cz_{21}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XIX}$$

$$\mathbf{B_{82}} = -x_{21}\,\mathbf{a}_1 - y_{21}\,\mathbf{a}_2 + \left(z_{21}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{21}\,\hat{\mathbf{x}} - by_{21}\,\hat{\mathbf{y}} + c\left(z_{21}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XIX}$$

$$\mathbf{B_{83}} = \left(x_{21}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{21}\,\mathbf{a}_2 + z_{21}\,\mathbf{a}_3 = a\left(x_{21}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{21}\,\hat{\mathbf{y}} + cz_{21}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XIX}$$

$$\mathbf{B_{84}} = -\left(x_{21}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{21}\,\mathbf{a}_2 + \left(z_{21}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{21}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{21}\,\hat{\mathbf{y}} + c\left(z_{21}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XIX}$$

$$\mathbf{B_{85}} = x_{22}\,\mathbf{a}_1 + y_{22}\,\mathbf{a}_2 + z_{22}\,\mathbf{a}_3 = ax_{22}\,\hat{\mathbf{x}} + by_{22}\,\hat{\mathbf{y}} + cz_{22}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XX}$$

$$\mathbf{B_{86}} = -x_{22}\,\mathbf{a}_1 - y_{22}\,\mathbf{a}_2 + \left(z_{22}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{22}\,\hat{\mathbf{x}} - by_{22}\,\hat{\mathbf{y}} + c\left(z_{22}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XX}$$

$$\mathbf{B_{87}} = \left(x_{22}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{22}\,\mathbf{a}_2 + z_{22}\,\mathbf{a}_3 = a\left(x_{22}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{22}\,\hat{\mathbf{y}} + cz_{22}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XX}$$

$$\mathbf{B_{88}} = -\left(x_{22}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{22}\,\mathbf{a}_2 + \left(z_{22}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{22}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{22}\,\hat{\mathbf{y}} + c\left(z_{22}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XX}$$

$$\mathbf{B_{89}} = x_{23}\,\mathbf{a}_1 + y_{23}\,\mathbf{a}_2 + z_{23}\,\mathbf{a}_3 = ax_{23}\,\hat{\mathbf{x}} + by_{23}\,\hat{\mathbf{y}} + cz_{23}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXI}$$

$$\mathbf{B_{90}} = -x_{23}\,\mathbf{a}_1 - y_{23}\,\mathbf{a}_2 + \left(z_{23}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{23}\,\hat{\mathbf{x}} - by_{23}\,\hat{\mathbf{y}} + c\left(z_{23}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXI}$$

$$\mathbf{B_{91}} = \left(x_{23}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{23}\,\mathbf{a}_2 + z_{23}\,\mathbf{a}_3 = a\left(x_{23}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{23}\,\hat{\mathbf{y}} + cz_{23}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXI}$$

$$\mathbf{B_{92}} = -\left(x_{23}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{23}\,\mathbf{a}_2 + \left(z_{23}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{23}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{23}\,\hat{\mathbf{y}} + c\left(z_{23}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXI}$$

$$\mathbf{B_{93}} = x_{24}\,\mathbf{a}_1 + y_{24}\,\mathbf{a}_2 + z_{24}\,\mathbf{a}_3 = ax_{24}\,\hat{\mathbf{x}} + by_{24}\,\hat{\mathbf{y}} + cz_{24}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXII}$$

$$\mathbf{B_{94}} = -x_{24}\,\mathbf{a}_1 - y_{24}\,\mathbf{a}_2 + \left(z_{24}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{24}\,\hat{\mathbf{x}} - by_{24}\,\hat{\mathbf{y}} + c\left(z_{24}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXII}$$

$$\mathbf{B_{95}} = \left(x_{24}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{24}\,\mathbf{a}_2 + z_{24}\,\mathbf{a}_3 = a\left(x_{24}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{24}\,\hat{\mathbf{y}} + cz_{24}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXII}$$

$$\mathbf{B_{96}} = -\left(x_{24}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{24}\,\mathbf{a}_2 + \left(z_{24}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{24}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{24}\,\hat{\mathbf{y}} + c\left(z_{24}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXII}$$

$$\mathbf{B_{97}} = x_{25}\,\mathbf{a}_1 + y_{25}\,\mathbf{a}_2 + z_{25}\,\mathbf{a}_3 = ax_{25}\,\hat{\mathbf{x}} + by_{25}\,\hat{\mathbf{y}} + cz_{25}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIII}$$

$$\mathbf{B_{98}} = -x_{25}\,\mathbf{a}_1 - y_{25}\,\mathbf{a}_2 + \left(z_{25}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{25}\,\hat{\mathbf{x}} - by_{25}\,\hat{\mathbf{y}} + c\left(z_{25}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIII}$$

$$\mathbf{B_{99}} = \left(x_{25}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{25}\,\mathbf{a}_2 + z_{25}\,\mathbf{a}_3 = a\left(x_{25}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{25}\,\hat{\mathbf{y}} + cz_{25}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIII}$$

$$\mathbf{B_{100}} = -\left(x_{25}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{25}\,\mathbf{a}_2 + \left(z_{25}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{25}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{25}\,\hat{\mathbf{y}} + c\left(z_{25}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIII}$$

$$\mathbf{B_{101}} = x_{26}\,\mathbf{a}_1 + y_{26}\,\mathbf{a}_2 + z_{26}\,\mathbf{a}_3 = ax_{26}\,\hat{\mathbf{x}} + by_{26}\,\hat{\mathbf{y}} + cz_{26}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIV}$$

$$\mathbf{B_{102}} = -x_{26}\,\mathbf{a}_1 - y_{26}\,\mathbf{a}_2 + \left(z_{26}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{26}\,\hat{\mathbf{x}} - by_{26}\,\hat{\mathbf{y}} + c\left(z_{26}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIV}$$

$$\mathbf{B_{103}} = \left(x_{26}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{26}\,\mathbf{a}_2 + z_{26}\,\mathbf{a}_3 = a\left(x_{26}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{26}\,\hat{\mathbf{y}} + cz_{26}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIV}$$

$$\mathbf{B_{104}} = -\left(x_{26}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{26}\,\mathbf{a}_2 + \left(z_{26}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{26}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{26}\,\hat{\mathbf{y}} + c\left(z_{26}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIV}$$

$$\mathbf{B_{105}} = x_{27}\,\mathbf{a}_1 + y_{27}\,\mathbf{a}_2 + z_{27}\,\mathbf{a}_3 = ax_{27}\,\hat{\mathbf{x}} + by_{27}\,\hat{\mathbf{y}} + cz_{27}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXV}$$

$$\mathbf{B_{106}} = -x_{27}\,\mathbf{a}_1 - y_{27}\,\mathbf{a}_2 + \left(z_{27}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{27}\,\hat{\mathbf{x}} - by_{27}\,\hat{\mathbf{y}} + c\left(z_{27}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXV}$$

$$\mathbf{B_{107}} = \left(x_{27}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{27}\,\mathbf{a}_2 + z_{27}\,\mathbf{a}_3 = a\left(x_{27}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{27}\,\hat{\mathbf{y}} + cz_{27}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXV}$$

$$\mathbf{B_{108}} = -\left(x_{27}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{27}\,\mathbf{a}_2 + \left(z_{27}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{27}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{27}\,\hat{\mathbf{y}} + c\left(z_{27}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXV}$$

$$\mathbf{B_{109}} = x_{28}\,\mathbf{a}_1 + y_{28}\,\mathbf{a}_2 + z_{28}\,\mathbf{a}_3 = ax_{28}\,\hat{\mathbf{x}} + by_{28}\,\hat{\mathbf{y}} + cz_{28}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVI}$$

$$\mathbf{B_{110}} = -x_{28}\,\mathbf{a}_1 - y_{28}\,\mathbf{a}_2 + \left(z_{28}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{28}\,\hat{\mathbf{x}} - by_{28}\,\hat{\mathbf{y}} + c\left(z_{28}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVI}$$

$$\mathbf{B_{111}} = \left(x_{28}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{28}\,\mathbf{a}_2 + z_{28}\,\mathbf{a}_3 = a\left(x_{28}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{28}\,\hat{\mathbf{y}} + cz_{28}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVI}$$

$$\mathbf{B_{112}} = -\left(x_{28}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{28}\,\mathbf{a}_2 + \left(z_{28}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{28}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{28}\,\hat{\mathbf{y}} + c\left(z_{28}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVI}$$

$$\mathbf{B_{113}} = x_{29}\,\mathbf{a}_1 + y_{29}\,\mathbf{a}_2 + z_{29}\,\mathbf{a}_3 = ax_{29}\,\hat{\mathbf{x}} + by_{29}\,\hat{\mathbf{y}} + cz_{29}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVII}$$

$$\mathbf{B_{114}} = -x_{29}\,\mathbf{a}_1 - y_{29}\,\mathbf{a}_2 + \left(z_{29}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{29}\,\hat{\mathbf{x}} - by_{29}\,\hat{\mathbf{y}} + c\left(z_{29}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVII}$$

$$\mathbf{B_{115}} = \left(x_{29}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{29}\,\mathbf{a}_2 + z_{29}\,\mathbf{a}_3 = a\left(x_{29}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{29}\,\hat{\mathbf{y}} + cz_{29}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVII}$$

$$\mathbf{B_{116}} = -\left(x_{29}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{29}\,\mathbf{a}_2 + \left(z_{29}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{29}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{29}\,\hat{\mathbf{y}} + c\left(z_{29}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVII}$$

$$\mathbf{B_{117}} = x_{30}\,\mathbf{a}_1 + y_{30}\,\mathbf{a}_2 + z_{30}\,\mathbf{a}_3 = ax_{30}\,\hat{\mathbf{x}} + by_{30}\,\hat{\mathbf{y}} + cz_{30}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVIII}$$

$$\mathbf{B_{118}} = -x_{30}\,\mathbf{a}_1 - y_{30}\,\mathbf{a}_2 + \left(z_{30}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{30}\,\hat{\mathbf{x}} - by_{30}\,\hat{\mathbf{y}} + c\left(z_{30}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVIII}$$

$$\mathbf{B_{119}} = \left(x_{30}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{30}\,\mathbf{a}_2 + z_{30}\,\mathbf{a}_3 = a\left(x_{30}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{30}\,\hat{\mathbf{y}} + cz_{30}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVIII}$$

$$\mathbf{B_{120}} = -\left(x_{30}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{30}\,\mathbf{a}_2 + \left(z_{30}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{30}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{30}\,\hat{\mathbf{y}} + c\left(z_{30}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXVIII}$$

$$\mathbf{B_{121}} = x_{31}\,\mathbf{a}_1 + y_{31}\,\mathbf{a}_2 + z_{31}\,\mathbf{a}_3 = ax_{31}\,\hat{\mathbf{x}} + by_{31}\,\hat{\mathbf{y}} + cz_{31}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIX}$$

$$\mathbf{B_{122}} = -x_{31}\,\mathbf{a}_1 - y_{31}\,\mathbf{a}_2 + \left(z_{31}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{31}\,\hat{\mathbf{x}} - by_{31}\,\hat{\mathbf{y}} + c\left(z_{31}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIX}$$

$$\mathbf{B_{123}} = \left(x_{31}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{31}\,\mathbf{a}_2 + z_{31}\,\mathbf{a}_3 = a\left(x_{31}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{31}\,\hat{\mathbf{y}} + cz_{31}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIX}$$

$$\mathbf{B_{124}} = -\left(x_{31}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{31}\,\mathbf{a}_2 + \left(z_{31}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{31}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{31}\,\hat{\mathbf{y}} + c\left(z_{31}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXIX}$$

$$\mathbf{B_{125}} = x_{32}\,\mathbf{a}_1 + y_{32}\,\mathbf{a}_2 + z_{32}\,\mathbf{a}_3 = ax_{32}\,\hat{\mathbf{x}} + by_{32}\,\hat{\mathbf{y}} + cz_{32}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXX}$$

$$\mathbf{B_{126}} = -x_{32}\,\mathbf{a}_1 - y_{32}\,\mathbf{a}_2 + \left(z_{32}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{32}\,\hat{\mathbf{x}} - by_{32}\,\hat{\mathbf{y}} + c\left(z_{32}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXX}$$

$$\mathbf{B_{127}} = \left(x_{32}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{32}\,\mathbf{a}_2 + z_{32}\,\mathbf{a}_3 = a\left(x_{32}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{32}\,\hat{\mathbf{y}} + cz_{32}\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXX}$$

$$\mathbf{B_{128}} = -\left(x_{32}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{32}\,\mathbf{a}_2 + \left(z_{32}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{32}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{32}\,\hat{\mathbf{y}} + c\left(z_{32}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{H XXX}$$

$$\mathbf{B_{129}} = x_{33}\,\mathbf{a}_1 + y_{33}\,\mathbf{a}_2 + z_{33}\,\mathbf{a}_3 = ax_{33}\,\hat{\mathbf{x}} + by_{33}\,\hat{\mathbf{y}} + cz_{33}\,\hat{\mathbf{z}} \quad (4a) \quad \text{N I}$$

$$\mathbf{B_{130}} = -x_{33}\,\mathbf{a}_1 - y_{33}\,\mathbf{a}_2 + \left(z_{33}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{33}\,\hat{\mathbf{x}} - by_{33}\,\hat{\mathbf{y}} + c\left(z_{33}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{N I}$$

$$\mathbf{B_{131}} = \left(x_{33}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{33}\,\mathbf{a}_2 + z_{33}\,\mathbf{a}_3 = a\left(x_{33}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{33}\,\hat{\mathbf{y}} + cz_{33}\,\hat{\mathbf{z}} \quad (4a) \quad \text{N I}$$

$$\mathbf{B_{132}} = -\left(x_{33}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{33}\,\mathbf{a}_2 + \left(z_{33}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{33}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{33}\,\hat{\mathbf{y}} + c\left(z_{33}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{N I}$$

$$\mathbf{B_{133}} = x_{34}\,\mathbf{a}_1 + y_{34}\,\mathbf{a}_2 + z_{34}\,\mathbf{a}_3 = ax_{34}\,\hat{\mathbf{x}} + by_{34}\,\hat{\mathbf{y}} + cz_{34}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O I}$$

$$\mathbf{B_{134}} = -x_{34}\,\mathbf{a}_1 - y_{34}\,\mathbf{a}_2 + \left(z_{34}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{34}\,\hat{\mathbf{x}} - by_{34}\,\hat{\mathbf{y}} + c\left(z_{34}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O I}$$

$$\mathbf{B_{135}} = \left(x_{34}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{34}\,\mathbf{a}_2 + z_{34}\,\mathbf{a}_3 = a\left(x_{34}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{34}\,\hat{\mathbf{y}} + cz_{34}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O I}$$

$$\mathbf{B_{136}} = -\left(x_{34}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{34}\,\mathbf{a}_2 + \left(z_{34}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{34}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{34}\,\hat{\mathbf{y}} + c\left(z_{34}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O I}$$

$$\mathbf{B_{137}} = x_{35}\,\mathbf{a}_1 + y_{35}\,\mathbf{a}_2 + z_{35}\,\mathbf{a}_3 = ax_{35}\,\hat{\mathbf{x}} + by_{35}\,\hat{\mathbf{y}} + cz_{35}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O II}$$

$$\mathbf{B_{138}} = -x_{35}\,\mathbf{a}_1 - y_{35}\,\mathbf{a}_2 + \left(z_{35}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{35}\,\hat{\mathbf{x}} - by_{35}\,\hat{\mathbf{y}} + c\left(z_{35}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O II}$$

$$\mathbf{B_{139}} = \left(x_{35}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{35}\,\mathbf{a}_2 + z_{35}\,\mathbf{a}_3 = a\left(x_{35}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{35}\,\hat{\mathbf{y}} + cz_{35}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O II}$$

$$\mathbf{B_{140}} = -\left(x_{35}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{35}\,\mathbf{a}_2 + \left(z_{35}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{35}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{35}\,\hat{\mathbf{y}} + c\left(z_{35}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O II}$$

$$\mathbf{B_{141}} = x_{36}\,\mathbf{a}_1 + y_{36}\,\mathbf{a}_2 + z_{36}\,\mathbf{a}_3 = ax_{36}\,\hat{\mathbf{x}} + by_{36}\,\hat{\mathbf{y}} + cz_{36}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O III}$$

$$\mathbf{B_{142}} = -x_{36}\,\mathbf{a}_1 - y_{36}\,\mathbf{a}_2 + \left(z_{36}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{36}\,\hat{\mathbf{x}} - by_{36}\,\hat{\mathbf{y}} + c\left(z_{36}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O III}$$

$$\mathbf{B_{143}} = \left(x_{36}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{36}\,\mathbf{a}_2 + z_{36}\,\mathbf{a}_3 = a\left(x_{36}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{36}\,\hat{\mathbf{y}} + cz_{36}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O III}$$

$$\mathbf{B_{144}} = -\left(x_{36}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{36}\,\mathbf{a}_2 + \left(z_{36}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{36}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{36}\,\hat{\mathbf{y}} + c\left(z_{36}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O III}$$

$$\mathbf{B_{145}} = x_{37}\,\mathbf{a}_1 + y_{37}\,\mathbf{a}_2 + z_{37}\,\mathbf{a}_3 = ax_{37}\,\hat{\mathbf{x}} + by_{37}\,\hat{\mathbf{y}} + cz_{37}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O IV}$$

$$\mathbf{B_{146}} = -x_{37}\,\mathbf{a}_1 - y_{37}\,\mathbf{a}_2 + \left(z_{37}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{37}\,\hat{\mathbf{x}} - by_{37}\,\hat{\mathbf{y}} + c\left(z_{37}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O IV}$$

$$\mathbf{B_{147}} = \left(x_{37}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{37}\,\mathbf{a}_2 + z_{37}\,\mathbf{a}_3 = a\left(x_{37}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{37}\,\hat{\mathbf{y}} + cz_{37}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O IV}$$

$$\mathbf{B_{148}} = -\left(x_{37}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{37}\,\mathbf{a}_2 + \left(z_{37}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{37}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{37}\,\hat{\mathbf{y}} + c\left(z_{37}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O IV}$$

$$\mathbf{B_{149}} = x_{38}\,\mathbf{a}_1 + y_{38}\,\mathbf{a}_2 + z_{38}\,\mathbf{a}_3 = ax_{38}\,\hat{\mathbf{x}} + by_{38}\,\hat{\mathbf{y}} + cz_{38}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O V}$$

$$\mathbf{B_{150}} = -x_{38}\,\mathbf{a}_1 - y_{38}\,\mathbf{a}_2 + \left(z_{38}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{38}\,\hat{\mathbf{x}} - by_{38}\,\hat{\mathbf{y}} + c\left(z_{38}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O V}$$

$$\mathbf{B_{151}} = \left(x_{38}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{38}\,\mathbf{a}_2 + z_{38}\,\mathbf{a}_3 = a\left(x_{38}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{38}\,\hat{\mathbf{y}} + cz_{38}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O V}$$

$$\mathbf{B_{152}} = -\left(x_{38}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{38}\,\mathbf{a}_2 + \left(z_{38}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{38}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{38}\,\hat{\mathbf{y}} + c\left(z_{38}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O V}$$

$$\mathbf{B_{153}} = x_{39}\,\mathbf{a}_1 + y_{39}\,\mathbf{a}_2 + z_{39}\,\mathbf{a}_3 = ax_{39}\,\hat{\mathbf{x}} + by_{39}\,\hat{\mathbf{y}} + cz_{39}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O VI}$$

$$\mathbf{B_{154}} = -x_{39}\,\mathbf{a}_1 - y_{39}\,\mathbf{a}_2 + \left(z_{39}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{39}\,\hat{\mathbf{x}} - by_{39}\,\hat{\mathbf{y}} + c\left(z_{39}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O VI}$$

$$\mathbf{B_{155}} = \left(x_{39}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{39}\,\mathbf{a}_2 + z_{39}\,\mathbf{a}_3 = a\left(x_{39}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{39}\,\hat{\mathbf{y}} + cz_{39}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O VI}$$

$$\mathbf{B_{156}} = -\left(x_{39}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{39}\,\mathbf{a}_2 + \left(z_{39}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{39}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{39}\,\hat{\mathbf{y}} + c\left(z_{39}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O VI}$$

$$\mathbf{B_{157}} = x_{40}\,\mathbf{a}_1 + y_{40}\,\mathbf{a}_2 + z_{40}\,\mathbf{a}_3 = ax_{40}\,\hat{\mathbf{x}} + by_{40}\,\hat{\mathbf{y}} + cz_{40}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O VII}$$

$$\mathbf{B_{158}} = -x_{40}\,\mathbf{a}_1 - y_{40}\,\mathbf{a}_2 + \left(z_{40}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{40}\,\hat{\mathbf{x}} - by_{40}\,\hat{\mathbf{y}} + c\left(z_{40}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O VII}$$

$$\mathbf{B_{159}} = \left(x_{40}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{40}\,\mathbf{a}_2 + z_{40}\,\mathbf{a}_3 = a\left(x_{40}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{40}\,\hat{\mathbf{y}} + cz_{40}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O VII}$$

$$\mathbf{B_{160}} = -\left(x_{40}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{40}\,\mathbf{a}_2 + \left(z_{40}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{40}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{40}\,\hat{\mathbf{y}} + c\left(z_{40}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O VII}$$

$$\mathbf{B_{161}} = x_{41}\,\mathbf{a}_1 + y_{41}\,\mathbf{a}_2 + z_{41}\,\mathbf{a}_3 = ax_{41}\,\hat{\mathbf{x}} + by_{41}\,\hat{\mathbf{y}} + cz_{41}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O VIII}$$

$$\mathbf{B_{162}} = -x_{41}\,\mathbf{a}_1 - y_{41}\,\mathbf{a}_2 + \left(z_{41}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{41}\,\hat{\mathbf{x}} - by_{41}\,\hat{\mathbf{y}} + c\left(z_{41}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O VIII}$$

$$\mathbf{B_{163}} = \left(x_{41}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{41}\,\mathbf{a}_2 + z_{41}\,\mathbf{a}_3 = a\left(x_{41}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{41}\,\hat{\mathbf{y}} + cz_{41}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O VIII}$$

$$\mathbf{B_{164}} = -\left(x_{41}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{41}\,\mathbf{a}_2 + \left(z_{41}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{41}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{41}\,\hat{\mathbf{y}} + c\left(z_{41}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O VIII}$$

$$\mathbf{B_{165}} = x_{42}\,\mathbf{a}_1 + y_{42}\,\mathbf{a}_2 + z_{42}\,\mathbf{a}_3 = ax_{42}\,\hat{\mathbf{x}} + by_{42}\,\hat{\mathbf{y}} + cz_{42}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O IX}$$

$$\mathbf{B_{166}} = -x_{42}\,\mathbf{a}_1 - y_{42}\,\mathbf{a}_2 + \left(z_{42}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{42}\,\hat{\mathbf{x}} - by_{42}\,\hat{\mathbf{y}} + c\left(z_{42}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O IX}$$

$$\mathbf{B_{167}} = \left(x_{42}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{42}\,\mathbf{a}_2 + z_{42}\,\mathbf{a}_3 = a\left(x_{42}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{42}\,\hat{\mathbf{y}} + cz_{42}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O IX}$$

$$\mathbf{B_{168}} = -\left(x_{42}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{42}\,\mathbf{a}_2 + \left(z_{42}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{42}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{42}\,\hat{\mathbf{y}} + c\left(z_{42}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O IX}$$

$$\mathbf{B_{169}} = x_{43}\,\mathbf{a}_1 + y_{43}\,\mathbf{a}_2 + z_{43}\,\mathbf{a}_3 = ax_{43}\,\hat{\mathbf{x}} + by_{43}\,\hat{\mathbf{y}} + cz_{43}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O X}$$

$$\mathbf{B_{170}} = -x_{43}\,\mathbf{a}_1 - y_{43}\,\mathbf{a}_2 + \left(z_{43}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{43}\,\hat{\mathbf{x}} - by_{43}\,\hat{\mathbf{y}} + c\left(z_{43}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O X}$$

$$\mathbf{B_{171}} = \left(x_{43}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{43}\,\mathbf{a}_2 + z_{43}\,\mathbf{a}_3 = a\left(x_{43}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{43}\,\hat{\mathbf{y}} + cz_{43}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O X}$$

$$\mathbf{B_{172}} = -\left(x_{43}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{43}\,\mathbf{a}_2 + \left(z_{43}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{43}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{43}\,\hat{\mathbf{y}} + c\left(z_{43}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O X}$$

$$\mathbf{B_{173}} = x_{44}\,\mathbf{a}_1 + y_{44}\,\mathbf{a}_2 + z_{44}\,\mathbf{a}_3 = ax_{44}\,\hat{\mathbf{x}} + by_{44}\,\hat{\mathbf{y}} + cz_{44}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XI}$$

$$\mathbf{B_{174}} = -x_{44}\,\mathbf{a}_1 - y_{44}\,\mathbf{a}_2 + \left(z_{44}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{44}\,\hat{\mathbf{x}} - by_{44}\,\hat{\mathbf{y}} + c\left(z_{44}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O XI}$$

$$\mathbf{B_{175}} = \left(x_{44}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{44}\,\mathbf{a}_2 + z_{44}\,\mathbf{a}_3 = a\left(x_{44}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{44}\,\hat{\mathbf{y}} + cz_{44}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XI}$$

$$\mathbf{B_{176}} = -\left(x_{44}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{44}\,\mathbf{a}_2 + \left(z_{44}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{44}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{44}\,\hat{\mathbf{y}} + c\left(z_{44}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O XI}$$

$$\mathbf{B_{177}} = x_{45}\,\mathbf{a}_1 + y_{45}\,\mathbf{a}_2 + z_{45}\,\mathbf{a}_3 = ax_{45}\,\hat{\mathbf{x}} + by_{45}\,\hat{\mathbf{y}} + cz_{45}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XII}$$

$$\mathbf{B_{178}} = -x_{45}\,\mathbf{a}_1 - y_{45}\,\mathbf{a}_2 + \left(z_{45}+\tfrac{1}{2}\right)\mathbf{a}_3 = -ax_{45}\,\hat{\mathbf{x}} - by_{45}\,\hat{\mathbf{y}} + c\left(z_{45}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O XII}$$

$$\mathbf{B_{179}} = \left(x_{45}+\tfrac{1}{2}\right)\mathbf{a}_1 - y_{45}\,\mathbf{a}_2 + z_{45}\,\mathbf{a}_3 = a\left(x_{45}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{45}\,\hat{\mathbf{y}} + cz_{45}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XII}$$

$$\mathbf{B_{180}} = -\left(x_{45}-\tfrac{1}{2}\right)\mathbf{a}_1 + y_{45}\,\mathbf{a}_2 + \left(z_{45}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{45}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{45}\,\hat{\mathbf{y}} + c\left(z_{45}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (4a) \quad \text{O XII}$$

$$\mathbf{B_{181}} = x_{46}\,\mathbf{a}_1 + y_{46}\,\mathbf{a}_2 + z_{46}\,\mathbf{a}_3 = ax_{46}\,\hat{\mathbf{x}} + by_{46}\,\hat{\mathbf{y}} + cz_{46}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIII}$$

$$\mathbf{B_{182}} = -x_{46}\,\mathbf{a}_1 - y_{46}\,\mathbf{a}_2 + \left(z_{46}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{46}\,\hat{\mathbf{x}} - by_{46}\,\hat{\mathbf{y}} + c\left(z_{46}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIII}$$

$$\mathbf{B_{183}} = \left(x_{46}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{46}\,\mathbf{a}_2 + z_{46}\,\mathbf{a}_3 = a\left(x_{46}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{46}\,\hat{\mathbf{y}} + cz_{46}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIII}$$

$$\mathbf{B_{184}} = -\left(x_{46}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{46}\,\mathbf{a}_2 + \left(z_{46}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{46}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{46}\,\hat{\mathbf{y}} + c\left(z_{46}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIII}$$

$$\mathbf{B_{185}} = x_{47}\,\mathbf{a}_1 + y_{47}\,\mathbf{a}_2 + z_{47}\,\mathbf{a}_3 = ax_{47}\,\hat{\mathbf{x}} + by_{47}\,\hat{\mathbf{y}} + cz_{47}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIV}$$

$$\mathbf{B_{186}} = -x_{47}\,\mathbf{a}_1 - y_{47}\,\mathbf{a}_2 + \left(z_{47}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{47}\,\hat{\mathbf{x}} - by_{47}\,\hat{\mathbf{y}} + c\left(z_{47}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIV}$$

$$\mathbf{B_{187}} = \left(x_{47}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{47}\,\mathbf{a}_2 + z_{47}\,\mathbf{a}_3 = a\left(x_{47}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{47}\,\hat{\mathbf{y}} + cz_{47}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIV}$$

$$\mathbf{B_{188}} = -\left(x_{47}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{47}\,\mathbf{a}_2 + \left(z_{47}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{47}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{47}\,\hat{\mathbf{y}} + c\left(z_{47}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIV}$$

$$\mathbf{B_{189}} = x_{48}\,\mathbf{a}_1 + y_{48}\,\mathbf{a}_2 + z_{48}\,\mathbf{a}_3 = ax_{48}\,\hat{\mathbf{x}} + by_{48}\,\hat{\mathbf{y}} + cz_{48}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XV}$$

$$\mathbf{B_{190}} = -x_{48}\,\mathbf{a}_1 - y_{48}\,\mathbf{a}_2 + \left(z_{48}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{48}\,\hat{\mathbf{x}} - by_{48}\,\hat{\mathbf{y}} + c\left(z_{48}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XV}$$

$$\mathbf{B_{191}} = \left(x_{48}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{48}\,\mathbf{a}_2 + z_{48}\,\mathbf{a}_3 = a\left(x_{48}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{48}\,\hat{\mathbf{y}} + cz_{48}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XV}$$

$$\mathbf{B_{192}} = -\left(x_{48}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{48}\,\mathbf{a}_2 + \left(z_{48}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{48}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{48}\,\hat{\mathbf{y}} + c\left(z_{48}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XV}$$

$$\mathbf{B_{193}} = x_{49}\,\mathbf{a}_1 + y_{49}\,\mathbf{a}_2 + z_{49}\,\mathbf{a}_3 = ax_{49}\,\hat{\mathbf{x}} + by_{49}\,\hat{\mathbf{y}} + cz_{49}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVI}$$

$$\mathbf{B_{194}} = -x_{49}\,\mathbf{a}_1 - y_{49}\,\mathbf{a}_2 + \left(z_{49}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{49}\,\hat{\mathbf{x}} - by_{49}\,\hat{\mathbf{y}} + c\left(z_{49}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVI}$$

$$\mathbf{B_{195}} = \left(x_{49}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{49}\,\mathbf{a}_2 + z_{49}\,\mathbf{a}_3 = a\left(x_{49}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{49}\,\hat{\mathbf{y}} + cz_{49}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVI}$$

$$\mathbf{B_{196}} = -\left(x_{49}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{49}\,\mathbf{a}_2 + \left(z_{49}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{49}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{49}\,\hat{\mathbf{y}} + c\left(z_{49}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVI}$$

$$\mathbf{B_{197}} = x_{50}\,\mathbf{a}_1 + y_{50}\,\mathbf{a}_2 + z_{50}\,\mathbf{a}_3 = ax_{50}\,\hat{\mathbf{x}} + by_{50}\,\hat{\mathbf{y}} + cz_{50}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVII}$$

$$\mathbf{B_{198}} = -x_{50}\,\mathbf{a}_1 - y_{50}\,\mathbf{a}_2 + \left(z_{50}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{50}\,\hat{\mathbf{x}} - by_{50}\,\hat{\mathbf{y}} + c\left(z_{50}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVII}$$

$$\mathbf{B_{199}} = \left(x_{50}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{50}\,\mathbf{a}_2 + z_{50}\,\mathbf{a}_3 = a\left(x_{50}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{50}\,\hat{\mathbf{y}} + cz_{50}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVII}$$

$$\mathbf{B_{200}} = -\left(x_{50}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{50}\,\mathbf{a}_2 + \left(z_{50}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{50}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{50}\,\hat{\mathbf{y}} + c\left(z_{50}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVII}$$

$$\mathbf{B_{201}} = x_{51}\,\mathbf{a}_1 + y_{51}\,\mathbf{a}_2 + z_{51}\,\mathbf{a}_3 = ax_{51}\,\hat{\mathbf{x}} + by_{51}\,\hat{\mathbf{y}} + cz_{51}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVIII}$$

$$\mathbf{B_{202}} = -x_{51}\,\mathbf{a}_1 - y_{51}\,\mathbf{a}_2 + \left(z_{51}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{51}\,\hat{\mathbf{x}} - by_{51}\,\hat{\mathbf{y}} + c\left(z_{51}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVIII}$$

$$\mathbf{B_{203}} = \left(x_{51}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{51}\,\mathbf{a}_2 + z_{51}\,\mathbf{a}_3 = a\left(x_{51}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{51}\,\hat{\mathbf{y}} + cz_{51}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVIII}$$

$$\mathbf{B_{204}} = -\left(x_{51}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{51}\,\mathbf{a}_2 + \left(z_{51}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{51}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{51}\,\hat{\mathbf{y}} + c\left(z_{51}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XVIII}$$

$$\mathbf{B_{205}} = x_{52}\,\mathbf{a}_1 + y_{52}\,\mathbf{a}_2 + z_{52}\,\mathbf{a}_3 = ax_{52}\,\hat{\mathbf{x}} + by_{52}\,\hat{\mathbf{y}} + cz_{52}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIX}$$

$$\mathbf{B_{206}} = -x_{52}\,\mathbf{a}_1 - y_{52}\,\mathbf{a}_2 + \left(z_{52}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{52}\,\hat{\mathbf{x}} - by_{52}\,\hat{\mathbf{y}} + c\left(z_{52}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIX}$$

$$\mathbf{B_{207}} = \left(x_{52}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{52}\,\mathbf{a}_2 + z_{52}\,\mathbf{a}_3 = a\left(x_{52}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{52}\,\hat{\mathbf{y}} + cz_{52}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIX}$$

$$\mathbf{B_{208}} = -\left(x_{52}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{52}\,\mathbf{a}_2 + \left(z_{52}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{52}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{52}\,\hat{\mathbf{y}} + c\left(z_{52}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XIX}$$

$$\mathbf{B_{209}} = x_{53}\,\mathbf{a}_1 + y_{53}\,\mathbf{a}_2 + z_{53}\,\mathbf{a}_3 = ax_{53}\,\hat{\mathbf{x}} + by_{53}\,\hat{\mathbf{y}} + cz_{53}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XX}$$

$$\mathbf{B_{210}} = -x_{53}\,\mathbf{a}_1 - y_{53}\,\mathbf{a}_2 + \left(z_{53}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{53}\,\hat{\mathbf{x}} - by_{53}\,\hat{\mathbf{y}} + c\left(z_{53}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XX}$$

$$\mathbf{B_{211}} = \left(x_{53}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{53}\,\mathbf{a}_2 + z_{53}\,\mathbf{a}_3 = a\left(x_{53}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{53}\,\hat{\mathbf{y}} + cz_{53}\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XX}$$

$$\mathbf{B_{212}} = -\left(x_{53}-\tfrac{1}{2}\right)\,\mathbf{a}_1 + y_{53}\,\mathbf{a}_2 + \left(z_{53}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -a\left(x_{53}-\tfrac{1}{2}\right)\,\hat{\mathbf{x}} + by_{53}\,\hat{\mathbf{y}} + c\left(z_{53}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{O XX}$$

$$\mathbf{B_{213}} = x_{54}\,\mathbf{a}_1 + y_{54}\,\mathbf{a}_2 + z_{54}\,\mathbf{a}_3 = ax_{54}\,\hat{\mathbf{x}} + by_{54}\,\hat{\mathbf{y}} + cz_{54}\,\hat{\mathbf{z}} \quad (4a) \quad \text{S I}$$

$$\mathbf{B_{214}} = -x_{54}\,\mathbf{a}_1 - y_{54}\,\mathbf{a}_2 + \left(z_{54}+\tfrac{1}{2}\right)\,\mathbf{a}_3 = -ax_{54}\,\hat{\mathbf{x}} - by_{54}\,\hat{\mathbf{y}} + c\left(z_{54}+\tfrac{1}{2}\right)\,\hat{\mathbf{z}} \quad (4a) \quad \text{S I}$$

$$\mathbf{B_{215}} = \left(x_{54}+\tfrac{1}{2}\right)\,\mathbf{a}_1 - y_{54}\,\mathbf{a}_2 + z_{54}\,\mathbf{a}_3 = a\left(x_{54}+\tfrac{1}{2}\right)\,\hat{\mathbf{x}} - by_{54}\,\hat{\mathbf{y}} + cz_{54}\,\hat{\mathbf{z}} \quad (4a) \quad \text{S I}$$

$\mathbf{B_{216}} =$	$-\left(x_{54}-\frac{1}{2}\right)\,\mathbf{a}_1 + y_{54}\,\mathbf{a}_2 + \left(z_{54}+\frac{1}{2}\right)\,\mathbf{a}_3$	$=$	$-a\left(x_{54}-\frac{1}{2}\right)\,\hat{\mathbf{x}} + by_{54}\,\hat{\mathbf{y}} + c\left(z_{54}+\frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4a)	S I
$\mathbf{B_{217}} =$	$x_{55}\,\mathbf{a}_1 + y_{55}\,\mathbf{a}_2 + z_{55}\,\mathbf{a}_3$	$=$	$ax_{55}\,\hat{\mathbf{x}} + by_{55}\,\hat{\mathbf{y}} + cz_{55}\,\hat{\mathbf{z}}$	(4a)	S II
$\mathbf{B_{218}} =$	$-x_{55}\,\mathbf{a}_1 - y_{55}\,\mathbf{a}_2 + \left(z_{55}+\frac{1}{2}\right)\,\mathbf{a}_3$	$=$	$-ax_{55}\,\hat{\mathbf{x}} - by_{55}\,\hat{\mathbf{y}} + c\left(z_{55}+\frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4a)	S II
$\mathbf{B_{219}} =$	$\left(x_{55}+\frac{1}{2}\right)\,\mathbf{a}_1 - y_{55}\,\mathbf{a}_2 + z_{55}\,\mathbf{a}_3$	$=$	$a\left(x_{55}+\frac{1}{2}\right)\,\hat{\mathbf{x}} - by_{55}\,\hat{\mathbf{y}} + cz_{55}\,\hat{\mathbf{z}}$	(4a)	S II
$\mathbf{B_{220}} =$	$-\left(x_{55}-\frac{1}{2}\right)\,\mathbf{a}_1 + y_{55}\,\mathbf{a}_2 + \left(z_{55}+\frac{1}{2}\right)\,\mathbf{a}_3$	$=$	$-a\left(x_{55}-\frac{1}{2}\right)\,\hat{\mathbf{x}} + by_{55}\,\hat{\mathbf{y}} + c\left(z_{55}+\frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4a)	S II

References

[1] R. O. W. Fletcher and H. Steeple, *The crystal structure of the low-temperature phase of methylammonium alum*, Acta Cryst. **24**, 1287–1289 (1968), doi:10.1107/S0365110X64000706.

[2] H. Lipson, *Existence of Three Alum Structures*, Nature **135**, 912 (1935), doi:10.1038/135912b0.

[3] H. Lipson, *The Relation between the Alum Structures*, Proc. Roy. Soc. London **151**, 347–356 (1935), doi:10.1098/rspa.1935.0154.

[4] A. H. C. Ledsham and H. Steeple, *The crystal structure of sodium chromium alum and caesium chromium alum*, Acta Crystallogr. Sect. B **24**, 1287–1289 (1968), doi:10.1107/S0567740868004188.

[5] C. Gottfried and F. Schossberger, eds., *Strukturbericht Band III 1933-1935* (Akademische Verlagsgesellschaft M. B. H., Leipzig, 1937).