Autunite $Ca[(UO_2)(PO_4)]_2(H_2O)_{11}$ Structure: AB22C23D2E2_oP200_62_c_11d_3c10d_d_d-001

This structure originally had the label `AB22C23D2E2_oP200_62_c_11d_3c10d_d_d`. Calls to that address will be redirected here.

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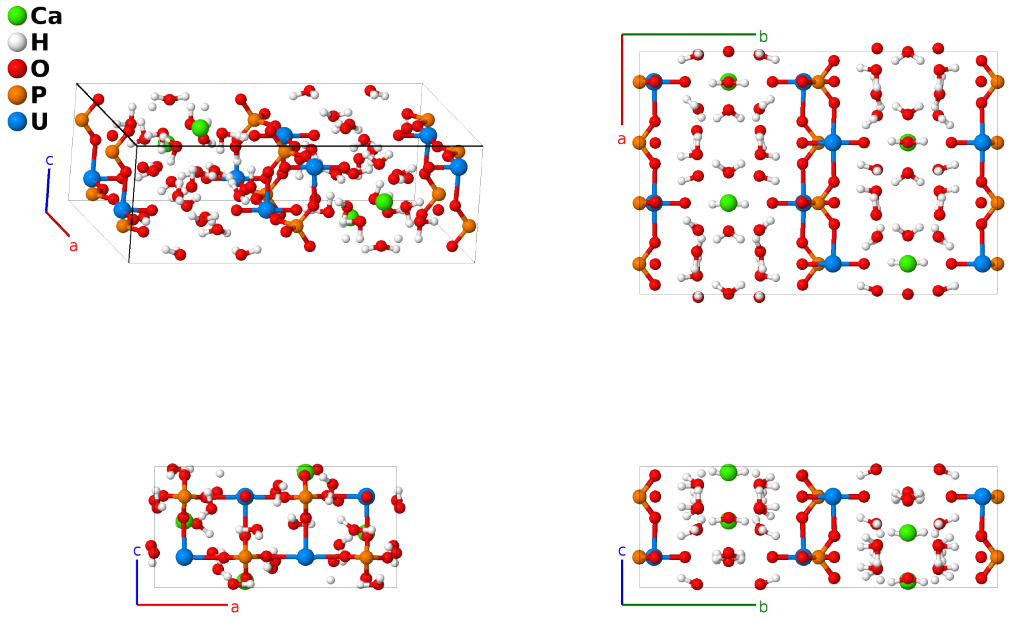
https://aflow.org/p/PYMC

https://aflow.org/p/AB22C23D2E2_oP200_62_c_11d_3c10d_d_d-001



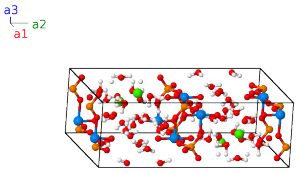
Prototype	$CaH_{22}O_{23}P_2U_2$
AFLOW prototype label	AB22C23D2E2_oP200_62_c_11d_3c10d_d_d-001
Mineral name	autunite
ICSD	96812
Pearson symbol	oP200
Space group number	62
Space group symbol	*Pnma*
AFLOW prototype command	`aflow --proto=AB22C23D2E2_oP200_62_c_11d_3c10d_d_d-001 --params=`$a, b/a, c/a, x_1, z_1, x_2, z_2, x_3, z_3, x_4, z_4, x_5, y_5, z_5, x_6, y_6, z_6, x_7, y_7, z_7, x_8, y_8, z_8, x_9, y_9, z_9, x_{10}, y_{10}, z_{10}, x_{11}, y_{11}, z_{11}, x_{12}, y_{12}, z_{12}, x_{13}, y_{13}, z_{13}, x_{14}, y_{14}, z_{14}, x_{15}, y_{15}, z_{15}, x_{16}, y_{16}, z_{16}, x_{17}, y_{17}, z_{17}, x_{18}, y_{18}, z_{18}, x_{19}, y_{19}, z_{19}, x_{20}, y_{20}, z_{20}, x_{21}, y_{21}, z_{21}, x_{22}, y_{22}, z_{22}, x_{23}, y_{23}, z_{23}, x_{24}, y_{24}, z_{24}, x_{25}, y_{25}, z_{25}, x_{26}, y_{26}, z_{26}, x_{27}, y_{27}, z_{27}$

- Autunite, $Ca(UO_2)_2(PO_4)_2{\cdot}nH_2O$, is found in three varieties:

- Naturally occurring autunite, with $n > 10$, and
- partially dehydrated meta-autunite (I) ($6 \leq n \leq 10$).
- Further dehydration in the laboratory produces meta-autunite (II).
- The original determination of the autunite structure designated $H5_9$ by (Herrmann, 1941) was a tetragonal structure, none of the positions of the oxygen atom or water molecules was determined. (Locock, 2003) find a pseudo-tetragaonal ($a \approx 2c$) unit cell which doubles the size of the original cell. They were able to locate all of the atoms in the structure.
- (Locock, 2003) found the (4c) calcium site to be occupied only 86% of the time.

Simple Orthorhombic primitive vectors

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



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)	Ca 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)	Ca 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)	Ca 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)	Ca 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)	O I
$\mathbf{B_6}$	=	$-\left(x_2 - \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 + \left(z_2 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_2 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} + c\left(z_2 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4c)	O I
$\mathbf{B_7}$	=	$-x_2\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 - z_2\,\mathbf{a}_3$	=	$-ax_2\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} - cz_2\,\hat{\mathbf{z}}$	(4c)	O I
$\mathbf{B_8}$	=	$\left(x_2 + \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 - \left(z_2 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(x_2 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} - c\left(z_2 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4c)	O I
$\mathbf{B_9}$	=	$x_3\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 + z_3\,\mathbf{a}_3$	=	$ax_3\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} + cz_3\,\hat{\mathbf{z}}$	(4c)	O II
$\mathbf{B_{10}}$	=	$-\left(x_3 - \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 + \left(z_3 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_3 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} + c\left(z_3 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4c)	O II
$\mathbf{B_{11}}$	=	$-x_3\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 - z_3\,\mathbf{a}_3$	=	$-ax_3\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} - cz_3\,\hat{\mathbf{z}}$	(4c)	O II
$\mathbf{B_{12}}$	=	$\left(x_3 + \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 - \left(z_3 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(x_3 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} - c\left(z_3 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4c)	O II
$\mathbf{B_{13}}$	=	$x_4\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 + z_4\,\mathbf{a}_3$	=	$ax_4\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} + cz_4\,\hat{\mathbf{z}}$	(4c)	O III
$\mathbf{B_{14}}$	=	$-\left(x_4 - \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 + \left(z_4 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_4 - \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} + c\left(z_4 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4c)	O III
$\mathbf{B_{15}}$	=	$-x_4\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_2 - z_4\,\mathbf{a}_3$	=	$-ax_4\,\hat{\mathbf{x}} + \frac{3}{4}b\,\hat{\mathbf{y}} - cz_4\,\hat{\mathbf{z}}$	(4c)	O III
$\mathbf{B_{16}}$	=	$\left(x_4 + \frac{1}{2}\right)\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_2 - \left(z_4 - \frac{1}{2}\right)\,\mathbf{a}_3$	=	$a\left(x_4 + \frac{1}{2}\right)\,\hat{\mathbf{x}} + \frac{1}{4}b\,\hat{\mathbf{y}} - c\left(z_4 - \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(4c)	O III
$\mathbf{B_{17}}$	=	$x_5\,\mathbf{a}_1 + y_5\,\mathbf{a}_2 + z_5\,\mathbf{a}_3$	=	$ax_5\,\hat{\mathbf{x}} + by_5\,\hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}}$	(8d)	H I
$\mathbf{B_{18}}$	=	$-\left(x_5 - \frac{1}{2}\right)\,\mathbf{a}_1 - y_5\,\mathbf{a}_2 + \left(z_5 + \frac{1}{2}\right)\,\mathbf{a}_3$	=	$-a\left(x_5 - \frac{1}{2}\right)\,\hat{\mathbf{x}} - by_5\,\hat{\mathbf{y}} + c\left(z_5 + \frac{1}{2}\right)\,\hat{\mathbf{z}}$	(8d)	H I
$\mathbf{B_{19}}$	=	$-x_5\,\mathbf{a}_1 + \left(y_5 + \frac{1}{2}\right)\,\mathbf{a}_2 - z_5\,\mathbf{a}_3$	=	$-ax_5\,\hat{\mathbf{x}} + b\left(y_5 + \frac{1}{2}\right)\,\hat{\mathbf{y}} - cz_5\,\hat{\mathbf{z}}$	(8d)	H I

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\begin{array}{lcccccc}
\mathbf{B_{20}} & = & \left(x_5+\frac{1}{2}\right)\mathbf{a}_1-\left(y_5-\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(x_5+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_5-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_5-\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ I}\\
 & & \left(z_5-\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{21}} & = & -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}} & (8\mathrm{d}) & \mathrm{H\ I}\\
\mathbf{B_{22}} & = & \left(x_5+\frac{1}{2}\right)\mathbf{a}_1+y_5\,\mathbf{a}_2-\left(z_5-\frac{1}{2}\right)\mathbf{a}_3 & = & a\left(x_5+\frac{1}{2}\right)\hat{\mathbf{x}}+by_5\,\hat{\mathbf{y}}-c\left(z_5-\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ I}\\
\mathbf{B_{23}} & = & x_5\,\mathbf{a}_1-\left(y_5-\frac{1}{2}\right)\mathbf{a}_2+z_5\,\mathbf{a}_3 & = & ax_5\,\hat{\mathbf{x}}-b\left(y_5-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_5\,\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ I}\\
\mathbf{B_{24}} & = & -\left(x_5-\frac{1}{2}\right)\mathbf{a}_1+\left(y_5+\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(x_5-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_5+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_5+\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ I}\\
 & & \left(z_5+\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{25}} & = & 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}} & (8\mathrm{d}) & \mathrm{H\ II}\\
\mathbf{B_{26}} & = & -\left(x_6-\frac{1}{2}\right)\mathbf{a}_1-y_6\,\mathbf{a}_2+ & = & -a\left(x_6-\frac{1}{2}\right)\hat{\mathbf{x}}-by_6\,\hat{\mathbf{y}}+c\left(z_6+\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ II}\\
 & & \left(z_6+\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{27}} & = & -x_6\,\mathbf{a}_1+\left(y_6+\frac{1}{2}\right)\mathbf{a}_2-z_6\,\mathbf{a}_3 & = & -ax_6\,\hat{\mathbf{x}}+b\left(y_6+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_6\,\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ II}\\
\mathbf{B_{28}} & = & \left(x_6+\frac{1}{2}\right)\mathbf{a}_1-\left(y_6-\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(x_6+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_6-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_6-\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ II}\\
 & & \left(z_6-\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{29}} & = & -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}} & (8\mathrm{d}) & \mathrm{H\ II}\\
\mathbf{B_{30}} & = & \left(x_6+\frac{1}{2}\right)\mathbf{a}_1+y_6\,\mathbf{a}_2-\left(z_6-\frac{1}{2}\right)\mathbf{a}_3 & = & a\left(x_6+\frac{1}{2}\right)\hat{\mathbf{x}}+by_6\,\hat{\mathbf{y}}-c\left(z_6-\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ II}\\
\mathbf{B_{31}} & = & x_6\,\mathbf{a}_1-\left(y_6-\frac{1}{2}\right)\mathbf{a}_2+z_6\,\mathbf{a}_3 & = & ax_6\,\hat{\mathbf{x}}-b\left(y_6-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_6\,\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ II}\\
\mathbf{B_{32}} & = & -\left(x_6-\frac{1}{2}\right)\mathbf{a}_1+\left(y_6+\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(x_6-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_6+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_6+\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ II}\\
 & & \left(z_6+\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{33}} & = & 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}} & (8\mathrm{d}) & \mathrm{H\ III}\\
\mathbf{B_{34}} & = & -\left(x_7-\frac{1}{2}\right)\mathbf{a}_1-y_7\,\mathbf{a}_2+ & = & -a\left(x_7-\frac{1}{2}\right)\hat{\mathbf{x}}-by_7\,\hat{\mathbf{y}}+c\left(z_7+\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ III}\\
 & & \left(z_7+\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{35}} & = & -x_7\,\mathbf{a}_1+\left(y_7+\frac{1}{2}\right)\mathbf{a}_2-z_7\,\mathbf{a}_3 & = & -ax_7\,\hat{\mathbf{x}}+b\left(y_7+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_7\,\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ III}\\
\mathbf{B_{36}} & = & \left(x_7+\frac{1}{2}\right)\mathbf{a}_1-\left(y_7-\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(x_7+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_7-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_7-\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ III}\\
 & & \left(z_7-\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{37}} & = & -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}} & (8\mathrm{d}) & \mathrm{H\ III}\\
\mathbf{B_{38}} & = & \left(x_7+\frac{1}{2}\right)\mathbf{a}_1+y_7\,\mathbf{a}_2-\left(z_7-\frac{1}{2}\right)\mathbf{a}_3 & = & a\left(x_7+\frac{1}{2}\right)\hat{\mathbf{x}}+by_7\,\hat{\mathbf{y}}-c\left(z_7-\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ III}\\
\mathbf{B_{39}} & = & x_7\,\mathbf{a}_1-\left(y_7-\frac{1}{2}\right)\mathbf{a}_2+z_7\,\mathbf{a}_3 & = & ax_7\,\hat{\mathbf{x}}-b\left(y_7-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_7\,\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ III}\\
\mathbf{B_{40}} & = & -\left(x_7-\frac{1}{2}\right)\mathbf{a}_1+\left(y_7+\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(x_7-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_7+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_7+\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ III}\\
 & & \left(z_7+\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{41}} & = & 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}} & (8\mathrm{d}) & \mathrm{H\ IV}\\
\mathbf{B_{42}} & = & -\left(x_8-\frac{1}{2}\right)\mathbf{a}_1-y_8\,\mathbf{a}_2+ & = & -a\left(x_8-\frac{1}{2}\right)\hat{\mathbf{x}}-by_8\,\hat{\mathbf{y}}+c\left(z_8+\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ IV}\\
 & & \left(z_8+\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{43}} & = & -x_8\,\mathbf{a}_1+\left(y_8+\frac{1}{2}\right)\mathbf{a}_2-z_8\,\mathbf{a}_3 & = & -ax_8\,\hat{\mathbf{x}}+b\left(y_8+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_8\,\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ IV}\\
\mathbf{B_{44}} & = & \left(x_8+\frac{1}{2}\right)\mathbf{a}_1-\left(y_8-\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(x_8+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_8-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_8-\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ IV}\\
 & & \left(z_8-\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{45}} & = & -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}} & (8\mathrm{d}) & \mathrm{H\ IV}\\
\mathbf{B_{46}} & = & \left(x_8+\frac{1}{2}\right)\mathbf{a}_1+y_8\,\mathbf{a}_2-\left(z_8-\frac{1}{2}\right)\mathbf{a}_3 & = & a\left(x_8+\frac{1}{2}\right)\hat{\mathbf{x}}+by_8\,\hat{\mathbf{y}}-c\left(z_8-\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ IV}\\
\mathbf{B_{47}} & = & x_8\,\mathbf{a}_1-\left(y_8-\frac{1}{2}\right)\mathbf{a}_2+z_8\,\mathbf{a}_3 & = & ax_8\,\hat{\mathbf{x}}-b\left(y_8-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_8\,\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ IV}\\
\mathbf{B_{48}} & = & -\left(x_8-\frac{1}{2}\right)\mathbf{a}_1+\left(y_8+\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(x_8-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_8+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_8+\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ IV}\\
 & & \left(z_8+\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{49}} & = & 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}} & (8\mathrm{d}) & \mathrm{H\ V}\\
\mathbf{B_{50}} & = & -\left(x_9-\frac{1}{2}\right)\mathbf{a}_1-y_9\,\mathbf{a}_2+ & = & -a\left(x_9-\frac{1}{2}\right)\hat{\mathbf{x}}-by_9\,\hat{\mathbf{y}}+c\left(z_9+\frac{1}{2}\right)\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ V}\\
 & & \left(z_9+\frac{1}{2}\right)\mathbf{a}_3 & & & & \\
\mathbf{B_{51}} & = & -x_9\,\mathbf{a}_1+\left(y_9+\frac{1}{2}\right)\mathbf{a}_2-z_9\,\mathbf{a}_3 & = & -ax_9\,\hat{\mathbf{x}}+b\left(y_9+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_9\,\hat{\mathbf{z}} & (8\mathrm{d}) & \mathrm{H\ V}
\end{array}
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\begin{array}{lcccll}
\mathbf{B_{52}} & = & \left(x_9+\frac{1}{2}\right)\mathbf{a}_1-\left(y_9-\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(x_9+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_9-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_9-\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(8d)} \quad \text{H V} \\
 & & \left(z_9-\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{53}} & = & -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}} & \text{(8d)} \quad \text{H V} \\
\mathbf{B_{54}} & = & \left(x_9+\frac{1}{2}\right)\mathbf{a}_1+y_9\,\mathbf{a}_2-\left(z_9-\frac{1}{2}\right)\mathbf{a}_3 & = & a\left(x_9+\frac{1}{2}\right)\hat{\mathbf{x}}+by_9\,\hat{\mathbf{y}}-c\left(z_9-\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(8d)} \quad \text{H V} \\
\mathbf{B_{55}} & = & x_9\,\mathbf{a}_1-\left(y_9-\frac{1}{2}\right)\mathbf{a}_2+z_9\,\mathbf{a}_3 & = & ax_9\,\hat{\mathbf{x}}-b\left(y_9-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_9\,\hat{\mathbf{z}} & \text{(8d)} \quad \text{H V} \\
\mathbf{B_{56}} & = & -\left(x_9-\frac{1}{2}\right)\mathbf{a}_1+\left(y_9+\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(x_9-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_9+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_9+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(8d)} \quad \text{H V} \\
 & & \left(z_9+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{57}} & = & 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}} & \text{(8d)} \quad \text{H VI} \\
\mathbf{B_{58}} & = & -\left(x_{10}-\frac{1}{2}\right)\mathbf{a}_1-y_{10}\,\mathbf{a}_2+ & = & -a\left(x_{10}-\frac{1}{2}\right)\hat{\mathbf{x}}-by_{10}\,\hat{\mathbf{y}}+c\left(z_{10}+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(8d)} \quad \text{H VI} \\
 & & \left(z_{10}+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{59}} & = & -x_{10}\,\mathbf{a}_1+\left(y_{10}+\frac{1}{2}\right)\mathbf{a}_2-z_{10}\,\mathbf{a}_3 & = & -ax_{10}\,\hat{\mathbf{x}}+b\left(y_{10}+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_{10}\,\hat{\mathbf{z}} & \text{(8d)} \quad \text{H VI} \\
\mathbf{B_{60}} & = & \left(x_{10}+\frac{1}{2}\right)\mathbf{a}_1-\left(y_{10}-\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(x_{10}+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{10}-\frac{1}{2}\right)\hat{\mathbf{y}}- & \text{(8d)} \quad \text{H VI} \\
 & & \left(z_{10}-\frac{1}{2}\right)\mathbf{a}_3 & & c\left(z_{10}-\frac{1}{2}\right)\hat{\mathbf{z}} & \\
\mathbf{B_{61}} & = & -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}} & \text{(8d)} \quad \text{H VI} \\
\mathbf{B_{62}} & = & \left(x_{10}+\frac{1}{2}\right)\mathbf{a}_1+y_{10}\,\mathbf{a}_2- & = & a\left(x_{10}+\frac{1}{2}\right)\hat{\mathbf{x}}+by_{10}\,\hat{\mathbf{y}}-c\left(z_{10}-\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(8d)} \quad \text{H VI} \\
 & & \left(z_{10}-\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{63}} & = & x_{10}\,\mathbf{a}_1-\left(y_{10}-\frac{1}{2}\right)\mathbf{a}_2+z_{10}\,\mathbf{a}_3 & = & ax_{10}\,\hat{\mathbf{x}}-b\left(y_{10}-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_{10}\,\hat{\mathbf{z}} & \text{(8d)} \quad \text{H VI} \\
\mathbf{B_{64}} & = & -\left(x_{10}-\frac{1}{2}\right)\mathbf{a}_1+\left(y_{10}+\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(x_{10}-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{10}+\frac{1}{2}\right)\hat{\mathbf{y}}+ & \text{(8d)} \quad \text{H VI} \\
 & & \left(z_{10}+\frac{1}{2}\right)\mathbf{a}_3 & & c\left(z_{10}+\frac{1}{2}\right)\hat{\mathbf{z}} & \\
\mathbf{B_{65}} & = & 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}} & \text{(8d)} \quad \text{H VII} \\
\mathbf{B_{66}} & = & -\left(x_{11}-\frac{1}{2}\right)\mathbf{a}_1-y_{11}\,\mathbf{a}_2+ & = & -a\left(x_{11}-\frac{1}{2}\right)\hat{\mathbf{x}}-by_{11}\,\hat{\mathbf{y}}+c\left(z_{11}+\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(8d)} \quad \text{H VII} \\
 & & \left(z_{11}+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{67}} & = & -x_{11}\,\mathbf{a}_1+\left(y_{11}+\frac{1}{2}\right)\mathbf{a}_2-z_{11}\,\mathbf{a}_3 & = & -ax_{11}\,\hat{\mathbf{x}}+b\left(y_{11}+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_{11}\,\hat{\mathbf{z}} & \text{(8d)} \quad \text{H VII} \\
\mathbf{B_{68}} & = & \left(x_{11}+\frac{1}{2}\right)\mathbf{a}_1-\left(y_{11}-\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(x_{11}+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{11}-\frac{1}{2}\right)\hat{\mathbf{y}}- & \text{(8d)} \quad \text{H VII} \\
 & & \left(z_{11}-\frac{1}{2}\right)\mathbf{a}_3 & & c\left(z_{11}-\frac{1}{2}\right)\hat{\mathbf{z}} & \\
\mathbf{B_{69}} & = & -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}} & \text{(8d)} \quad \text{H VII} \\
\mathbf{B_{70}} & = & \left(x_{11}+\frac{1}{2}\right)\mathbf{a}_1+y_{11}\,\mathbf{a}_2- & = & a\left(x_{11}+\frac{1}{2}\right)\hat{\mathbf{x}}+by_{11}\,\hat{\mathbf{y}}-c\left(z_{11}-\frac{1}{2}\right)\hat{\mathbf{z}} & \text{(8d)} \quad \text{H VII} \\
 & & \left(z_{11}-\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{71}} & = & x_{11}\,\mathbf{a}_1-\left(y_{11}-\frac{1}{2}\right)\mathbf{a}_2+z_{11}\,\mathbf{a}_3 & = & ax_{11}\,\hat{\mathbf{x}}-b\left(y_{11}-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_{11}\,\hat{\mathbf{z}} & \text{(8d)} \quad \text{H VII} \\
\mathbf{B_{72}} & = & -\left(x_{11}-\frac{1}{2}\right)\mathbf{a}_1+\left(y_{11}+\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(x_{11}-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{11}+\frac{1}{2}\right)\hat{\mathbf{y}}+ & \text{(8d)} \quad \text{H VII} \\
 & & \left(z_{11}+\frac{1}{2}\right)\mathbf{a}_3 & & c\left(z_{11}+\frac{1}{2}\right)\hat{\mathbf{z}} & \\
\mathbf{B_{73}} & = & 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}} & \text{(8d)} \quad \text{H VIII} \\
\mathbf{B_{74}} & = & -\left(x_{12}-\frac{1}{2}\right)\mathbf{a}_1-y_{12}\,\mathbf{a}_2+ & = & -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}} & \text{(8d)} \quad \text{H VIII} \\
 & & \left(z_{12}+\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{75}} & = & -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}} & \text{(8d)} \quad \text{H VIII} \\
\mathbf{B_{76}} & = & \left(x_{12}+\frac{1}{2}\right)\mathbf{a}_1-\left(y_{12}-\frac{1}{2}\right)\mathbf{a}_2- & = & a\left(x_{12}+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{12}-\frac{1}{2}\right)\hat{\mathbf{y}}- & \text{(8d)} \quad \text{H VIII} \\
 & & \left(z_{12}-\frac{1}{2}\right)\mathbf{a}_3 & & c\left(z_{12}-\frac{1}{2}\right)\hat{\mathbf{z}} & \\
\mathbf{B_{77}} & = & -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}} & \text{(8d)} \quad \text{H VIII} \\
\mathbf{B_{78}} & = & \left(x_{12}+\frac{1}{2}\right)\mathbf{a}_1+y_{12}\,\mathbf{a}_2- & = & 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}} & \text{(8d)} \quad \text{H VIII} \\
 & & \left(z_{12}-\frac{1}{2}\right)\mathbf{a}_3 & & & \\
\mathbf{B_{79}} & = & 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}} & \text{(8d)} \quad \text{H VIII} \\
\mathbf{B_{80}} & = & -\left(x_{12}-\frac{1}{2}\right)\mathbf{a}_1+\left(y_{12}+\frac{1}{2}\right)\mathbf{a}_2+ & = & -a\left(x_{12}-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{12}+\frac{1}{2}\right)\hat{\mathbf{y}}+ & \text{(8d)} \quad \text{H VIII} \\
 & & \left(z_{12}+\frac{1}{2}\right)\mathbf{a}_3 & & c\left(z_{12}+\frac{1}{2}\right)\hat{\mathbf{z}} & \\
\mathbf{B_{81}} & = & 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}} & \text{(8d)} \quad \text{H IX}
\end{array}
$$

$\mathbf{B_{82}}$	$= -\left(x_{13}-\frac{1}{2}\right)\mathbf{a}_1 - y_{13}\mathbf{a}_2 + \left(z_{13}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{13}-\frac{1}{2}\right)\hat{\mathbf{x}} - by_{13}\hat{\mathbf{y}} + c\left(z_{13}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H IX
$\mathbf{B_{83}}$	$= -x_{13}\mathbf{a}_1 + \left(y_{13}+\frac{1}{2}\right)\mathbf{a}_2 - z_{13}\mathbf{a}_3$	$=$	$-ax_{13}\hat{\mathbf{x}} + b\left(y_{13}+\frac{1}{2}\right)\hat{\mathbf{y}} - cz_{13}\hat{\mathbf{z}}$	(8d)	H IX
$\mathbf{B_{84}}$	$= \left(x_{13}+\frac{1}{2}\right)\mathbf{a}_1 - \left(y_{13}-\frac{1}{2}\right)\mathbf{a}_2 - \left(z_{13}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{13}+\frac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{13}-\frac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{13}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H IX
$\mathbf{B_{85}}$	$= -x_{13}\mathbf{a}_1 - y_{13}\mathbf{a}_2 - z_{13}\mathbf{a}_3$	$=$	$-ax_{13}\hat{\mathbf{x}} - by_{13}\hat{\mathbf{y}} - cz_{13}\hat{\mathbf{z}}$	(8d)	H IX
$\mathbf{B_{86}}$	$= \left(x_{13}+\frac{1}{2}\right)\mathbf{a}_1 + y_{13}\mathbf{a}_2 - \left(z_{13}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{13}+\frac{1}{2}\right)\hat{\mathbf{x}} + by_{13}\hat{\mathbf{y}} - c\left(z_{13}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H IX
$\mathbf{B_{87}}$	$= x_{13}\mathbf{a}_1 - \left(y_{13}-\frac{1}{2}\right)\mathbf{a}_2 + z_{13}\mathbf{a}_3$	$=$	$ax_{13}\hat{\mathbf{x}} - b\left(y_{13}-\frac{1}{2}\right)\hat{\mathbf{y}} + cz_{13}\hat{\mathbf{z}}$	(8d)	H IX
$\mathbf{B_{88}}$	$= -\left(x_{13}-\frac{1}{2}\right)\mathbf{a}_1 + \left(y_{13}+\frac{1}{2}\right)\mathbf{a}_2 + \left(z_{13}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{13}-\frac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{13}+\frac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{13}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H IX
$\mathbf{B_{89}}$	$= x_{14}\mathbf{a}_1 + y_{14}\mathbf{a}_2 + z_{14}\mathbf{a}_3$	$=$	$ax_{14}\hat{\mathbf{x}} + by_{14}\hat{\mathbf{y}} + cz_{14}\hat{\mathbf{z}}$	(8d)	H X
$\mathbf{B_{90}}$	$= -\left(x_{14}-\frac{1}{2}\right)\mathbf{a}_1 - y_{14}\mathbf{a}_2 + \left(z_{14}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{14}-\frac{1}{2}\right)\hat{\mathbf{x}} - by_{14}\hat{\mathbf{y}} + c\left(z_{14}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H X
$\mathbf{B_{91}}$	$= -x_{14}\mathbf{a}_1 + \left(y_{14}+\frac{1}{2}\right)\mathbf{a}_2 - z_{14}\mathbf{a}_3$	$=$	$-ax_{14}\hat{\mathbf{x}} + b\left(y_{14}+\frac{1}{2}\right)\hat{\mathbf{y}} - cz_{14}\hat{\mathbf{z}}$	(8d)	H X
$\mathbf{B_{92}}$	$= \left(x_{14}+\frac{1}{2}\right)\mathbf{a}_1 - \left(y_{14}-\frac{1}{2}\right)\mathbf{a}_2 - \left(z_{14}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{14}+\frac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{14}-\frac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{14}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H X
$\mathbf{B_{93}}$	$= -x_{14}\mathbf{a}_1 - y_{14}\mathbf{a}_2 - z_{14}\mathbf{a}_3$	$=$	$-ax_{14}\hat{\mathbf{x}} - by_{14}\hat{\mathbf{y}} - cz_{14}\hat{\mathbf{z}}$	(8d)	H X
$\mathbf{B_{94}}$	$= \left(x_{14}+\frac{1}{2}\right)\mathbf{a}_1 + y_{14}\mathbf{a}_2 - \left(z_{14}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{14}+\frac{1}{2}\right)\hat{\mathbf{x}} + by_{14}\hat{\mathbf{y}} - c\left(z_{14}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H X
$\mathbf{B_{95}}$	$= x_{14}\mathbf{a}_1 - \left(y_{14}-\frac{1}{2}\right)\mathbf{a}_2 + z_{14}\mathbf{a}_3$	$=$	$ax_{14}\hat{\mathbf{x}} - b\left(y_{14}-\frac{1}{2}\right)\hat{\mathbf{y}} + cz_{14}\hat{\mathbf{z}}$	(8d)	H X
$\mathbf{B_{96}}$	$= -\left(x_{14}-\frac{1}{2}\right)\mathbf{a}_1 + \left(y_{14}+\frac{1}{2}\right)\mathbf{a}_2 + \left(z_{14}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{14}-\frac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{14}+\frac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{14}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H X
$\mathbf{B_{97}}$	$= x_{15}\mathbf{a}_1 + y_{15}\mathbf{a}_2 + z_{15}\mathbf{a}_3$	$=$	$ax_{15}\hat{\mathbf{x}} + by_{15}\hat{\mathbf{y}} + cz_{15}\hat{\mathbf{z}}$	(8d)	H XI
$\mathbf{B_{98}}$	$= -\left(x_{15}-\frac{1}{2}\right)\mathbf{a}_1 - y_{15}\mathbf{a}_2 + \left(z_{15}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{15}-\frac{1}{2}\right)\hat{\mathbf{x}} - by_{15}\hat{\mathbf{y}} + c\left(z_{15}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H XI
$\mathbf{B_{99}}$	$= -x_{15}\mathbf{a}_1 + \left(y_{15}+\frac{1}{2}\right)\mathbf{a}_2 - z_{15}\mathbf{a}_3$	$=$	$-ax_{15}\hat{\mathbf{x}} + b\left(y_{15}+\frac{1}{2}\right)\hat{\mathbf{y}} - cz_{15}\hat{\mathbf{z}}$	(8d)	H XI
$\mathbf{B_{100}}$	$= \left(x_{15}+\frac{1}{2}\right)\mathbf{a}_1 - \left(y_{15}-\frac{1}{2}\right)\mathbf{a}_2 - \left(z_{15}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{15}+\frac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{15}-\frac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{15}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H XI
$\mathbf{B_{101}}$	$= -x_{15}\mathbf{a}_1 - y_{15}\mathbf{a}_2 - z_{15}\mathbf{a}_3$	$=$	$-ax_{15}\hat{\mathbf{x}} - by_{15}\hat{\mathbf{y}} - cz_{15}\hat{\mathbf{z}}$	(8d)	H XI
$\mathbf{B_{102}}$	$= \left(x_{15}+\frac{1}{2}\right)\mathbf{a}_1 + y_{15}\mathbf{a}_2 - \left(z_{15}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{15}+\frac{1}{2}\right)\hat{\mathbf{x}} + by_{15}\hat{\mathbf{y}} - c\left(z_{15}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H XI
$\mathbf{B_{103}}$	$= x_{15}\mathbf{a}_1 - \left(y_{15}-\frac{1}{2}\right)\mathbf{a}_2 + z_{15}\mathbf{a}_3$	$=$	$ax_{15}\hat{\mathbf{x}} - b\left(y_{15}-\frac{1}{2}\right)\hat{\mathbf{y}} + cz_{15}\hat{\mathbf{z}}$	(8d)	H XI
$\mathbf{B_{104}}$	$= -\left(x_{15}-\frac{1}{2}\right)\mathbf{a}_1 + \left(y_{15}+\frac{1}{2}\right)\mathbf{a}_2 + \left(z_{15}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{15}-\frac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{15}+\frac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{15}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	H XI
$\mathbf{B_{105}}$	$= x_{16}\mathbf{a}_1 + y_{16}\mathbf{a}_2 + z_{16}\mathbf{a}_3$	$=$	$ax_{16}\hat{\mathbf{x}} + by_{16}\hat{\mathbf{y}} + cz_{16}\hat{\mathbf{z}}$	(8d)	O IV
$\mathbf{B_{106}}$	$= -\left(x_{16}-\frac{1}{2}\right)\mathbf{a}_1 - y_{16}\mathbf{a}_2 + \left(z_{16}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{16}-\frac{1}{2}\right)\hat{\mathbf{x}} - by_{16}\hat{\mathbf{y}} + c\left(z_{16}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	O IV
$\mathbf{B_{107}}$	$= -x_{16}\mathbf{a}_1 + \left(y_{16}+\frac{1}{2}\right)\mathbf{a}_2 - z_{16}\mathbf{a}_3$	$=$	$-ax_{16}\hat{\mathbf{x}} + b\left(y_{16}+\frac{1}{2}\right)\hat{\mathbf{y}} - cz_{16}\hat{\mathbf{z}}$	(8d)	O IV
$\mathbf{B_{108}}$	$= \left(x_{16}+\frac{1}{2}\right)\mathbf{a}_1 - \left(y_{16}-\frac{1}{2}\right)\mathbf{a}_2 - \left(z_{16}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{16}+\frac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{16}-\frac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{16}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	O IV
$\mathbf{B_{109}}$	$= -x_{16}\mathbf{a}_1 - y_{16}\mathbf{a}_2 - z_{16}\mathbf{a}_3$	$=$	$-ax_{16}\hat{\mathbf{x}} - by_{16}\hat{\mathbf{y}} - cz_{16}\hat{\mathbf{z}}$	(8d)	O IV
$\mathbf{B_{110}}$	$= \left(x_{16}+\frac{1}{2}\right)\mathbf{a}_1 + y_{16}\mathbf{a}_2 - \left(z_{16}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{16}+\frac{1}{2}\right)\hat{\mathbf{x}} + by_{16}\hat{\mathbf{y}} - c\left(z_{16}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	O IV
$\mathbf{B_{111}}$	$= x_{16}\mathbf{a}_1 - \left(y_{16}-\frac{1}{2}\right)\mathbf{a}_2 + z_{16}\mathbf{a}_3$	$=$	$ax_{16}\hat{\mathbf{x}} - b\left(y_{16}-\frac{1}{2}\right)\hat{\mathbf{y}} + cz_{16}\hat{\mathbf{z}}$	(8d)	O IV

$$\mathbf{B_{112}} = -\left(x_{16}-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_{16}+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_{16}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{16}-\tfrac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{16}+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{16}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O IV}$$

$$\mathbf{B_{113}} = x_{17}\mathbf{a}_1+y_{17}\mathbf{a}_2+z_{17}\mathbf{a}_3 = ax_{17}\hat{\mathbf{x}}+by_{17}\hat{\mathbf{y}}+cz_{17}\hat{\mathbf{z}} \quad (8d) \quad \text{O V}$$

$$\mathbf{B_{114}} = -\left(x_{17}-\tfrac{1}{2}\right)\mathbf{a}_1-y_{17}\mathbf{a}_2+\left(z_{17}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{17}-\tfrac{1}{2}\right)\hat{\mathbf{x}}-by_{17}\hat{\mathbf{y}}+c\left(z_{17}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O V}$$

$$\mathbf{B_{115}} = -x_{17}\mathbf{a}_1+\left(y_{17}+\tfrac{1}{2}\right)\mathbf{a}_2-z_{17}\mathbf{a}_3 = -ax_{17}\hat{\mathbf{x}}+b\left(y_{17}+\tfrac{1}{2}\right)\hat{\mathbf{y}}-cz_{17}\hat{\mathbf{z}} \quad (8d) \quad \text{O V}$$

$$\mathbf{B_{116}} = \left(x_{17}+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_{17}-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_{17}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{17}+\tfrac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{17}-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{17}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O V}$$

$$\mathbf{B_{117}} = -x_{17}\mathbf{a}_1-y_{17}\mathbf{a}_2-z_{17}\mathbf{a}_3 = -ax_{17}\hat{\mathbf{x}}-by_{17}\hat{\mathbf{y}}-cz_{17}\hat{\mathbf{z}} \quad (8d) \quad \text{O V}$$

$$\mathbf{B_{118}} = \left(x_{17}+\tfrac{1}{2}\right)\mathbf{a}_1+y_{17}\mathbf{a}_2-\left(z_{17}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{17}+\tfrac{1}{2}\right)\hat{\mathbf{x}}+by_{17}\hat{\mathbf{y}}-c\left(z_{17}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O V}$$

$$\mathbf{B_{119}} = x_{17}\mathbf{a}_1-\left(y_{17}-\tfrac{1}{2}\right)\mathbf{a}_2+z_{17}\mathbf{a}_3 = ax_{17}\hat{\mathbf{x}}-b\left(y_{17}-\tfrac{1}{2}\right)\hat{\mathbf{y}}+cz_{17}\hat{\mathbf{z}} \quad (8d) \quad \text{O V}$$

$$\mathbf{B_{120}} = -\left(x_{17}-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_{17}+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_{17}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{17}-\tfrac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{17}+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{17}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O V}$$

$$\mathbf{B_{121}} = x_{18}\mathbf{a}_1+y_{18}\mathbf{a}_2+z_{18}\mathbf{a}_3 = ax_{18}\hat{\mathbf{x}}+by_{18}\hat{\mathbf{y}}+cz_{18}\hat{\mathbf{z}} \quad (8d) \quad \text{O VI}$$

$$\mathbf{B_{122}} = -\left(x_{18}-\tfrac{1}{2}\right)\mathbf{a}_1-y_{18}\mathbf{a}_2+\left(z_{18}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{18}-\tfrac{1}{2}\right)\hat{\mathbf{x}}-by_{18}\hat{\mathbf{y}}+c\left(z_{18}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VI}$$

$$\mathbf{B_{123}} = -x_{18}\mathbf{a}_1+\left(y_{18}+\tfrac{1}{2}\right)\mathbf{a}_2-z_{18}\mathbf{a}_3 = -ax_{18}\hat{\mathbf{x}}+b\left(y_{18}+\tfrac{1}{2}\right)\hat{\mathbf{y}}-cz_{18}\hat{\mathbf{z}} \quad (8d) \quad \text{O VI}$$

$$\mathbf{B_{124}} = \left(x_{18}+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_{18}-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_{18}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{18}+\tfrac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{18}-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{18}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VI}$$

$$\mathbf{B_{125}} = -x_{18}\mathbf{a}_1-y_{18}\mathbf{a}_2-z_{18}\mathbf{a}_3 = -ax_{18}\hat{\mathbf{x}}-by_{18}\hat{\mathbf{y}}-cz_{18}\hat{\mathbf{z}} \quad (8d) \quad \text{O VI}$$

$$\mathbf{B_{126}} = \left(x_{18}+\tfrac{1}{2}\right)\mathbf{a}_1+y_{18}\mathbf{a}_2-\left(z_{18}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{18}+\tfrac{1}{2}\right)\hat{\mathbf{x}}+by_{18}\hat{\mathbf{y}}-c\left(z_{18}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VI}$$

$$\mathbf{B_{127}} = x_{18}\mathbf{a}_1-\left(y_{18}-\tfrac{1}{2}\right)\mathbf{a}_2+z_{18}\mathbf{a}_3 = ax_{18}\hat{\mathbf{x}}-b\left(y_{18}-\tfrac{1}{2}\right)\hat{\mathbf{y}}+cz_{18}\hat{\mathbf{z}} \quad (8d) \quad \text{O VI}$$

$$\mathbf{B_{128}} = -\left(x_{18}-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_{18}+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_{18}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{18}-\tfrac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{18}+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{18}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VI}$$

$$\mathbf{B_{129}} = x_{19}\mathbf{a}_1+y_{19}\mathbf{a}_2+z_{19}\mathbf{a}_3 = ax_{19}\hat{\mathbf{x}}+by_{19}\hat{\mathbf{y}}+cz_{19}\hat{\mathbf{z}} \quad (8d) \quad \text{O VII}$$

$$\mathbf{B_{130}} = -\left(x_{19}-\tfrac{1}{2}\right)\mathbf{a}_1-y_{19}\mathbf{a}_2+\left(z_{19}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{19}-\tfrac{1}{2}\right)\hat{\mathbf{x}}-by_{19}\hat{\mathbf{y}}+c\left(z_{19}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VII}$$

$$\mathbf{B_{131}} = -x_{19}\mathbf{a}_1+\left(y_{19}+\tfrac{1}{2}\right)\mathbf{a}_2-z_{19}\mathbf{a}_3 = -ax_{19}\hat{\mathbf{x}}+b\left(y_{19}+\tfrac{1}{2}\right)\hat{\mathbf{y}}-cz_{19}\hat{\mathbf{z}} \quad (8d) \quad \text{O VII}$$

$$\mathbf{B_{132}} = \left(x_{19}+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_{19}-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_{19}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{19}+\tfrac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{19}-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{19}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VII}$$

$$\mathbf{B_{133}} = -x_{19}\mathbf{a}_1-y_{19}\mathbf{a}_2-z_{19}\mathbf{a}_3 = -ax_{19}\hat{\mathbf{x}}-by_{19}\hat{\mathbf{y}}-cz_{19}\hat{\mathbf{z}} \quad (8d) \quad \text{O VII}$$

$$\mathbf{B_{134}} = \left(x_{19}+\tfrac{1}{2}\right)\mathbf{a}_1+y_{19}\mathbf{a}_2-\left(z_{19}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{19}+\tfrac{1}{2}\right)\hat{\mathbf{x}}+by_{19}\hat{\mathbf{y}}-c\left(z_{19}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VII}$$

$$\mathbf{B_{135}} = x_{19}\mathbf{a}_1-\left(y_{19}-\tfrac{1}{2}\right)\mathbf{a}_2+z_{19}\mathbf{a}_3 = ax_{19}\hat{\mathbf{x}}-b\left(y_{19}-\tfrac{1}{2}\right)\hat{\mathbf{y}}+cz_{19}\hat{\mathbf{z}} \quad (8d) \quad \text{O VII}$$

$$\mathbf{B_{136}} = -\left(x_{19}-\tfrac{1}{2}\right)\mathbf{a}_1+\left(y_{19}+\tfrac{1}{2}\right)\mathbf{a}_2+\left(z_{19}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{19}-\tfrac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{19}+\tfrac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{19}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VII}$$

$$\mathbf{B_{137}} = x_{20}\mathbf{a}_1+y_{20}\mathbf{a}_2+z_{20}\mathbf{a}_3 = ax_{20}\hat{\mathbf{x}}+by_{20}\hat{\mathbf{y}}+cz_{20}\hat{\mathbf{z}} \quad (8d) \quad \text{O VIII}$$

$$\mathbf{B_{138}} = -\left(x_{20}-\tfrac{1}{2}\right)\mathbf{a}_1-y_{20}\mathbf{a}_2+\left(z_{20}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{20}-\tfrac{1}{2}\right)\hat{\mathbf{x}}-by_{20}\hat{\mathbf{y}}+c\left(z_{20}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VIII}$$

$$\mathbf{B_{139}} = -x_{20}\mathbf{a}_1+\left(y_{20}+\tfrac{1}{2}\right)\mathbf{a}_2-z_{20}\mathbf{a}_3 = -ax_{20}\hat{\mathbf{x}}+b\left(y_{20}+\tfrac{1}{2}\right)\hat{\mathbf{y}}-cz_{20}\hat{\mathbf{z}} \quad (8d) \quad \text{O VIII}$$

$$\mathbf{B_{140}} = \left(x_{20}+\tfrac{1}{2}\right)\mathbf{a}_1-\left(y_{20}-\tfrac{1}{2}\right)\mathbf{a}_2-\left(z_{20}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{20}+\tfrac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{20}-\tfrac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{20}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VIII}$$

$$\mathbf{B_{141}} = -x_{20}\mathbf{a}_1-y_{20}\mathbf{a}_2-z_{20}\mathbf{a}_3 = -ax_{20}\hat{\mathbf{x}}-by_{20}\hat{\mathbf{y}}-cz_{20}\hat{\mathbf{z}} \quad (8d) \quad \text{O VIII}$$

$$\mathbf{B_{142}} = \left(x_{20}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{20}\,\mathbf{a}_2 - \left(z_{20}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{20}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{20}\,\hat{\mathbf{y}} - c\left(z_{20}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VIII}$$

$$\mathbf{B_{143}} = x_{20}\,\mathbf{a}_1 - \left(y_{20}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{20}\,\mathbf{a}_3 = ax_{20}\,\hat{\mathbf{x}} - b\left(y_{20}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{20}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O VIII}$$

$$\mathbf{B_{144}} = -\left(x_{20}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{20}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{20}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{20}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{20}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{20}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O VIII}$$

$$\mathbf{B_{145}} = x_{21}\,\mathbf{a}_1 + y_{21}\,\mathbf{a}_2 + z_{21}\,\mathbf{a}_3 = ax_{21}\,\hat{\mathbf{x}} + by_{21}\,\hat{\mathbf{y}} + cz_{21}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O IX}$$

$$\mathbf{B_{146}} = -\left(x_{21}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{21}\,\mathbf{a}_2 + \left(z_{21}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{21}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{21}\,\hat{\mathbf{y}} + c\left(z_{21}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O IX}$$

$$\mathbf{B_{147}} = -x_{21}\,\mathbf{a}_1 + \left(y_{21}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{21}\,\mathbf{a}_3 = -ax_{21}\,\hat{\mathbf{x}} + b\left(y_{21}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{21}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O IX}$$

$$\mathbf{B_{148}} = \left(x_{21}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{21}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{21}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{21}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{21}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{21}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O IX}$$

$$\mathbf{B_{149}} = -x_{21}\,\mathbf{a}_1 - y_{21}\,\mathbf{a}_2 - z_{21}\,\mathbf{a}_3 = -ax_{21}\,\hat{\mathbf{x}} - by_{21}\,\hat{\mathbf{y}} - cz_{21}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O IX}$$

$$\mathbf{B_{150}} = \left(x_{21}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{21}\,\mathbf{a}_2 - \left(z_{21}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{21}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{21}\,\hat{\mathbf{y}} - c\left(z_{21}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O IX}$$

$$\mathbf{B_{151}} = x_{21}\,\mathbf{a}_1 - \left(y_{21}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{21}\,\mathbf{a}_3 = ax_{21}\,\hat{\mathbf{x}} - b\left(y_{21}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{21}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O IX}$$

$$\mathbf{B_{152}} = -\left(x_{21}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{21}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{21}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{21}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{21}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{21}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O IX}$$

$$\mathbf{B_{153}} = x_{22}\,\mathbf{a}_1 + y_{22}\,\mathbf{a}_2 + z_{22}\,\mathbf{a}_3 = ax_{22}\,\hat{\mathbf{x}} + by_{22}\,\hat{\mathbf{y}} + cz_{22}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O X}$$

$$\mathbf{B_{154}} = -\left(x_{22}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{22}\,\mathbf{a}_2 + \left(z_{22}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{22}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{22}\,\hat{\mathbf{y}} + c\left(z_{22}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O X}$$

$$\mathbf{B_{155}} = -x_{22}\,\mathbf{a}_1 + \left(y_{22}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{22}\,\mathbf{a}_3 = -ax_{22}\,\hat{\mathbf{x}} + b\left(y_{22}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{22}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O X}$$

$$\mathbf{B_{156}} = \left(x_{22}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{22}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{22}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{22}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{22}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{22}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O X}$$

$$\mathbf{B_{157}} = -x_{22}\,\mathbf{a}_1 - y_{22}\,\mathbf{a}_2 - z_{22}\,\mathbf{a}_3 = -ax_{22}\,\hat{\mathbf{x}} - by_{22}\,\hat{\mathbf{y}} - cz_{22}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O X}$$

$$\mathbf{B_{158}} = \left(x_{22}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{22}\,\mathbf{a}_2 - \left(z_{22}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{22}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{22}\,\hat{\mathbf{y}} - c\left(z_{22}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O X}$$

$$\mathbf{B_{159}} = x_{22}\,\mathbf{a}_1 - \left(y_{22}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{22}\,\mathbf{a}_3 = ax_{22}\,\hat{\mathbf{x}} - b\left(y_{22}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{22}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O X}$$

$$\mathbf{B_{160}} = -\left(x_{22}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{22}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{22}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{22}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{22}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{22}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O X}$$

$$\mathbf{B_{161}} = x_{23}\,\mathbf{a}_1 + y_{23}\,\mathbf{a}_2 + z_{23}\,\mathbf{a}_3 = ax_{23}\,\hat{\mathbf{x}} + by_{23}\,\hat{\mathbf{y}} + cz_{23}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O XI}$$

$$\mathbf{B_{162}} = -\left(x_{23}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{23}\,\mathbf{a}_2 + \left(z_{23}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{23}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{23}\,\hat{\mathbf{y}} + c\left(z_{23}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O XI}$$

$$\mathbf{B_{163}} = -x_{23}\,\mathbf{a}_1 + \left(y_{23}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{23}\,\mathbf{a}_3 = -ax_{23}\,\hat{\mathbf{x}} + b\left(y_{23}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{23}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O XI}$$

$$\mathbf{B_{164}} = \left(x_{23}+\tfrac{1}{2}\right)\mathbf{a}_1 - \left(y_{23}-\tfrac{1}{2}\right)\mathbf{a}_2 - \left(z_{23}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{23}+\tfrac{1}{2}\right)\hat{\mathbf{x}} - b\left(y_{23}-\tfrac{1}{2}\right)\hat{\mathbf{y}} - c\left(z_{23}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O XI}$$

$$\mathbf{B_{165}} = -x_{23}\,\mathbf{a}_1 - y_{23}\,\mathbf{a}_2 - z_{23}\,\mathbf{a}_3 = -ax_{23}\,\hat{\mathbf{x}} - by_{23}\,\hat{\mathbf{y}} - cz_{23}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O XI}$$

$$\mathbf{B_{166}} = \left(x_{23}+\tfrac{1}{2}\right)\mathbf{a}_1 + y_{23}\,\mathbf{a}_2 - \left(z_{23}-\tfrac{1}{2}\right)\mathbf{a}_3 = a\left(x_{23}+\tfrac{1}{2}\right)\hat{\mathbf{x}} + by_{23}\,\hat{\mathbf{y}} - c\left(z_{23}-\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O XI}$$

$$\mathbf{B_{167}} = x_{23}\,\mathbf{a}_1 - \left(y_{23}-\tfrac{1}{2}\right)\mathbf{a}_2 + z_{23}\,\mathbf{a}_3 = ax_{23}\,\hat{\mathbf{x}} - b\left(y_{23}-\tfrac{1}{2}\right)\hat{\mathbf{y}} + cz_{23}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O XI}$$

$$\mathbf{B_{168}} = -\left(x_{23}-\tfrac{1}{2}\right)\mathbf{a}_1 + \left(y_{23}+\tfrac{1}{2}\right)\mathbf{a}_2 + \left(z_{23}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{23}-\tfrac{1}{2}\right)\hat{\mathbf{x}} + b\left(y_{23}+\tfrac{1}{2}\right)\hat{\mathbf{y}} + c\left(z_{23}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O XI}$$

$$\mathbf{B_{169}} = x_{24}\,\mathbf{a}_1 + y_{24}\,\mathbf{a}_2 + z_{24}\,\mathbf{a}_3 = ax_{24}\,\hat{\mathbf{x}} + by_{24}\,\hat{\mathbf{y}} + cz_{24}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O XII}$$

$$\mathbf{B_{170}} = -\left(x_{24}-\tfrac{1}{2}\right)\mathbf{a}_1 - y_{24}\,\mathbf{a}_2 + \left(z_{24}+\tfrac{1}{2}\right)\mathbf{a}_3 = -a\left(x_{24}-\tfrac{1}{2}\right)\hat{\mathbf{x}} - by_{24}\,\hat{\mathbf{y}} + c\left(z_{24}+\tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (8d) \quad \text{O XII}$$

$$\mathbf{B_{171}} = -x_{24}\,\mathbf{a}_1 + \left(y_{24}+\tfrac{1}{2}\right)\mathbf{a}_2 - z_{24}\,\mathbf{a}_3 = -ax_{24}\,\hat{\mathbf{x}} + b\left(y_{24}+\tfrac{1}{2}\right)\hat{\mathbf{y}} - cz_{24}\,\hat{\mathbf{z}} \quad (8d) \quad \text{O XII}$$

$\mathbf{B_{172}} =$	$\left(x_{24}+\frac{1}{2}\right)\mathbf{a}_1-\left(y_{24}-\frac{1}{2}\right)\mathbf{a}_2-\left(z_{24}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{24}+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{24}-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{24}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	O XII
$\mathbf{B_{173}} =$	$-x_{24}\mathbf{a}_1-y_{24}\mathbf{a}_2-z_{24}\mathbf{a}_3$	$=$	$-ax_{24}\hat{\mathbf{x}}-by_{24}\hat{\mathbf{y}}-cz_{24}\hat{\mathbf{z}}$	(8d)	O XII
$\mathbf{B_{174}} =$	$\left(x_{24}+\frac{1}{2}\right)\mathbf{a}_1+y_{24}\mathbf{a}_2-\left(z_{24}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{24}+\frac{1}{2}\right)\hat{\mathbf{x}}+by_{24}\hat{\mathbf{y}}-c\left(z_{24}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	O XII
$\mathbf{B_{175}} =$	$x_{24}\mathbf{a}_1-\left(y_{24}-\frac{1}{2}\right)\mathbf{a}_2+z_{24}\mathbf{a}_3$	$=$	$ax_{24}\hat{\mathbf{x}}-b\left(y_{24}-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_{24}\hat{\mathbf{z}}$	(8d)	O XII
$\mathbf{B_{176}} =$	$-\left(x_{24}-\frac{1}{2}\right)\mathbf{a}_1+\left(y_{24}+\frac{1}{2}\right)\mathbf{a}_2+\left(z_{24}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{24}-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{24}+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{24}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	O XII
$\mathbf{B_{177}} =$	$x_{25}\mathbf{a}_1+y_{25}\mathbf{a}_2+z_{25}\mathbf{a}_3$	$=$	$ax_{25}\hat{\mathbf{x}}+by_{25}\hat{\mathbf{y}}+cz_{25}\hat{\mathbf{z}}$	(8d)	O XIII
$\mathbf{B_{178}} =$	$-\left(x_{25}-\frac{1}{2}\right)\mathbf{a}_1-y_{25}\mathbf{a}_2+\left(z_{25}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{25}-\frac{1}{2}\right)\hat{\mathbf{x}}-by_{25}\hat{\mathbf{y}}+c\left(z_{25}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	O XIII
$\mathbf{B_{179}} =$	$-x_{25}\mathbf{a}_1+\left(y_{25}+\frac{1}{2}\right)\mathbf{a}_2-z_{25}\mathbf{a}_3$	$=$	$-ax_{25}\hat{\mathbf{x}}+b\left(y_{25}+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_{25}\hat{\mathbf{z}}$	(8d)	O XIII
$\mathbf{B_{180}} =$	$\left(x_{25}+\frac{1}{2}\right)\mathbf{a}_1-\left(y_{25}-\frac{1}{2}\right)\mathbf{a}_2-\left(z_{25}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{25}+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{25}-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{25}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	O XIII
$\mathbf{B_{181}} =$	$-x_{25}\mathbf{a}_1-y_{25}\mathbf{a}_2-z_{25}\mathbf{a}_3$	$=$	$-ax_{25}\hat{\mathbf{x}}-by_{25}\hat{\mathbf{y}}-cz_{25}\hat{\mathbf{z}}$	(8d)	O XIII
$\mathbf{B_{182}} =$	$\left(x_{25}+\frac{1}{2}\right)\mathbf{a}_1+y_{25}\mathbf{a}_2-\left(z_{25}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{25}+\frac{1}{2}\right)\hat{\mathbf{x}}+by_{25}\hat{\mathbf{y}}-c\left(z_{25}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	O XIII
$\mathbf{B_{183}} =$	$x_{25}\mathbf{a}_1-\left(y_{25}-\frac{1}{2}\right)\mathbf{a}_2+z_{25}\mathbf{a}_3$	$=$	$ax_{25}\hat{\mathbf{x}}-b\left(y_{25}-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_{25}\hat{\mathbf{z}}$	(8d)	O XIII
$\mathbf{B_{184}} =$	$-\left(x_{25}-\frac{1}{2}\right)\mathbf{a}_1+\left(y_{25}+\frac{1}{2}\right)\mathbf{a}_2+\left(z_{25}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{25}-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{25}+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{25}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	O XIII
$\mathbf{B_{185}} =$	$x_{26}\mathbf{a}_1+y_{26}\mathbf{a}_2+z_{26}\mathbf{a}_3$	$=$	$ax_{26}\hat{\mathbf{x}}+by_{26}\hat{\mathbf{y}}+cz_{26}\hat{\mathbf{z}}$	(8d)	P I
$\mathbf{B_{186}} =$	$-\left(x_{26}-\frac{1}{2}\right)\mathbf{a}_1-y_{26}\mathbf{a}_2+\left(z_{26}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{26}-\frac{1}{2}\right)\hat{\mathbf{x}}-by_{26}\hat{\mathbf{y}}+c\left(z_{26}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	P I
$\mathbf{B_{187}} =$	$-x_{26}\mathbf{a}_1+\left(y_{26}+\frac{1}{2}\right)\mathbf{a}_2-z_{26}\mathbf{a}_3$	$=$	$-ax_{26}\hat{\mathbf{x}}+b\left(y_{26}+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_{26}\hat{\mathbf{z}}$	(8d)	P I
$\mathbf{B_{188}} =$	$\left(x_{26}+\frac{1}{2}\right)\mathbf{a}_1-\left(y_{26}-\frac{1}{2}\right)\mathbf{a}_2-\left(z_{26}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{26}+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{26}-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{26}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	P I
$\mathbf{B_{189}} =$	$-x_{26}\mathbf{a}_1-y_{26}\mathbf{a}_2-z_{26}\mathbf{a}_3$	$=$	$-ax_{26}\hat{\mathbf{x}}-by_{26}\hat{\mathbf{y}}-cz_{26}\hat{\mathbf{z}}$	(8d)	P I
$\mathbf{B_{190}} =$	$\left(x_{26}+\frac{1}{2}\right)\mathbf{a}_1+y_{26}\mathbf{a}_2-\left(z_{26}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{26}+\frac{1}{2}\right)\hat{\mathbf{x}}+by_{26}\hat{\mathbf{y}}-c\left(z_{26}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	P I
$\mathbf{B_{191}} =$	$x_{26}\mathbf{a}_1-\left(y_{26}-\frac{1}{2}\right)\mathbf{a}_2+z_{26}\mathbf{a}_3$	$=$	$ax_{26}\hat{\mathbf{x}}-b\left(y_{26}-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_{26}\hat{\mathbf{z}}$	(8d)	P I
$\mathbf{B_{192}} =$	$-\left(x_{26}-\frac{1}{2}\right)\mathbf{a}_1+\left(y_{26}+\frac{1}{2}\right)\mathbf{a}_2+\left(z_{26}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{26}-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{26}+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{26}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	P I
$\mathbf{B_{193}} =$	$x_{27}\mathbf{a}_1+y_{27}\mathbf{a}_2+z_{27}\mathbf{a}_3$	$=$	$ax_{27}\hat{\mathbf{x}}+by_{27}\hat{\mathbf{y}}+cz_{27}\hat{\mathbf{z}}$	(8d)	U I
$\mathbf{B_{194}} =$	$-\left(x_{27}-\frac{1}{2}\right)\mathbf{a}_1-y_{27}\mathbf{a}_2+\left(z_{27}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{27}-\frac{1}{2}\right)\hat{\mathbf{x}}-by_{27}\hat{\mathbf{y}}+c\left(z_{27}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	U I
$\mathbf{B_{195}} =$	$-x_{27}\mathbf{a}_1+\left(y_{27}+\frac{1}{2}\right)\mathbf{a}_2-z_{27}\mathbf{a}_3$	$=$	$-ax_{27}\hat{\mathbf{x}}+b\left(y_{27}+\frac{1}{2}\right)\hat{\mathbf{y}}-cz_{27}\hat{\mathbf{z}}$	(8d)	U I
$\mathbf{B_{196}} =$	$\left(x_{27}+\frac{1}{2}\right)\mathbf{a}_1-\left(y_{27}-\frac{1}{2}\right)\mathbf{a}_2-\left(z_{27}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{27}+\frac{1}{2}\right)\hat{\mathbf{x}}-b\left(y_{27}-\frac{1}{2}\right)\hat{\mathbf{y}}-c\left(z_{27}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	U I
$\mathbf{B_{197}} =$	$-x_{27}\mathbf{a}_1-y_{27}\mathbf{a}_2-z_{27}\mathbf{a}_3$	$=$	$-ax_{27}\hat{\mathbf{x}}-by_{27}\hat{\mathbf{y}}-cz_{27}\hat{\mathbf{z}}$	(8d)	U I
$\mathbf{B_{198}} =$	$\left(x_{27}+\frac{1}{2}\right)\mathbf{a}_1+y_{27}\mathbf{a}_2-\left(z_{27}-\frac{1}{2}\right)\mathbf{a}_3$	$=$	$a\left(x_{27}+\frac{1}{2}\right)\hat{\mathbf{x}}+by_{27}\hat{\mathbf{y}}-c\left(z_{27}-\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	U I
$\mathbf{B_{199}} =$	$x_{27}\mathbf{a}_1-\left(y_{27}-\frac{1}{2}\right)\mathbf{a}_2+z_{27}\mathbf{a}_3$	$=$	$ax_{27}\hat{\mathbf{x}}-b\left(y_{27}-\frac{1}{2}\right)\hat{\mathbf{y}}+cz_{27}\hat{\mathbf{z}}$	(8d)	U I
$\mathbf{B_{200}} =$	$-\left(x_{27}-\frac{1}{2}\right)\mathbf{a}_1+\left(y_{27}+\frac{1}{2}\right)\mathbf{a}_2+\left(z_{27}+\frac{1}{2}\right)\mathbf{a}_3$	$=$	$-a\left(x_{27}-\frac{1}{2}\right)\hat{\mathbf{x}}+b\left(y_{27}+\frac{1}{2}\right)\hat{\mathbf{y}}+c\left(z_{27}+\frac{1}{2}\right)\hat{\mathbf{z}}$	(8d)	U I

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