Osumilite ($KMg_2Al_3Si_{12}O_{30}$) Structure: A3BC2D30E12_hP96_192_f_a_c_l2m_m-001

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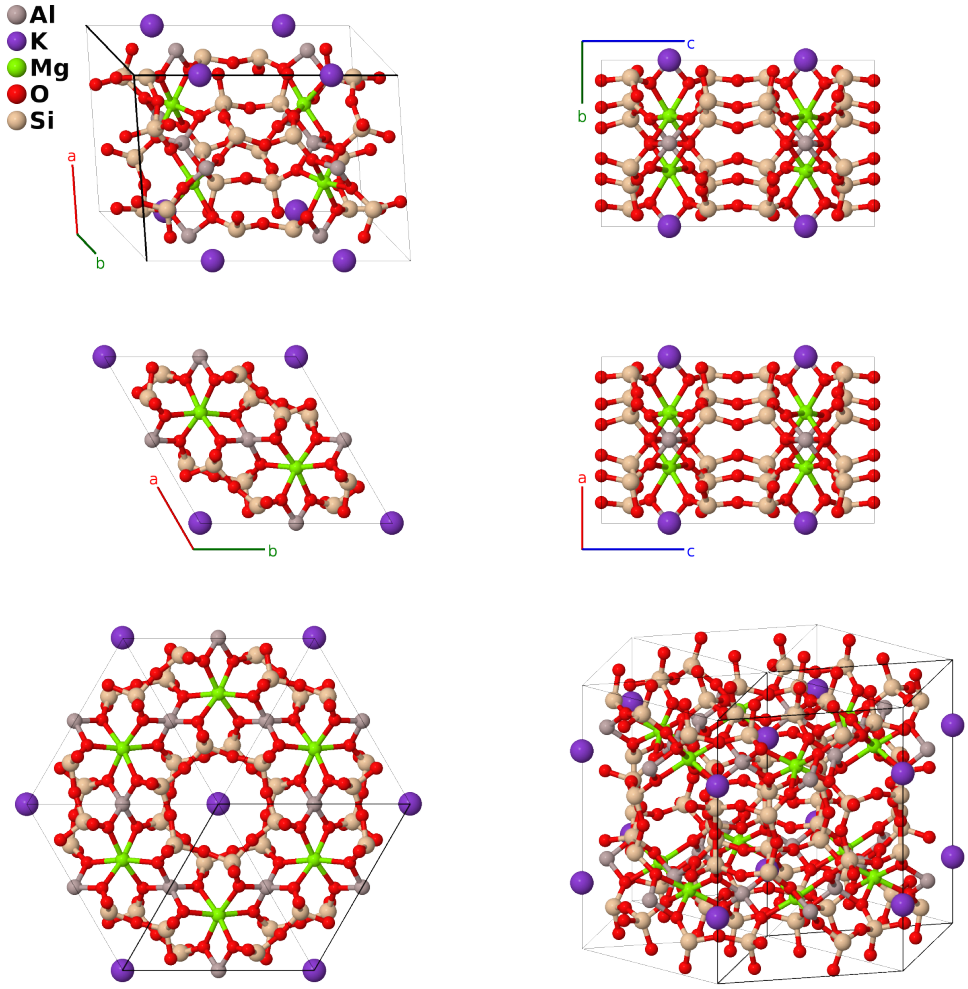
https://aflow.org/p/FPN8

https://aflow.org/p/A3BC2D30E12_hP96_192_f_a_c_l2m_m-001

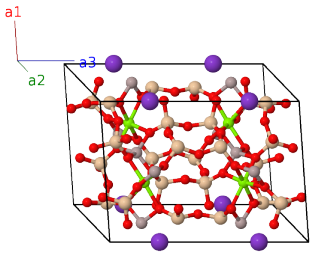


Prototype	$Al_3KMg_2O_{15}Si_{12}$
AFLOW prototype label	A3BC2D30E12_hP96_192_f_a_c_l2m_m-001
Mineral name	osumilite
ICSD	202731
Pearson symbol	hP96
Space group number	192
Space group symbol	$P6/mcc$
AFLOW prototype command	`aflow --proto=A3BC2D30E12_hP96_192_f_a_c_l2m_m-001 --params=`$a, c/a, x_4, y_4, x_5, y_5, z_5, x_6, y_6, z_6, x_7, y_7, z_7$

- We use the data from the Antarctica sample of (Armbruster, 1988). As with most minerals, some of the sites contain mixtures of elements and vacancies. We use the compositions in the American Mineralogist Crystal Structure Database (Downs, 2003):
  - The K (2a) site is 91% potassium and 1% iron, with the remainder of the sites vacant.
  - The Mg (4c) site is 99% magnesium/aluminum and 1% iron.
  - The Al (6f) site is mostly aluminum/magnesium with a trace of iron/manganese/titanium, even though in Table 4 they call it an Fe site.
  - The Si (24m) site is 86% silicon and 14% magnesium.
  - The oxygen sites are all filled.
- These compositions are very dependent upon where the sample was found. See Table 5 in (Armbruster, 1988) for more details.

Hexagonal primitive vectors

$$\mathbf{a_1} = \frac{1}{2}a\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,\hat{\mathbf{y}}$$
$$\mathbf{a_2} = \frac{1}{2}a\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,\hat{\mathbf{y}}$$
$$\mathbf{a_3} = c\,\hat{\mathbf{z}}$$



Basis vectors

		Lattice coordinates		Cartesian coordinates	Wyckoff position	Atom type
$\mathbf{B_1}$	=	$\frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{4}c\,\hat{\mathbf{z}}$	(2a)	K I
$\mathbf{B_2}$	=	$\frac{3}{4}\,\mathbf{a}_3$	=	$\frac{3}{4}c\,\hat{\mathbf{z}}$	(2a)	K I
$\mathbf{B_3}$	=	$\frac{1}{3}\,\mathbf{a}_1 + \frac{2}{3}\,\mathbf{a}_2 + \frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{6}a\,\hat{\mathbf{y}} + \frac{1}{4}c\,\hat{\mathbf{z}}$	(4c)	Mg I
$\mathbf{B_4}$	=	$\frac{2}{3}\,\mathbf{a}_1 + \frac{1}{3}\,\mathbf{a}_2 + \frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{6}a\,\hat{\mathbf{y}} + \frac{1}{4}c\,\hat{\mathbf{z}}$	(4c)	Mg I
$\mathbf{B_5}$	=	$\frac{2}{3}\,\mathbf{a}_1 + \frac{1}{3}\,\mathbf{a}_2 + \frac{3}{4}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{6}a\,\hat{\mathbf{y}} + \frac{3}{4}c\,\hat{\mathbf{z}}$	(4c)	Mg I
$\mathbf{B_6}$	=	$\frac{1}{3}\,\mathbf{a}_1 + \frac{2}{3}\,\mathbf{a}_2 + \frac{3}{4}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{6}a\,\hat{\mathbf{y}} + \frac{3}{4}c\,\hat{\mathbf{z}}$	(4c)	Mg I
$\mathbf{B_7}$	=	$\frac{1}{2}\,\mathbf{a}_1 + \frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{4}a\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{4}a\,\hat{\mathbf{y}} + \frac{1}{4}c\,\hat{\mathbf{z}}$	(6f)	Al I
$\mathbf{B_8}$	=	$\frac{1}{2}\,\mathbf{a}_2 + \frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{4}a\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{4}a\,\hat{\mathbf{y}} + \frac{1}{4}c\,\hat{\mathbf{z}}$	(6f)	Al I
$\mathbf{B_9}$	=	$\frac{1}{2}\,\mathbf{a}_1 + \frac{1}{2}\,\mathbf{a}_2 + \frac{1}{4}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} + \frac{1}{4}c\,\hat{\mathbf{z}}$	(6f)	Al I
$\mathbf{B_{10}}$	=	$\frac{1}{2}\,\mathbf{a}_1 + \frac{3}{4}\,\mathbf{a}_3$	=	$\frac{1}{4}a\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{4}a\,\hat{\mathbf{y}} + \frac{3}{4}c\,\hat{\mathbf{z}}$	(6f)	Al I
$\mathbf{B_{11}}$	=	$\frac{1}{2}\,\mathbf{a}_2 + \frac{3}{4}\,\mathbf{a}_3$	=	$\frac{1}{4}a\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{4}a\,\hat{\mathbf{y}} + \frac{3}{4}c\,\hat{\mathbf{z}}$	(6f)	Al I
$\mathbf{B_{12}}$	=	$\frac{1}{2}\,\mathbf{a}_1 + \frac{1}{2}\,\mathbf{a}_2 + \frac{3}{4}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,\hat{\mathbf{x}} + \frac{3}{4}c\,\hat{\mathbf{z}}$	(6f)	Al I
$\mathbf{B_{13}}$	=	$x_4\,\mathbf{a}_1 + y_4\,\mathbf{a}_2$	=	$\frac{1}{2}a\,(x_4 + y_4)\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,(x_4 - y_4)\,\hat{\mathbf{y}}$	(12l)	O I
$\mathbf{B_{14}}$	=	$-y_4\,\mathbf{a}_1 + (x_4 - y_4)\,\mathbf{a}_2$	=	$\frac{1}{2}a\,(x_4 - 2y_4)\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_4\,\hat{\mathbf{y}}$	(12l)	O I
$\mathbf{B_{15}}$	=	$-(x_4 - y_4)\,\mathbf{a}_1 - x_4\,\mathbf{a}_2$	=	$-\frac{1}{2}a\,(2x_4 - y_4)\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ay_4\,\hat{\mathbf{y}}$	(12l)	O I
$\mathbf{B_{16}}$	=	$-x_4\,\mathbf{a}_1 - y_4\,\mathbf{a}_2$	=	$-\frac{1}{2}a\,(x_4 + y_4)\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,(x_4 - y_4)\,\hat{\mathbf{y}}$	(12l)	O I
$\mathbf{B_{17}}$	=	$y_4\,\mathbf{a}_1 - (x_4 - y_4)\,\mathbf{a}_2$	=	$\frac{1}{2}a\,(-x_4 + 2y_4)\,\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_4\,\hat{\mathbf{y}}$	(12l)	O I
$\mathbf{B_{18}}$	=	$(x_4 - y_4)\,\mathbf{a}_1 + x_4\,\mathbf{a}_2$	=	$\frac{1}{2}a\,(2x_4 - y_4)\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ay_4\,\hat{\mathbf{y}}$	(12l)	O I
$\mathbf{B_{19}}$	=	$y_4\,\mathbf{a}_1 + x_4\,\mathbf{a}_2 + \frac{1}{2}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_4 + y_4)\,\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,(x_4 - y_4)\,\hat{\mathbf{y}} + \frac{1}{2}c\,\hat{\mathbf{z}}$	(12l)	O I

$\mathbf{B_{20}}$	=	$(x_4 - y_4)\ \mathbf{a}_1 - y_4\,\mathbf{a}_2 + \frac{1}{2}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_4 - 2y_4)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_4\,\hat{\mathbf{y}} + \frac{1}{2}c\,\hat{\mathbf{z}}$	(12l)	O I
$\mathbf{B_{21}}$	=	$-x_4\,\mathbf{a}_1 - (x_4 - y_4)\ \mathbf{a}_2 + \frac{1}{2}\,\mathbf{a}_3$	=	$-\frac{1}{2}a\,(2x_4 - y_4)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ay_4\,\hat{\mathbf{y}} + \frac{1}{2}c\,\hat{\mathbf{z}}$	(12l)	O I
$\mathbf{B_{22}}$	=	$-y_4\,\mathbf{a}_1 - x_4\,\mathbf{a}_2 + \frac{1}{2}\,\mathbf{a}_3$	=	$-\frac{1}{2}a\,(x_4 + y_4)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,(x_4 - y_4)\ \hat{\mathbf{y}} + \frac{1}{2}c\,\hat{\mathbf{z}}$	(12l)	O I
$\mathbf{B_{23}}$	=	$-\,(x_4 - y_4)\ \mathbf{a}_1 + y_4\,\mathbf{a}_2 + \frac{1}{2}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(-x_4 + 2y_4)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_4\,\hat{\mathbf{y}} + \frac{1}{2}c\,\hat{\mathbf{z}}$	(12l)	O I
$\mathbf{B_{24}}$	=	$x_4\,\mathbf{a}_1 + (x_4 - y_4)\ \mathbf{a}_2 + \frac{1}{2}\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(2x_4 - y_4)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ay_4\,\hat{\mathbf{y}} + \frac{1}{2}c\,\hat{\mathbf{z}}$	(12l)	O I
$\mathbf{B_{25}}$	=	$x_5\,\mathbf{a}_1 + y_5\,\mathbf{a}_2 + z_5\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 + y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,(x_5 - y_5)\ \hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{26}}$	=	$-y_5\,\mathbf{a}_1 + (x_5 - y_5)\ \mathbf{a}_2 + z_5\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 - 2y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_5\,\hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{27}}$	=	$-\,(x_5 - y_5)\ \mathbf{a}_1 - x_5\,\mathbf{a}_2 + z_5\,\mathbf{a}_3$	=	$-\frac{1}{2}a\,(2x_5 - y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ay_5\,\hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{28}}$	=	$-x_5\,\mathbf{a}_1 - y_5\,\mathbf{a}_2 + z_5\,\mathbf{a}_3$	=	$-\frac{1}{2}a\,(x_5 + y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,(x_5 - y_5)\ \hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{29}}$	=	$y_5\,\mathbf{a}_1 - (x_5 - y_5)\ \mathbf{a}_2 + z_5\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(-x_5 + 2y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_5\,\hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{30}}$	=	$(x_5 - y_5)\ \mathbf{a}_1 + x_5\,\mathbf{a}_2 + z_5\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(2x_5 - y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ay_5\,\hat{\mathbf{y}} + cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{31}}$	=	$y_5\,\mathbf{a}_1 + x_5\,\mathbf{a}_2 - \left(z_5 - \frac{1}{2}\right)\ \mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 + y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,(x_5 - y_5)\ \hat{\mathbf{y}} - c\left(z_5 - \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{32}}$	=	$(x_5 - y_5)\ \mathbf{a}_1 - y_5\,\mathbf{a}_2 - \left(z_5 - \frac{1}{2}\right)\ \mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 - 2y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_5\,\hat{\mathbf{y}} - c\left(z_5 - \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{33}}$	=	$-x_5\,\mathbf{a}_1 - (x_5 - y_5)\ \mathbf{a}_2 - \left(z_5 - \frac{1}{2}\right)\ \mathbf{a}_3$	=	$-\frac{1}{2}a\,(2x_5 - y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ay_5\,\hat{\mathbf{y}} - c\left(z_5 - \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{34}}$	=	$-y_5\,\mathbf{a}_1 - x_5\,\mathbf{a}_2 - \left(z_5 - \frac{1}{2}\right)\ \mathbf{a}_3$	=	$-\frac{1}{2}a\,(x_5 + y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,(x_5 - y_5)\ \hat{\mathbf{y}} - c\left(z_5 - \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{35}}$	=	$-\,(x_5 - y_5)\ \mathbf{a}_1 + y_5\,\mathbf{a}_2 - \left(z_5 - \frac{1}{2}\right)\ \mathbf{a}_3$	=	$\frac{1}{2}a\,(-x_5 + 2y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_5\,\hat{\mathbf{y}} - c\left(z_5 - \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{36}}$	=	$x_5\,\mathbf{a}_1 + (x_5 - y_5)\ \mathbf{a}_2 - \left(z_5 - \frac{1}{2}\right)\ \mathbf{a}_3$	=	$\frac{1}{2}a\,(2x_5 - y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ay_5\,\hat{\mathbf{y}} - c\left(z_5 - \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{37}}$	=	$-x_5\,\mathbf{a}_1 - y_5\,\mathbf{a}_2 - z_5\,\mathbf{a}_3$	=	$-\frac{1}{2}a\,(x_5 + y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,(x_5 - y_5)\ \hat{\mathbf{y}} - cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{38}}$	=	$y_5\,\mathbf{a}_1 - (x_5 - y_5)\ \mathbf{a}_2 - z_5\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(-x_5 + 2y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_5\,\hat{\mathbf{y}} - cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{39}}$	=	$(x_5 - y_5)\ \mathbf{a}_1 + x_5\,\mathbf{a}_2 - z_5\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(2x_5 - y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ay_5\,\hat{\mathbf{y}} - cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{40}}$	=	$x_5\,\mathbf{a}_1 + y_5\,\mathbf{a}_2 - z_5\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 + y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,(x_5 - y_5)\ \hat{\mathbf{y}} - cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{41}}$	=	$-y_5\,\mathbf{a}_1 + (x_5 - y_5)\ \mathbf{a}_2 - z_5\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 - 2y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_5\,\hat{\mathbf{y}} - cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{42}}$	=	$-\,(x_5 - y_5)\ \mathbf{a}_1 - x_5\,\mathbf{a}_2 - z_5\,\mathbf{a}_3$	=	$-\frac{1}{2}a\,(2x_5 - y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ay_5\,\hat{\mathbf{y}} - cz_5\,\hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{43}}$	=	$-y_5\,\mathbf{a}_1 - x_5\,\mathbf{a}_2 + \left(z_5 + \frac{1}{2}\right)\ \mathbf{a}_3$	=	$-\frac{1}{2}a\,(x_5 + y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,(x_5 - y_5)\ \hat{\mathbf{y}} + c\left(z_5 + \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{44}}$	=	$-\,(x_5 - y_5)\ \mathbf{a}_1 + y_5\,\mathbf{a}_2 + \left(z_5 + \frac{1}{2}\right)\ \mathbf{a}_3$	=	$\frac{1}{2}a\,(-x_5 + 2y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_5\,\hat{\mathbf{y}} + c\left(z_5 + \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{45}}$	=	$x_5\,\mathbf{a}_1 + (x_5 - y_5)\ \mathbf{a}_2 + \left(z_5 + \frac{1}{2}\right)\ \mathbf{a}_3$	=	$\frac{1}{2}a\,(2x_5 - y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ay_5\,\hat{\mathbf{y}} + c\left(z_5 + \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{46}}$	=	$y_5\,\mathbf{a}_1 + x_5\,\mathbf{a}_2 + \left(z_5 + \frac{1}{2}\right)\ \mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 + y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,(x_5 - y_5)\ \hat{\mathbf{y}} + c\left(z_5 + \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{47}}$	=	$(x_5 - y_5)\ \mathbf{a}_1 - y_5\,\mathbf{a}_2 + \left(z_5 + \frac{1}{2}\right)\ \mathbf{a}_3$	=	$\frac{1}{2}a\,(x_5 - 2y_5)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_5\,\hat{\mathbf{y}} + c\left(z_5 + \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{48}}$	=	$-x_5\,\mathbf{a}_1 - (x_5 - y_5)\ \mathbf{a}_2 + \left(z_5 + \frac{1}{2}\right)\ \mathbf{a}_3$	=	$-\frac{1}{2}a\,(2x_5 - y_5)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ay_5\,\hat{\mathbf{y}} + c\left(z_5 + \frac{1}{2}\right)\ \hat{\mathbf{z}}$	(24m)	O II
$\mathbf{B_{49}}$	=	$x_6\,\mathbf{a}_1 + y_6\,\mathbf{a}_2 + z_6\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_6 + y_6)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,(x_6 - y_6)\ \hat{\mathbf{y}} + cz_6\,\hat{\mathbf{z}}$	(24m)	O III
$\mathbf{B_{50}}$	=	$-y_6\,\mathbf{a}_1 + (x_6 - y_6)\ \mathbf{a}_2 + z_6\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_6 - 2y_6)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_6\,\hat{\mathbf{y}} + cz_6\,\hat{\mathbf{z}}$	(24m)	O III
$\mathbf{B_{51}}$	=	$-\,(x_6 - y_6)\ \mathbf{a}_1 - x_6\,\mathbf{a}_2 + z_6\,\mathbf{a}_3$	=	$-\frac{1}{2}a\,(2x_6 - y_6)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ay_6\,\hat{\mathbf{y}} + cz_6\,\hat{\mathbf{z}}$	(24m)	O III
$\mathbf{B_{52}}$	=	$-x_6\,\mathbf{a}_1 - y_6\,\mathbf{a}_2 + z_6\,\mathbf{a}_3$	=	$-\frac{1}{2}a\,(x_6 + y_6)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,(x_6 - y_6)\ \hat{\mathbf{y}} + cz_6\,\hat{\mathbf{z}}$	(24m)	O III
$\mathbf{B_{53}}$	=	$y_6\,\mathbf{a}_1 - (x_6 - y_6)\ \mathbf{a}_2 + z_6\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(-x_6 + 2y_6)\ \hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_6\,\hat{\mathbf{y}} + cz_6\,\hat{\mathbf{z}}$	(24m)	O III
$\mathbf{B_{54}}$	=	$(x_6 - y_6)\ \mathbf{a}_1 + x_6\,\mathbf{a}_2 + z_6\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(2x_6 - y_6)\ \hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ay_6\,\hat{\mathbf{y}} + cz_6\,\hat{\mathbf{z}}$	(24m)	O III

$$\mathbf{B_{55}} = y_6\,\mathbf{a}_1 + x_6\,\mathbf{a}_2 - \left(z_6 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_6 + y_6)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}a\,(x_6 - y_6)\,\hat{\mathbf{y}} - c\left(z_6 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{56}} = (x_6 - y_6)\,\mathbf{a}_1 - y_6\,\mathbf{a}_2 - \left(z_6 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_6 - 2y_6)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ax_6\,\hat{\mathbf{y}} - c\left(z_6 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{57}} = -x_6\,\mathbf{a}_1 - (x_6 - y_6)\,\mathbf{a}_2 - \left(z_6 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_6 - y_6)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ay_6\,\hat{\mathbf{y}} - c\left(z_6 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{58}} = -y_6\,\mathbf{a}_1 - x_6\,\mathbf{a}_2 - \left(z_6 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(x_6 + y_6)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}a\,(x_6 - y_6)\,\hat{\mathbf{y}} - c\left(z_6 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{59}} = -(x_6 - y_6)\,\mathbf{a}_1 + y_6\,\mathbf{a}_2 - \left(z_6 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(-x_6 + 2y_6)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ax_6\,\hat{\mathbf{y}} - c\left(z_6 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{60}} = x_6\,\mathbf{a}_1 + (x_6 - y_6)\,\mathbf{a}_2 - \left(z_6 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(2x_6 - y_6)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ay_6\,\hat{\mathbf{y}} - c\left(z_6 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{61}} = -x_6\,\mathbf{a}_1 - y_6\,\mathbf{a}_2 - z_6\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(x_6 + y_6)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}a\,(x_6 - y_6)\,\hat{\mathbf{y}} - cz_6\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{62}} = y_6\,\mathbf{a}_1 - (x_6 - y_6)\,\mathbf{a}_2 - z_6\,\mathbf{a}_3 = \tfrac{1}{2}a\,(-x_6 + 2y_6)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ax_6\,\hat{\mathbf{y}} - cz_6\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{63}} = (x_6 - y_6)\,\mathbf{a}_1 + x_6\,\mathbf{a}_2 - z_6\,\mathbf{a}_3 = \tfrac{1}{2}a\,(2x_6 - y_6)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ay_6\,\hat{\mathbf{y}} - cz_6\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{64}} = x_6\,\mathbf{a}_1 + y_6\,\mathbf{a}_2 - z_6\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_6 + y_6)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}a\,(x_6 - y_6)\,\hat{\mathbf{y}} - cz_6\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{65}} = -y_6\,\mathbf{a}_1 + (x_6 - y_6)\,\mathbf{a}_2 - z_6\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_6 - 2y_6)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ax_6\,\hat{\mathbf{y}} - cz_6\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{66}} = -(x_6 - y_6)\,\mathbf{a}_1 - x_6\,\mathbf{a}_2 - z_6\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_6 - y_6)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ay_6\,\hat{\mathbf{y}} - cz_6\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{67}} = -y_6\,\mathbf{a}_1 - x_6\,\mathbf{a}_2 + \left(z_6 + \tfrac{1}{2}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(x_6 + y_6)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}a\,(x_6 - y_6)\,\hat{\mathbf{y}} + c\left(z_6 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{68}} = -(x_6 - y_6)\,\mathbf{a}_1 + y_6\,\mathbf{a}_2 + \left(z_6 + \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(-x_6 + 2y_6)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ax_6\,\hat{\mathbf{y}} + c\left(z_6 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{69}} = x_6\,\mathbf{a}_1 + (x_6 - y_6)\,\mathbf{a}_2 + \left(z_6 + \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(2x_6 - y_6)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ay_6\,\hat{\mathbf{y}} + c\left(z_6 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{70}} = y_6\,\mathbf{a}_1 + x_6\,\mathbf{a}_2 + \left(z_6 + \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_6 + y_6)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}a\,(x_6 - y_6)\,\hat{\mathbf{y}} + c\left(z_6 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{71}} = (x_6 - y_6)\,\mathbf{a}_1 - y_6\,\mathbf{a}_2 + \left(z_6 + \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_6 - 2y_6)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ax_6\,\hat{\mathbf{y}} + c\left(z_6 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{72}} = -x_6\,\mathbf{a}_1 - (x_6 - y_6)\,\mathbf{a}_2 + \left(z_6 + \tfrac{1}{2}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_6 - y_6)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ay_6\,\hat{\mathbf{y}} + c\left(z_6 + \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{O III}$$

$$\mathbf{B_{73}} = x_7\,\mathbf{a}_1 + y_7\,\mathbf{a}_2 + z_7\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_7 + y_7)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}a\,(x_7 - y_7)\,\hat{\mathbf{y}} + cz_7\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{74}} = -y_7\,\mathbf{a}_1 + (x_7 - y_7)\,\mathbf{a}_2 + z_7\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_7 - 2y_7)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ax_7\,\hat{\mathbf{y}} + cz_7\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{75}} = -(x_7 - y_7)\,\mathbf{a}_1 - x_7\,\mathbf{a}_2 + z_7\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_7 - y_7)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ay_7\,\hat{\mathbf{y}} + cz_7\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{76}} = -x_7\,\mathbf{a}_1 - y_7\,\mathbf{a}_2 + z_7\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(x_7 + y_7)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}a\,(x_7 - y_7)\,\hat{\mathbf{y}} + cz_7\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{77}} = y_7\,\mathbf{a}_1 - (x_7 - y_7)\,\mathbf{a}_2 + z_7\,\mathbf{a}_3 = \tfrac{1}{2}a\,(-x_7 + 2y_7)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ax_7\,\hat{\mathbf{y}} + cz_7\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{78}} = (x_7 - y_7)\,\mathbf{a}_1 + x_7\,\mathbf{a}_2 + z_7\,\mathbf{a}_3 = \tfrac{1}{2}a\,(2x_7 - y_7)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ay_7\,\hat{\mathbf{y}} + cz_7\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{79}} = y_7\,\mathbf{a}_1 + x_7\,\mathbf{a}_2 - \left(z_7 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_7 + y_7)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}a\,(x_7 - y_7)\,\hat{\mathbf{y}} - c\left(z_7 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{80}} = (x_7 - y_7)\,\mathbf{a}_1 - y_7\,\mathbf{a}_2 - \left(z_7 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(x_7 - 2y_7)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ax_7\,\hat{\mathbf{y}} - c\left(z_7 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{81}} = -x_7\,\mathbf{a}_1 - (x_7 - y_7)\,\mathbf{a}_2 - \left(z_7 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(2x_7 - y_7)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ay_7\,\hat{\mathbf{y}} - c\left(z_7 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{82}} = -y_7\,\mathbf{a}_1 - x_7\,\mathbf{a}_2 - \left(z_7 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(x_7 + y_7)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}a\,(x_7 - y_7)\,\hat{\mathbf{y}} - c\left(z_7 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{83}} = -(x_7 - y_7)\,\mathbf{a}_1 + y_7\,\mathbf{a}_2 - \left(z_7 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(-x_7 + 2y_7)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ax_7\,\hat{\mathbf{y}} - c\left(z_7 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{84}} = x_7\,\mathbf{a}_1 + (x_7 - y_7)\,\mathbf{a}_2 - \left(z_7 - \tfrac{1}{2}\right)\,\mathbf{a}_3 = \tfrac{1}{2}a\,(2x_7 - y_7)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ay_7\,\hat{\mathbf{y}} - c\left(z_7 - \tfrac{1}{2}\right)\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{85}} = -x_7\,\mathbf{a}_1 - y_7\,\mathbf{a}_2 - z_7\,\mathbf{a}_3 = -\tfrac{1}{2}a\,(x_7 + y_7)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}a\,(x_7 - y_7)\,\hat{\mathbf{y}} - cz_7\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{86}} = y_7\,\mathbf{a}_1 - (x_7 - y_7)\,\mathbf{a}_2 - z_7\,\mathbf{a}_3 = \tfrac{1}{2}a\,(-x_7 + 2y_7)\,\hat{\mathbf{x}} - \tfrac{\sqrt{3}}{2}ax_7\,\hat{\mathbf{y}} - cz_7\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$$\mathbf{B_{87}} = (x_7 - y_7)\,\mathbf{a}_1 + x_7\,\mathbf{a}_2 - z_7\,\mathbf{a}_3 = \tfrac{1}{2}a\,(2x_7 - y_7)\,\hat{\mathbf{x}} + \tfrac{\sqrt{3}}{2}ay_7\,\hat{\mathbf{y}} - cz_7\,\hat{\mathbf{z}} \quad (24\mathrm{m}) \quad \text{Si I}$$

$\mathbf{B_{88}}$	=	$x_7\,\mathbf{a}_1 + y_7\,\mathbf{a}_2 - z_7\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_7 + y_7)\;\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,(x_7 - y_7)\;\hat{\mathbf{y}} - cz_7\,\hat{\mathbf{z}}$	(24m)	Si I
$\mathbf{B_{89}}$	=	$-y_7\,\mathbf{a}_1 + (x_7 - y_7)\;\mathbf{a}_2 - z_7\,\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_7 - 2y_7)\;\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_7\,\hat{\mathbf{y}} - cz_7\,\hat{\mathbf{z}}$	(24m)	Si I
$\mathbf{B_{90}}$	=	$-\,(x_7 - y_7)\;\mathbf{a}_1 - x_7\,\mathbf{a}_2 - z_7\,\mathbf{a}_3$	=	$-\frac{1}{2}a\,(2x_7 - y_7)\;\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ay_7\,\hat{\mathbf{y}} - cz_7\,\hat{\mathbf{z}}$	(24m)	Si I
$\mathbf{B_{91}}$	=	$-y_7\,\mathbf{a}_1 - x_7\,\mathbf{a}_2 + \left(z_7 + \frac{1}{2}\right)\;\mathbf{a}_3$	=	$-\frac{1}{2}a\,(x_7 + y_7)\;\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}a\,(x_7 - y_7)\;\hat{\mathbf{y}} + c\left(z_7 + \frac{1}{2}\right)\;\hat{\mathbf{z}}$	(24m)	Si I
$\mathbf{B_{92}}$	=	$-\,(x_7 - y_7)\;\mathbf{a}_1 + y_7\,\mathbf{a}_2 + \left(z_7 + \frac{1}{2}\right)\;\mathbf{a}_3$	=	$\frac{1}{2}a\,(-x_7 + 2y_7)\;\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ax_7\,\hat{\mathbf{y}} + c\left(z_7 + \frac{1}{2}\right)\;\hat{\mathbf{z}}$	(24m)	Si I
$\mathbf{B_{93}}$	=	$x_7\,\mathbf{a}_1 + (x_7 - y_7)\;\mathbf{a}_2 + \left(z_7 + \frac{1}{2}\right)\;\mathbf{a}_3$	=	$\frac{1}{2}a\,(2x_7 - y_7)\;\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ay_7\,\hat{\mathbf{y}} + c\left(z_7 + \frac{1}{2}\right)\;\hat{\mathbf{z}}$	(24m)	Si I
$\mathbf{B_{94}}$	=	$y_7\,\mathbf{a}_1 + x_7\,\mathbf{a}_2 + \left(z_7 + \frac{1}{2}\right)\;\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_7 + y_7)\;\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}a\,(x_7 - y_7)\;\hat{\mathbf{y}} + c\left(z_7 + \frac{1}{2}\right)\;\hat{\mathbf{z}}$	(24m)	Si I
$\mathbf{B_{95}}$	=	$(x_7 - y_7)\;\mathbf{a}_1 - y_7\,\mathbf{a}_2 + \left(z_7 + \frac{1}{2}\right)\;\mathbf{a}_3$	=	$\frac{1}{2}a\,(x_7 - 2y_7)\;\hat{\mathbf{x}} - \frac{\sqrt{3}}{2}ax_7\,\hat{\mathbf{y}} + c\left(z_7 + \frac{1}{2}\right)\;\hat{\mathbf{z}}$	(24m)	Si I
$\mathbf{B_{96}}$	=	$-x_7\,\mathbf{a}_1 - (x_7 - y_7)\;\mathbf{a}_2 + \left(z_7 + \frac{1}{2}\right)\;\mathbf{a}_3$	=	$-\frac{1}{2}a\,(2x_7 - y_7)\;\hat{\mathbf{x}} + \frac{\sqrt{3}}{2}ay_7\,\hat{\mathbf{y}} + c\left(z_7 + \frac{1}{2}\right)\;\hat{\mathbf{z}}$	(24m)	Si I

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