

$Fd\bar{3}c$

O_h^8

$m\bar{3}m$

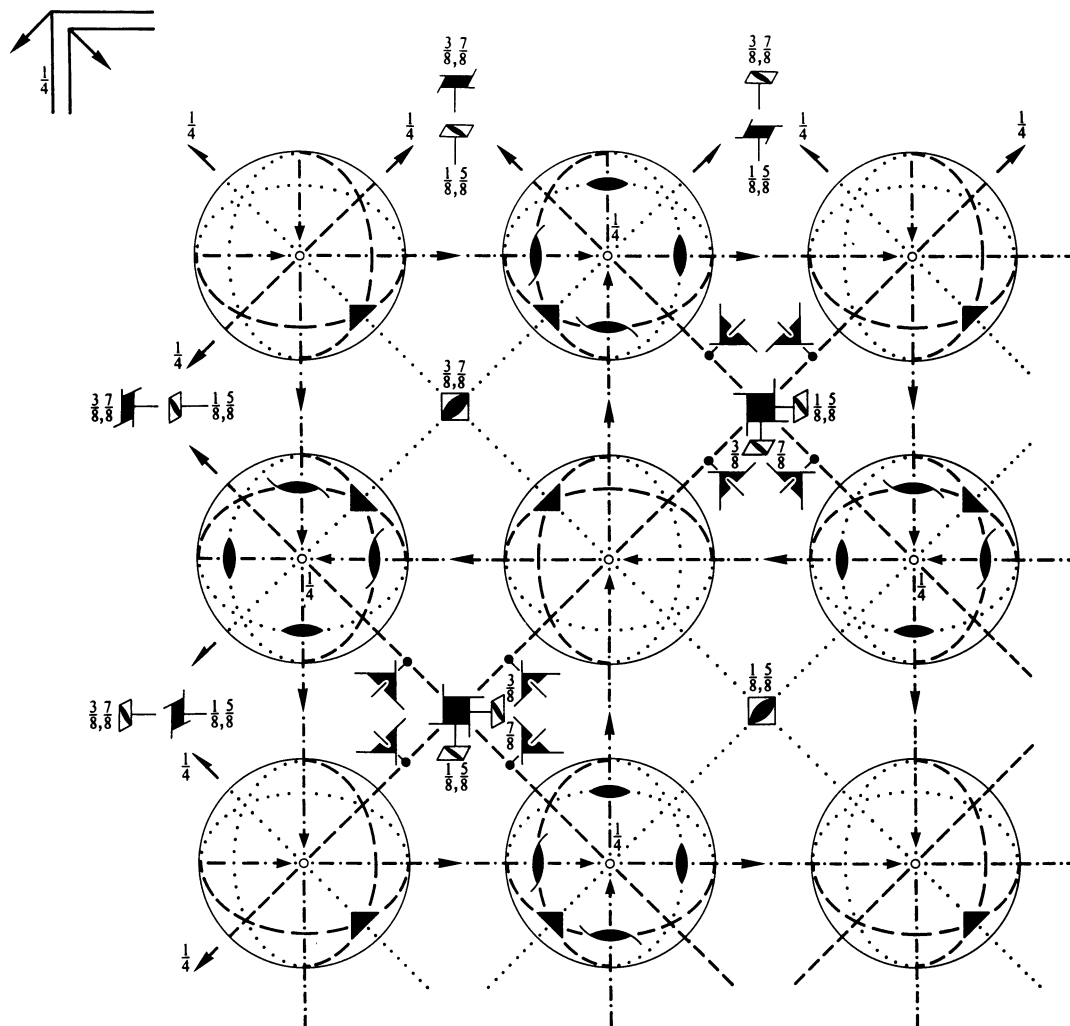
Cubic

No. 228

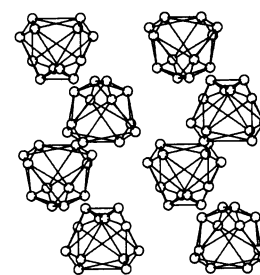
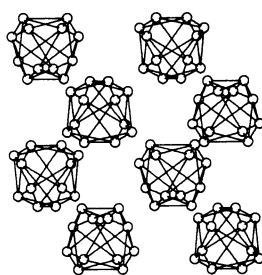
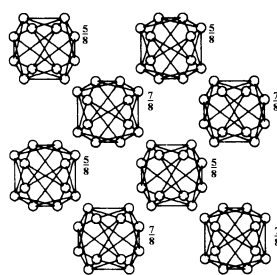
$F 4_1/d \bar{3} 2/c$

Patterson symmetry $Fm\bar{3}m$

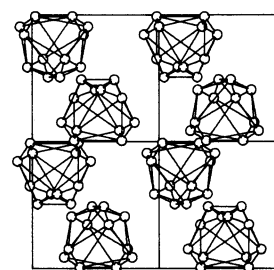
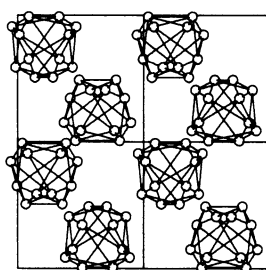
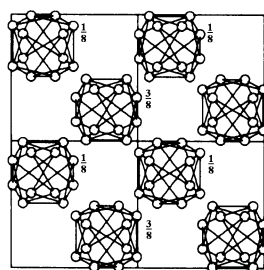
ORIGIN CHOICE 2



Upper left quadrant only



Upper half of unit cell



Lower half of unit cell

Origin at centre ($\bar{3}$), at $\frac{1}{8}, \frac{1}{8}, \frac{1}{8}$ from 23

Asymmetric unit $-\frac{1}{8} \leq x \leq \frac{3}{8}; -\frac{1}{8} \leq y \leq 0; -\frac{1}{4} \leq z \leq 0; y \leq \min(\frac{1}{4}-x, x); -y-\frac{1}{4} \leq z \leq y$
Vertices $-\frac{1}{8}, -\frac{1}{8}, -\frac{1}{8}; \frac{3}{8}, -\frac{1}{8}, -\frac{1}{8}; \frac{1}{4}, 0, 0; 0, 0, 0; \frac{1}{4}, 0, -\frac{1}{4}; 0, 0, -\frac{1}{4}$

Symmetry operations

(given on page 711)

Generators selected (1); $t(1,0,0)$; $t(0,1,0)$; $t(0,0,1)$; $t(0, \frac{1}{2}, \frac{1}{2})$; $t(\frac{1}{2}, 0, \frac{1}{2})$; (2); (3); (5); (13); (25)

Positions

Multiplicity, Wyckoff letter, Site symmetry		Coordinates		Reflection conditions
	(0,0,0)+	$(0, \frac{1}{2}, \frac{1}{2})+$	$(\frac{1}{2}, 0, \frac{1}{2})+$	$(\frac{1}{2}, \frac{1}{2}, 0)+$

192	<i>h</i>	1	(1) x, y, z	(2) $\bar{x} + \frac{1}{4}, \bar{y} + \frac{3}{4}, z + \frac{1}{2}$	(3) $\bar{x} + \frac{3}{4}, y + \frac{1}{2}, \bar{z} + \frac{1}{4}$	(4) $x + \frac{1}{2}, \bar{y} + \frac{1}{4}, \bar{z} + \frac{3}{4}$	<i>hkl</i> : $h + k = 2n$ and $h + l, k + l = 2n$
			(5) z, x, y	(6) $z + \frac{1}{2}, \bar{x} + \frac{1}{4}, \bar{y} + \frac{3}{4}$	(7) $\bar{z} + \frac{1}{4}, \bar{x} + \frac{3}{4}, y + \frac{1}{2}$	(8) $\bar{z} + \frac{3}{4}, x + \frac{1}{2}, \bar{y} + \frac{1}{4}$	<i>Ok</i> l : $k + l = 4n$ and $k, l = 2n$
			(9) y, z, x	(10) $\bar{y} + \frac{3}{4}, z + \frac{1}{2}, \bar{x} + \frac{1}{4}$	(11) $y + \frac{1}{2}, \bar{z} + \frac{1}{4}, \bar{x} + \frac{3}{4}$	(12) $\bar{y} + \frac{1}{4}, \bar{z} + \frac{3}{4}, x + \frac{1}{2}$	<i>hh</i> l : $h, l = 2n$
			(13) $y + \frac{3}{4}, x + \frac{1}{4}, \bar{z}$	(14) $\bar{y} + \frac{1}{2}, \bar{x} + \frac{1}{2}, \bar{z} + \frac{1}{2}$	(15) $y + \frac{1}{4}, \bar{x}, z + \frac{3}{4}$	(16) $\bar{y}, x + \frac{3}{4}, z + \frac{1}{4}$	<i>h00</i> : $h = 4n$
			(17) $x + \frac{3}{4}, z + \frac{1}{4}, \bar{y}$	(18) $\bar{x}, z + \frac{3}{4}, y + \frac{1}{4}$	(19) $\bar{x} + \frac{1}{2}, \bar{z} + \frac{1}{2}, \bar{y} + \frac{1}{2}$	(20) $x + \frac{1}{4}, \bar{z}, y + \frac{3}{4}$	
			(21) $z + \frac{3}{4}, y + \frac{1}{4}, \bar{x}$	(22) $z + \frac{1}{4}, \bar{y}, x + \frac{3}{4}$	(23) $\bar{z}, y + \frac{3}{4}, x + \frac{1}{4}$	(24) $\bar{z} + \frac{1}{2}, \bar{y} + \frac{1}{2}, \bar{x} + \frac{1}{2}$	
			(25) $\bar{x}, \bar{y}, \bar{z}$	(26) $x + \frac{3}{4}, y + \frac{1}{4}, \bar{z} + \frac{1}{2}$	(27) $x + \frac{1}{4}, \bar{y} + \frac{1}{2}, z + \frac{3}{4}$	(28) $\bar{x} + \frac{1}{2}, y + \frac{3}{4}, z + \frac{1}{4}$	
			(29) $\bar{z}, \bar{x}, \bar{y}$	(30) $\bar{z} + \frac{1}{2}, x + \frac{3}{4}, y + \frac{1}{4}$	(31) $z + \frac{3}{4}, x + \frac{1}{4}, \bar{y} + \frac{1}{2}$	(32) $z + \frac{1}{4}, \bar{x} + \frac{1}{2}, y + \frac{3}{4}$	
			(33) $\bar{y}, \bar{z}, \bar{x}$	(34) $y + \frac{1}{4}, \bar{z} + \frac{1}{2}, x + \frac{3}{4}$	(35) $\bar{y} + \frac{1}{2}, z + \frac{3}{4}, x + \frac{1}{4}$	(36) $y + \frac{3}{4}, z + \frac{1}{4}, \bar{x} + \frac{1}{2}$	
			(37) $\bar{y} + \frac{1}{4}, \bar{x} + \frac{3}{4}, z$	(38) $y + \frac{1}{2}, x + \frac{1}{2}, z + \frac{1}{2}$	(39) $\bar{y} + \frac{3}{4}, x, \bar{z} + \frac{1}{4}$	(40) $y, \bar{x} + \frac{1}{4}, \bar{z} + \frac{3}{4}$	
			(41) $\bar{x} + \frac{1}{4}, \bar{z} + \frac{3}{4}, y$	(42) $x, \bar{z} + \frac{1}{4}, \bar{y} + \frac{3}{4}$	(43) $x + \frac{1}{2}, z + \frac{1}{2}, y + \frac{1}{2}$	(44) $\bar{x} + \frac{3}{4}, z, \bar{y} + \frac{1}{4}$	
			(45) $\bar{z} + \frac{1}{4}, \bar{y} + \frac{3}{4}, x$	(46) $\bar{z} + \frac{3}{4}, y, \bar{x} + \frac{1}{4}$	(47) $z, \bar{y} + \frac{1}{4}, \bar{x} + \frac{3}{4}$	(48) $z + \frac{1}{2}, y + \frac{1}{2}, x + \frac{1}{2}$	

Special: as above, plus

no extra conditions

hkl : $h + k + l = 4n$

hkl : $h = 2n$

hkl : $h + k + l = 4n$

hkl : $h, k, l = 4n + 2$
or $h, k, l = 4n$

hkl : $h, k, l = 4n + 2$
or $h, k, l = 4n$

hkl : $h + k + l = 4n$

ORIGIN CHOICE 2

Symmetry of special projections

Along $[001] p4mm$

$$\mathbf{a}' = \frac{1}{4}(\mathbf{a} - \mathbf{b}) \quad \mathbf{b}' = \frac{1}{4}(\mathbf{a} + \mathbf{b})$$

Origin at $\frac{1}{8}, \frac{3}{8}, z$

Along $[111] p6mm$

$$\mathbf{a}' = \frac{1}{6}(2\mathbf{a} - \mathbf{b} - \mathbf{c}) \quad \mathbf{b}' = \frac{1}{6}(-\mathbf{a} + 2\mathbf{b} - \mathbf{c})$$

Origin at x, x, x

Along $[110] p2mm$

$$\mathbf{a}' = \frac{1}{4}(-\mathbf{a} + \mathbf{b}) \quad \mathbf{b}' = \frac{1}{2}\mathbf{c}$$

Origin at $x, x, 0$

Maximal non-isomorphic subgroups

I	[2] $F\bar{4}3c$ (219)	(1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 37; 38; 39; 40; 41; 42; 43; 44; 45; 46; 47; 48)+
	[2] $F4_132$ (210)	(1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13; 14; 15; 16; 17; 18; 19; 20; 21; 22; 23; 24)+
	[2] $Fd\bar{3}1$ ($Fd\bar{3}$, 203)	(1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 25; 26; 27; 28; 29; 30; 31; 32; 33; 34; 35; 36)+
	{ [3] $F4_1/d12/c$ ($I4_1/acd$, 142)	(1; 2; 3; 4; 13; 14; 15; 16; 25; 26; 27; 28; 37; 38; 39; 40)+
	{ [3] $F4_1/d12/c$ ($I4_1/acd$, 142)	(1; 2; 3; 4; 17; 18; 19; 20; 25; 26; 27; 28; 41; 42; 43; 44)+
	{ [3] $F4_1/d12/c$ ($I4_1/acd$, 142)	(1; 2; 3; 4; 21; 22; 23; 24; 25; 26; 27; 28; 45; 46; 47; 48)+
	{ [4] $F1\bar{3}2/c$ ($R\bar{3}c$, 167)	(1; 5; 9; 14; 19; 24; 25; 29; 33; 38; 43; 48)+
	{ [4] $F1\bar{3}2/c$ ($R\bar{3}c$, 167)	(1; 6; 12; 13; 18; 24; 25; 30; 36; 37; 42; 48)+
	{ [4] $F1\bar{3}2/c$ ($R\bar{3}c$, 167)	(1; 7; 10; 13; 19; 22; 25; 31; 34; 37; 43; 46)+
	{ [4] $F1\bar{3}2/c$ ($R\bar{3}c$, 167)	(1; 8; 11; 14; 18; 22; 25; 32; 35; 38; 42; 46)+

IIa none

IIb none

Maximal isomorphic subgroups of lowest index

IIc [27] $Fd\bar{3}c$ ($\mathbf{a}' = 3\mathbf{a}, \mathbf{b}' = 3\mathbf{b}, \mathbf{c}' = 3\mathbf{c}$) (228)

Minimal non-isomorphic supergroups

I none

II [2] $Pn\bar{3}m$ ($\mathbf{a}' = \frac{1}{2}\mathbf{a}, \mathbf{b}' = \frac{1}{2}\mathbf{b}, \mathbf{c}' = \frac{1}{2}\mathbf{c}$) (224)

Symmetry operations

For (0,0,0)+ set

- | | | | |
|---|--|--|--|
| (1) 1 | (2) $2(0,0,\frac{1}{2}) \frac{1}{8},\frac{3}{8},z$ | (3) $2(0,\frac{1}{2},0) \frac{3}{8},y,\frac{1}{8}$ | (4) $2(\frac{1}{2},0,0) x,\frac{1}{8},\frac{3}{8}$ |
| (5) $3^+ x,x,x$ | (6) $3^+(\frac{1}{3},-\frac{1}{3},\frac{1}{3}) \bar{x}+\frac{1}{6},x+\frac{5}{12},\bar{x}$ | (7) $3^+(-\frac{1}{3},\frac{1}{3},\frac{1}{3}) x+\frac{7}{12},\bar{x}-\frac{1}{6},\bar{x}$ | (8) $3^+(\frac{1}{3},\frac{1}{3},-\frac{1}{3}) \bar{x}+\frac{5}{12},\bar{x}+\frac{7}{12},x$ |
| (9) $3^- x,x,x$ | (10) $3^- x+\frac{1}{4},\bar{x}+\frac{1}{2},\bar{x}$ | (11) $3^- \bar{x}+\frac{3}{4},\bar{x}+\frac{1}{4},x$ | (12) $3^- \bar{x}-\frac{1}{2},x+\frac{3}{4},\bar{x}$ |
| (13) $2(\frac{1}{2},\frac{1}{2},0) x,x-\frac{1}{4},0$ | (14) $2 x,\bar{x}+\frac{1}{2},\frac{1}{4}$ | (15) $4^-(0,0,\frac{3}{4}) \frac{1}{8},-\frac{1}{8},z$ | (16) $4^+(0,0,\frac{1}{4}) -\frac{3}{8},\frac{3}{8},z$ |
| (17) $4^-(\frac{3}{4},0,0) x,\frac{1}{8},-\frac{1}{8}$ | (18) $2(0,\frac{1}{2},\frac{1}{2}) 0,y+\frac{1}{4},y$ | (19) $2 \frac{1}{4},y+\frac{1}{2},\bar{y}$ | (20) $4^+(\frac{1}{4},0,0) x,-\frac{3}{8},\frac{3}{8}$ |
| (21) $4^+(0,\frac{1}{4},0) \frac{3}{8},y,-\frac{3}{8}$ | (22) $2(\frac{1}{2},0,\frac{1}{2}) x-\frac{1}{4},0,x$ | (23) $4^-(0,\frac{3}{4},0) -\frac{1}{8},y,\frac{1}{8}$ | (24) $2 \bar{x}+\frac{1}{2},\frac{1}{4},x$ |
| (25) $\bar{1} 0,0,0$ | (26) $d(\frac{3}{4},\frac{1}{4},0) x,y,\frac{1}{4}$ | (27) $d(\frac{1}{4},0,\frac{3}{4}) x,\frac{1}{4},z$ | (28) $d(0,\frac{3}{4},\frac{1}{4}) \frac{1}{4},y,z$ |
| (29) $\bar{3}^+ x,x,x; 0,0,0$ | (30) $\bar{3}^+ \bar{x}-1,x+\frac{5}{4},\bar{x}; -\frac{1}{4},\frac{1}{2},\frac{3}{4}$ | (31) $\bar{3}^+ x+\frac{1}{4},\bar{x}+1,\bar{x}; \frac{1}{2},\frac{3}{4},-\frac{1}{4}$ | (32) $\bar{3}^+ \bar{x}+\frac{5}{4},\bar{x}+\frac{1}{4},x; \frac{3}{4},-\frac{1}{4},\frac{1}{2}$ |
| (33) $\bar{3}^- x,x,x; 0,0,0$ | (34) $\bar{3}^- x+\frac{3}{4},\bar{x}-1,\bar{x}; 0,-\frac{1}{4},\frac{3}{4}$ | (35) $\bar{3}^- \bar{x}-\frac{1}{4},\bar{x}+\frac{3}{4},x; -\frac{1}{4},\frac{3}{4},0$ | (36) $\bar{3}^- \bar{x}+1,x-\frac{1}{4},\bar{x}; \frac{3}{4},0,-\frac{1}{4}$ |
| (37) $g(-\frac{1}{4},\frac{1}{4},0) x+\frac{1}{2},\bar{x},z$ | (38) $n(\frac{1}{2},\frac{1}{2},\frac{1}{2}) x,x,z$ | (39) $\bar{4}^- \frac{3}{8},\frac{3}{8},z; \frac{3}{8},\frac{3}{8},\frac{1}{8}$ | (40) $\bar{4}^+ \frac{1}{8},\frac{1}{8},z; \frac{1}{8},\frac{1}{8},\frac{3}{8}$ |
| (41) $\bar{4}^- x,\frac{3}{8},\frac{3}{8}; \frac{1}{8},\frac{3}{8},\frac{3}{8}$ | (42) $g(0,-\frac{1}{4},\frac{1}{4}) x,y+\frac{1}{2},\bar{y}$ | (43) $n(\frac{1}{2},\frac{1}{2},\frac{1}{2}) x,y,y$ | (44) $\bar{4}^+ x,\frac{1}{8},\frac{1}{8}; \frac{3}{8},\frac{3}{8},\frac{1}{8}$ |
| (45) $\bar{4}^+ \frac{1}{8},y,\frac{3}{8}; \frac{1}{8},\frac{3}{8},\frac{1}{8}$ | (46) $g(\frac{1}{4},0,-\frac{1}{4}) \bar{x}+\frac{1}{2},y,x$ | (47) $\bar{4}^- \frac{3}{8},y,\frac{3}{8}; \frac{1}{8},\frac{1}{8},\frac{3}{8}$ | (48) $n(\frac{1}{2},\frac{1}{2},\frac{1}{2}) x,y,x$ |

For (0, $\frac{1}{2},\frac{1}{2}$)+ set

- | | | | |
|---|--|--|--|
| (1) $t(0,\frac{1}{2},\frac{1}{2})$ | (2) $2 \frac{1}{8},\frac{1}{8},z$ | (3) $2 \frac{3}{8},y,\frac{3}{8}$ | (4) $2(\frac{1}{2},0,0) x,\frac{3}{8},\frac{1}{8}$ |
| (5) $3^+(\frac{1}{3},\frac{1}{3},\frac{1}{3}) x-\frac{1}{3},x-\frac{1}{6},x$ | (6) $3^+ \bar{x}+\frac{1}{2},x+\frac{1}{4},\bar{x}$ | (7) $3^+ x+\frac{1}{4},\bar{x},\bar{x}$ | (8) $3^+ \bar{x}+\frac{3}{4},\bar{x}+\frac{3}{4},x$ |
| (9) $3^-(\frac{1}{3},\frac{1}{3},\frac{1}{3}) x-\frac{1}{6},x+\frac{1}{6},x$ | (10) $3^- x+\frac{3}{4},\bar{x},\bar{x}$ | (11) $3^-(\frac{1}{3},\frac{1}{3},-\frac{1}{3}) \bar{x}+\frac{7}{12},\bar{x}+\frac{5}{12},x$ | (12) $3^- \bar{x},x+\frac{1}{4},\bar{x}$ |
| (13) $2(\frac{3}{4},\frac{3}{4},0) x,x,\frac{1}{4}$ | (14) $2(\frac{1}{4},-\frac{1}{4},0) x,\bar{x}+\frac{1}{4},0$ | (15) $4^-(0,0,\frac{1}{4}) \frac{3}{8},\frac{1}{8},z$ | (16) $4^+(0,0,\frac{3}{4}) -\frac{1}{8},\frac{1}{8},z$ |
| (17) $4^-(\frac{3}{4},0,0) x,\frac{3}{8},-\frac{1}{8}$ | (18) $2(0,\frac{1}{2},\frac{1}{2}) 0,y-\frac{1}{4},y$ | (19) $2 \frac{1}{4},y,\bar{y}$ | (20) $4^+(\frac{1}{4},0,0) x,\frac{1}{8},\frac{3}{8}$ |
| (21) $4^+(0,\frac{3}{4},0) \frac{5}{8},y,-\frac{1}{8}$ | (22) $2(\frac{1}{4},0,\frac{1}{4}) x,\frac{1}{4},x$ | (23) $4^-(0,\frac{1}{4},0) -\frac{3}{8},y,\frac{3}{8}$ | (24) $2(\frac{1}{4},0,-\frac{1}{4}) \bar{x}+\frac{1}{4},0,x$ |
| (25) $\bar{1} 0,\frac{1}{4},\frac{1}{4}$ | (26) $d(\frac{3}{4},\frac{3}{4},0) x,y,0$ | (27) $d(\frac{1}{4},0,\frac{1}{4}) x,0,z$ | (28) $d(0,\frac{1}{4},\frac{3}{4}) \frac{1}{4},y,z$ |
| (29) $\bar{3}^+ x,x+\frac{1}{2},x; 0,\frac{1}{2},0$ | (30) $\bar{3}^+ \bar{x}-1,x+\frac{3}{4},\bar{x}; -\frac{1}{4},0,\frac{3}{4}$ | (31) $\bar{3}^+ x-\frac{3}{4},\bar{x}+\frac{3}{2},\bar{x}; 0,\frac{3}{4},-\frac{3}{4}$ | (32) $\bar{3}^+ \bar{x}+\frac{1}{4},\bar{x}-\frac{1}{4},x; \frac{1}{4},-\frac{1}{4},0$ |
| (33) $\bar{3}^- x-\frac{1}{2},x-\frac{1}{2},x; 0,0,\frac{1}{2}$ | (34) $\bar{3}^- x+\frac{1}{4},\bar{x}-\frac{1}{2},\bar{x}; 0,-\frac{1}{4},\frac{1}{4}$ | (35) $\bar{3}^- \bar{x}+\frac{1}{4},\bar{x}+\frac{5}{4},x; -\frac{1}{4},\frac{3}{4},\frac{1}{2}$ | (36) $\bar{3}^- \bar{x}+\frac{3}{2},x-\frac{3}{4},\bar{x}; \frac{3}{4},0,-\frac{3}{4}$ |
| (37) $c x+\frac{1}{4},\bar{x},z$ | (38) $g(\frac{1}{4},\frac{1}{4},0) x+\frac{1}{4},x,z$ | (39) $\bar{4}^- \frac{1}{8},\frac{3}{8},z; \frac{1}{8},\frac{3}{8},\frac{3}{8}$ | (40) $\bar{4}^+ \frac{3}{8},\frac{3}{8},z; \frac{1}{8},\frac{3}{8},\frac{1}{8}$ |
| (41) $\bar{4}^- x,-\frac{1}{8},\frac{3}{8}; \frac{1}{8},-\frac{1}{8},\frac{3}{8}$ | (42) $g(0,\frac{1}{4},-\frac{1}{4}) x,y+\frac{1}{2},\bar{y}$ | (43) $a x,y,y$ | (44) $\bar{4}^+ x,\frac{3}{8},\frac{1}{8}; \frac{3}{8},\frac{3}{8},\frac{1}{8}$ |
| (45) $\bar{4}^+ -\frac{1}{8},y,\frac{3}{8}; -\frac{1}{8},\frac{3}{8},\frac{1}{8}$ | (46) $b \bar{x}+\frac{3}{4},y,x$ | (47) $\bar{4}^- \frac{1}{8},y,\frac{1}{8}; \frac{3}{8},\frac{3}{8},\frac{1}{8}$ | (48) $g(\frac{1}{4},0,\frac{1}{4}) x+\frac{1}{4},y,x$ |

For ($\frac{1}{2},0,\frac{1}{2}$)+ set

- | | | | |
|---|---|--|--|
| (1) $t(\frac{1}{2},0,\frac{1}{2})$ | (2) $2 \frac{3}{8},\frac{3}{8},z$ | (3) $2(0,\frac{1}{2},0) \frac{1}{8},y,\frac{3}{8}$ | (4) $2 x,\frac{1}{8},\frac{1}{8}$ |
| (5) $3^+(\frac{1}{3},\frac{1}{3},\frac{1}{3}) x+\frac{1}{6},x-\frac{1}{6},x$ | (6) $3^+ \bar{x},x+\frac{1}{4},\bar{x}$ | (7) $3^+ x+\frac{3}{4},\bar{x},\bar{x}$ | (8) $3^+ \bar{x}+\frac{1}{4},\bar{x}+\frac{3}{4},x$ |
| (9) $3^-(\frac{1}{3},\frac{1}{3},\frac{1}{3}) x-\frac{1}{6},x-\frac{1}{3},x$ | (10) $3^-(-\frac{1}{3},\frac{1}{3},\frac{1}{3}) x+\frac{5}{12},\bar{x}+\frac{1}{6},\bar{x}$ | (11) $3^- \bar{x}+\frac{1}{4},\bar{x}+\frac{1}{4},x$ | (12) $3^- \bar{x},x+\frac{3}{4},\bar{x}$ |
| (13) $2(\frac{1}{4},\frac{1}{4},0) x,x,\frac{1}{4}$ | (14) $2(-\frac{1}{4},\frac{1}{4},0) x,\bar{x}+\frac{1}{4},0$ | (15) $4^-(0,0,\frac{1}{4}) \frac{3}{8},-\frac{3}{8},z$ | (16) $4^+(0,0,\frac{3}{4}) -\frac{1}{8},\frac{5}{8},z$ |
| (17) $4^-(\frac{1}{4},0,0) x,\frac{3}{8},\frac{1}{8}$ | (18) $2(0,\frac{3}{4},\frac{3}{4}) \frac{1}{4},y,y$ | (19) $2(0,\frac{1}{4},-\frac{1}{4}) 0,y+\frac{1}{4},\bar{y}$ | (20) $4^+(\frac{3}{4},0,0) x,-\frac{1}{8},\frac{1}{8}$ |
| (21) $4^+(0,\frac{1}{4},0) \frac{3}{8},y,\frac{1}{8}$ | (22) $2(\frac{1}{2},0,\frac{1}{2}) x+\frac{1}{4},0,x$ | (23) $4^-(0,\frac{3}{4},0) -\frac{1}{8},y,\frac{5}{8}$ | (24) $2 \bar{x},\frac{1}{4},x$ |
| (25) $\bar{1} \frac{1}{4},0,\frac{1}{4}$ | (26) $d(\frac{1}{4},\frac{1}{4},0) x,y,0$ | (27) $d(\frac{3}{4},0,\frac{1}{4}) x,\frac{1}{4},z$ | (28) $d(0,\frac{3}{4},\frac{3}{4}) 0,y,z$ |
| (29) $\bar{3}^+ x-\frac{1}{2},x-\frac{1}{2},x; 0,0,\frac{1}{2}$ | (30) $\bar{3}^+ \bar{x}-\frac{3}{2},x+\frac{3}{4},\bar{x}; -\frac{3}{4},0,\frac{3}{4}$ | (31) $\bar{3}^+ x-\frac{1}{4},\bar{x}+\frac{1}{2},\bar{x}; 0,\frac{1}{4},-\frac{1}{4}$ | (32) $\bar{3}^+ \bar{x}+\frac{3}{4},\bar{x}-\frac{1}{4},x; \frac{3}{4},-\frac{1}{4},0$ |
| (33) $\bar{3}^- x+\frac{1}{2},x,x; \frac{1}{2},0,0$ | (34) $\bar{3}^- x+\frac{3}{4},\bar{x}-1,\bar{x}; \frac{1}{2},-\frac{1}{4},\frac{3}{4}$ | (35) $\bar{3}^- \bar{x}-\frac{3}{2},\bar{x}+\frac{3}{2},x; -\frac{3}{4},\frac{3}{4},0$ | (36) $\bar{3}^- \bar{x}+\frac{1}{2},x-\frac{1}{4},\bar{x}; \frac{1}{4},0,-\frac{1}{4}$ |
| (37) $c x+\frac{3}{4},\bar{x},z$ | (38) $g(\frac{1}{4},\frac{1}{4},0) x-\frac{1}{4},x,z$ | (39) $\bar{4}^- \frac{1}{8},\frac{1}{8},z; \frac{1}{8},\frac{1}{8},\frac{3}{8}$ | (40) $\bar{4}^+ \frac{3}{8},-\frac{1}{8},z; \frac{3}{8},-\frac{1}{8},\frac{1}{8}$ |
| (41) $\bar{4}^- x,\frac{1}{8},\frac{5}{8}; \frac{3}{8},\frac{1}{8},\frac{5}{8}$ | (42) $a x,y+\frac{1}{4},\bar{y}$ | (43) $g(0,\frac{1}{4},\frac{1}{4}) x,y+\frac{1}{4},y$ | (44) $\bar{4}^+ x,\frac{3}{8},\frac{3}{8}; \frac{1}{8},\frac{3}{8},\frac{3}{8}$ |
| (45) $\bar{4}^+ \frac{1}{8},y,\frac{5}{8}; \frac{3}{8},\frac{3}{8},\frac{5}{8}$ | (46) $g(-\frac{1}{4},0,\frac{1}{4}) \bar{x}+\frac{1}{2},y,x$ | (47) $\bar{4}^- \frac{3}{8},y,-\frac{1}{8}; \frac{3}{8},\frac{1}{8},-\frac{1}{8}$ | (48) $b x,y,x$ |

For ($\frac{1}{2},\frac{1}{2},0$)+ set

- | | | | |
|---|--|--|---|
| (1) $t(\frac{1}{2},\frac{1}{2},0)$ | (2) $2(0,0,\frac{1}{2}) \frac{3}{8},\frac{3}{8},z$ | (3) $2 \frac{1}{8},y,\frac{1}{8}$ | (4) $2 x,\frac{3}{8},\frac{3}{8}$ |
| (5) $3^+(\frac{1}{3},\frac{1}{3},\frac{1}{3}) x+\frac{1}{6},x+\frac{1}{3},x$ | (6) $3^+ \bar{x},x+\frac{3}{4},\bar{x}$ | (7) $3^+ x+\frac{3}{4},\bar{x}-\frac{1}{2},\bar{x}$ | (8) $3^+ \bar{x}+\frac{1}{4},\bar{x}+\frac{1}{4},x$ |
| (9) $3^-(\frac{1}{3},\frac{1}{3},\frac{1}{3}) x+\frac{1}{3},x+\frac{1}{6},x$ | (10) $3^- x+\frac{1}{4},\bar{x},\bar{x}$ | (11) $3^- \bar{x}+\frac{3}{4},\bar{x}+\frac{3}{4},x$ | (12) $3^-(\frac{1}{3},-\frac{1}{3},\frac{1}{3}) \bar{x}-\frac{1}{6},x+\frac{7}{12},\bar{x}$ |
| (13) $2(\frac{1}{2},\frac{1}{2},0) x,x+\frac{1}{4},0$ | (14) $2 x,\bar{x},\frac{1}{4}$ | (15) $4^-(0,0,\frac{3}{4}) \frac{5}{8},-\frac{1}{8},z$ | (16) $4^+(0,0,\frac{1}{4}) \frac{1}{8},\frac{3}{8},z$ |
| (17) $4^-(\frac{1}{4},0,0) x,\frac{3}{8},-\frac{3}{8}$ | (18) $2(0,\frac{1}{4},\frac{1}{4}) \frac{1}{4},y,y$ | (19) $2(0,-\frac{1}{4},\frac{1}{4}) 0,y+\frac{1}{4},\bar{y}$ | (20) $4^+(\frac{3}{4},0,0) x,-\frac{1}{8},\frac{5}{8}$ |
| (21) $4^+(0,\frac{3}{4},0) \frac{1}{8},y,-\frac{1}{8}$ | (22) $2(\frac{3}{4},0,\frac{3}{4}) x,\frac{1}{4},x$ | (23) $4^-(0,\frac{1}{4},0) \frac{1}{8},y,\frac{3}{8}$ | (24) $2(-\frac{1}{4},0,\frac{1}{4}) \bar{x}+\frac{1}{4},0,x$ |
| (25) $\bar{1} \frac{1}{4},\frac{1}{4},0$ | (26) $d(\frac{1}{4},\frac{3}{4},0) x,y,\frac{1}{4}$ | (27) $d(\frac{3}{4},0,\frac{3}{4}) x,0,z$ | (28) $d(0,\frac{1}{4},\frac{1}{4}) 0,y,z$ |
| (29) $\bar{3}^+ x+\frac{1}{2},x,x; \frac{1}{2},0,0$ | (30) $\bar{3}^+ \bar{x}-\frac{1}{2},x+\frac{1}{4},\bar{x}; -\frac{1}{4},0,\frac{1}{4}$ | (31) $\bar{3}^+ x-\frac{1}{4},\bar{x}+1,\bar{x}; 0,\frac{3}{4},-\frac{1}{4}$ | (32) $\bar{3}^+ \bar{x}+\frac{3}{4},\bar{x}-\frac{3}{4},x; \frac{3}{4},-\frac{3}{4},0$ |
| (33) $\bar{3}^- x,x+\frac{1}{2},x; 0,\frac{1}{2},0$ | (34) $\bar{3}^- x+\frac{3}{4},\bar{x}-\frac{3}{2},\bar{x}; 0,-\frac{3}{4},\frac{3}{4}$ | (35) $\bar{3}^- \bar{x}-\frac{1}{4},\bar{x}+\frac{1}{4},x; -\frac{1}{4},\frac{1}{4},0$ | (36) $\bar{3}^- \bar{x}+1,x+\frac{1}{4},\bar{x}; \frac{3}{4},\frac{1}{2},-\frac{1}{4}$ |
| (37) $g(\frac{1}{4},-\frac{1}{4},0) x+\frac{1}{2},\bar{x},z$ | (38) $c x,x,z$ | (39) $\bar{4}^- \frac{1}{8},\frac{3}{8},z; -\frac{1}{8},\frac{3}{8},\frac{1}{8}$ | (40) $\bar{4}^+ \frac{5}{8},\frac{3}{8},z; \frac{5}{8},\frac{1}{8},\frac{3}{8}$ |
| (41) $\bar{4}^- x,\frac{1}{8},\frac{1}{8}; \frac{3}{8},\frac{1}{8},\frac{1}{8}$ | (42) $a x,y+\frac{3}{4},\bar{y}$ | (43) $g(0,\frac{1}{4},\frac{1}{4}) x,y-\frac{1}{4},y$ | (44) $\bar{4}^+ x,\frac{3}{8},-\frac{1}{8}; \frac{1}{8},\frac{3}{8},-\frac{1}{8}$ |
| (45) $\bar{4}^+ \frac{3}{8},y,\frac{3}{8}; \frac{3}{8},\frac{1}{8},\frac{3}{8}$ | (46) $b \bar{x}+\frac{1}{4},y,x$ | (47) $\bar{4}^- \frac{5}{8},y,\frac{1}{8}; \frac{5}{8},\frac{3}{8},\frac{1}{8}$ | (48) $g(\frac{1}{4},0,\frac{1}{4}) x-\frac{1}{4},y,x$ |