

$Fd\bar{3}c$

O_h^8

$m\bar{3}m$

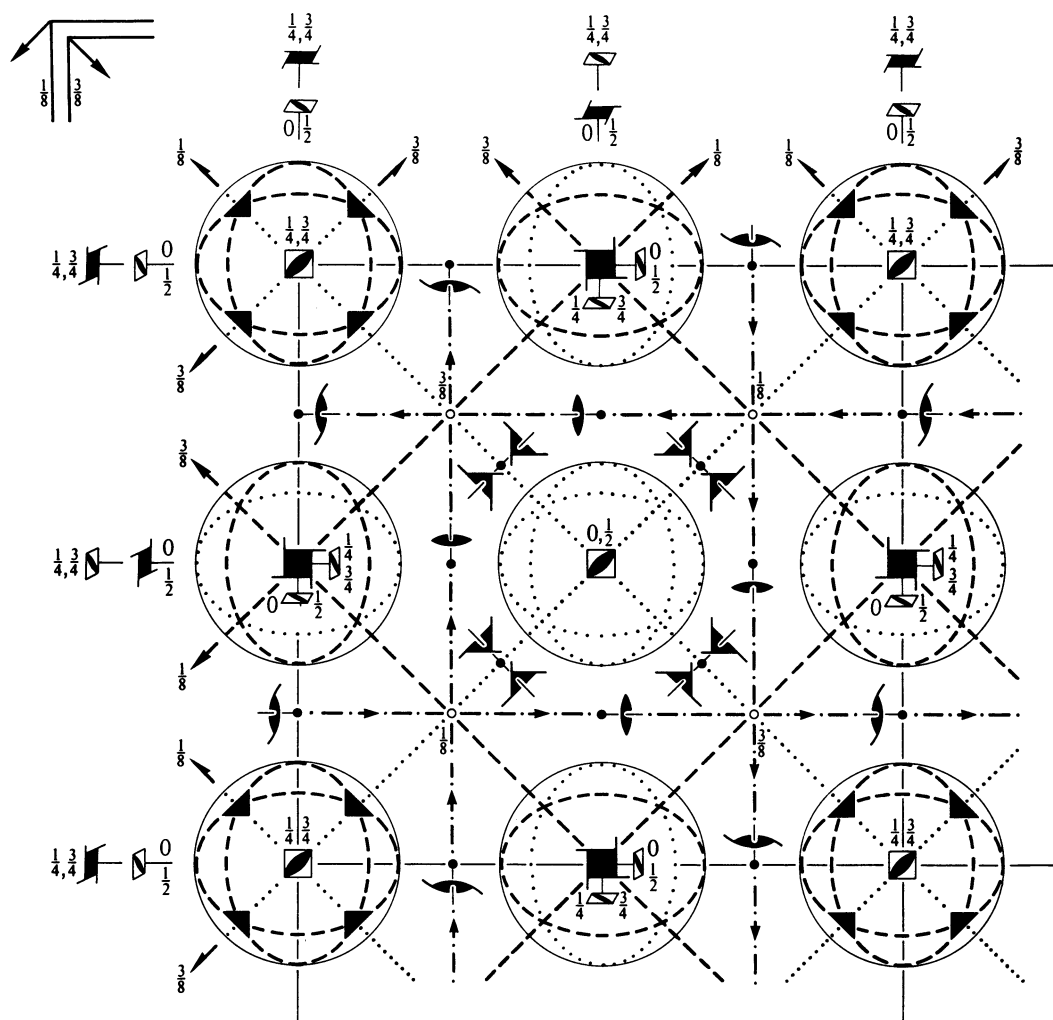
Cubic

No. 228

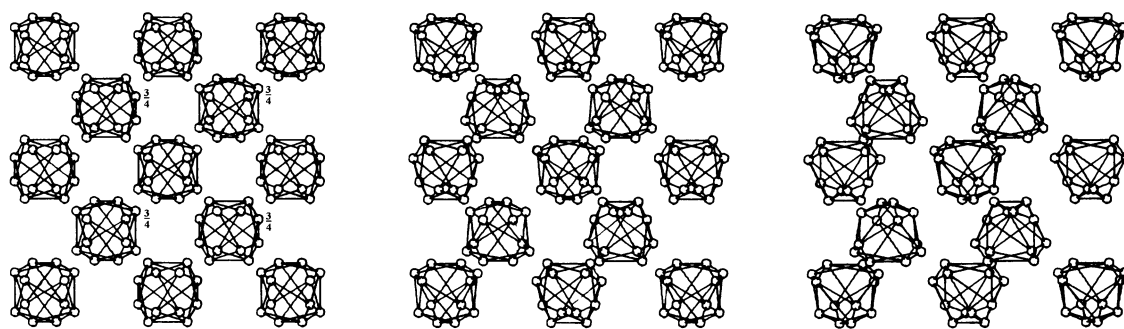
$F 4_1/d \bar{3} 2/c$

Patterson symmetry $Fm\bar{3}m$

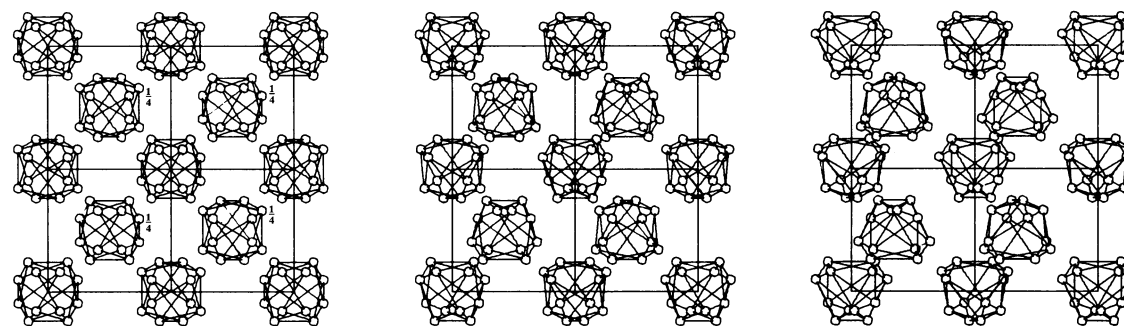
ORIGIN CHOICE 1



Upper left quadrant only



Upper half of unit cell



Lower half of unit cell

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

Asymmetric unit $0 \leq x \leq \frac{1}{2}; 0 \leq y \leq \frac{1}{8}; -\frac{1}{8} \leq z \leq \frac{1}{8}; y \leq \min(\frac{1}{2} - x, x); -y \leq z \leq y$

Vertices $0, 0, 0 \quad \frac{1}{2}, 0, 0 \quad \frac{3}{8}, \frac{1}{8}, \frac{1}{8} \quad \frac{1}{8}, \frac{1}{8}, \frac{1}{8} \quad \frac{3}{8}, \frac{1}{8}, -\frac{1}{8} \quad \frac{1}{8}, \frac{1}{8}, -\frac{1}{8}$

Symmetry operations

(given on page 707)

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

h, k, l permutable
General:

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

$hkl : h + k = 2n$ and
 $h + l, k + l = 2n$
 $0kl : k + l = 4n$ and
 $k, l = 2n$
 $hhl : h, l = 2n$
 $h00 : h = 4n$

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 1

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 $0, 0, z$

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 $x, x, \frac{1}{8}$

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

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

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