

$Ia\bar{3}d$

$O_h^{10}$

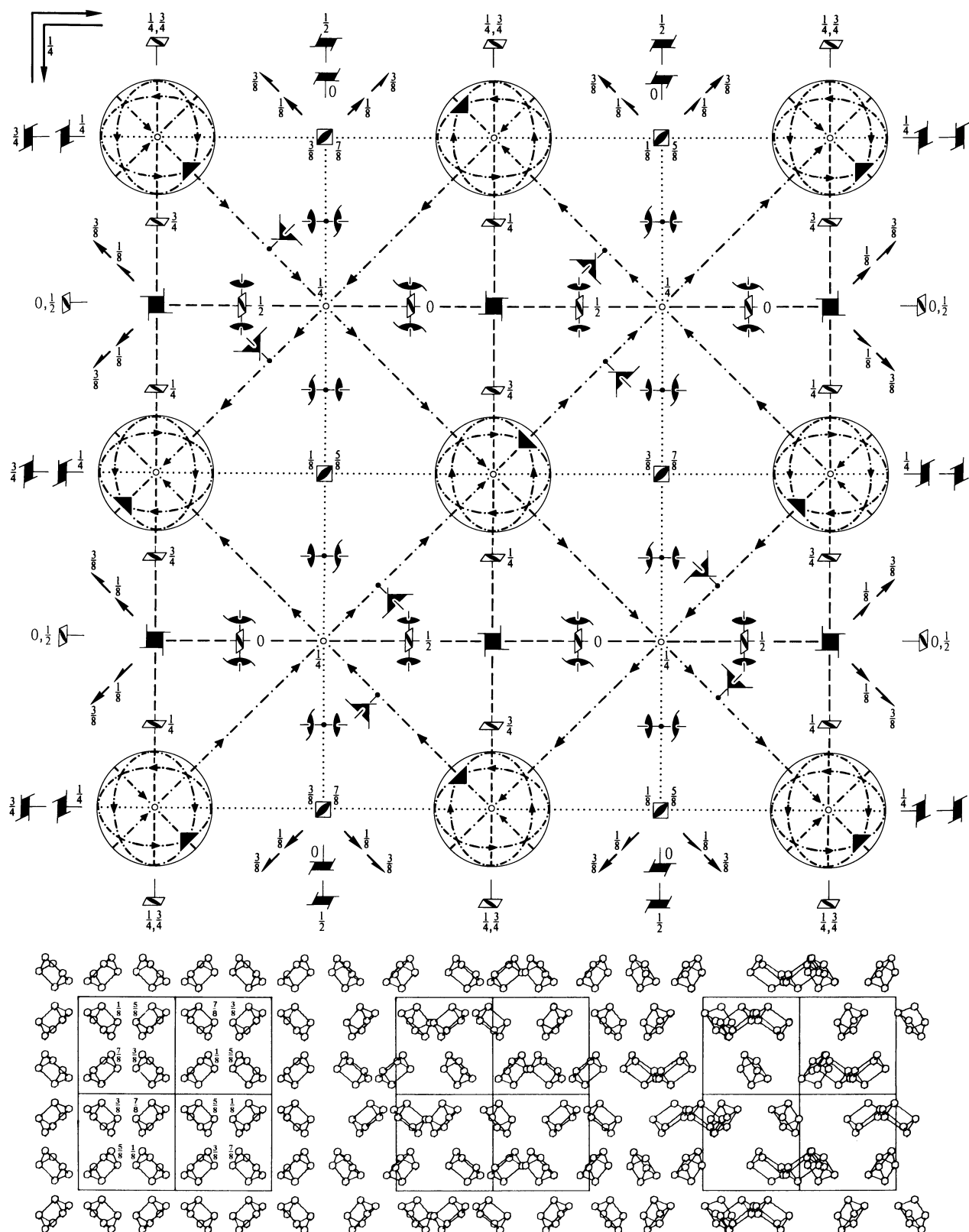
$m\bar{3}m$

Cubic

No. 230

$I 4_1/a \bar{3} 2/d$

Patterson symmetry  $Im\bar{3}m$



Origin at centre ( $\bar{3}$ )

Asymmetric unit

$$-\frac{1}{8} \leq x \leq \frac{1}{8}; \quad -\frac{1}{8} \leq y \leq \frac{1}{8}; \quad 0 \leq z \leq \frac{1}{4}; \quad \max(x, -x, y, -y) \leq z$$

Vertices

$$0, 0, 0 \quad \frac{1}{8}, \frac{1}{8}, \frac{1}{8} \quad -\frac{1}{8}, \frac{1}{8}, \frac{1}{8} \quad -\frac{1}{8}, -\frac{1}{8}, \frac{1}{8} \quad \frac{1}{8}, -\frac{1}{8}, \frac{1}{8}$$

$$\frac{1}{8}, \frac{1}{8}, \frac{1}{4} \quad -\frac{1}{8}, \frac{1}{8}, \frac{1}{4} \quad -\frac{1}{8}, -\frac{1}{8}, \frac{1}{4} \quad \frac{1}{8}, -\frac{1}{8}, \frac{1}{4}$$

**Symmetry operations**

(given on page 715)

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

**Positions**

Multiplicity,  
Wyckoff letter,  
Site symmetry

Coordinates

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

Reflection conditions

$h, k, l$  permutable  
General:

96	$h$	1	(1) $x, y, z$	(2) $\bar{x} + \frac{1}{2}, \bar{y}, z + \frac{1}{2}$	(3) $\bar{x}, y + \frac{1}{2}, \bar{z} + \frac{1}{2}$	(4) $x + \frac{1}{2}, \bar{y} + \frac{1}{2}, \bar{z}$	$hkl : h + k + l = 2n$
			(5) $z, x, y$	(6) $z + \frac{1}{2}, \bar{x} + \frac{1}{2}, \bar{y}$	(7) $\bar{z} + \frac{1}{2}, \bar{x}, y + \frac{1}{2}$	(8) $\bar{z}, x + \frac{1}{2}, \bar{y} + \frac{1}{2}$	$Ok l : k, l = 2n$
			(9) $y, z, x$	(10) $\bar{y}, z + \frac{1}{2}, \bar{x} + \frac{1}{2}$	(11) $y + \frac{1}{2}, \bar{z} + \frac{1}{2}, \bar{x}$	(12) $\bar{y} + \frac{1}{2}, \bar{z}, x + \frac{1}{2}$	$hhl : 2h + l = 4n$
			(13) $y + \frac{3}{4}, x + \frac{1}{4}, \bar{z} + \frac{1}{4}$	(14) $\bar{y} + \frac{3}{4}, \bar{x} + \frac{3}{4}, \bar{z} + \frac{3}{4}$	(15) $y + \frac{1}{4}, \bar{x} + \frac{1}{4}, z + \frac{3}{4}$	(16) $\bar{y} + \frac{1}{4}, x + \frac{3}{4}, z + \frac{1}{4}$	$h00 : h = 4n$
			(17) $x + \frac{3}{4}, z + \frac{1}{4}, \bar{y} + \frac{1}{4}$	(18) $\bar{x} + \frac{1}{4}, z + \frac{3}{4}, y + \frac{1}{4}$	(19) $\bar{x} + \frac{3}{4}, \bar{z} + \frac{3}{4}, \bar{y} + \frac{3}{4}$	(20) $x + \frac{1}{4}, \bar{z} + \frac{1}{4}, y + \frac{3}{4}$	
			(21) $z + \frac{3}{4}, y + \frac{1}{4}, \bar{x} + \frac{1}{4}$	(22) $z + \frac{1}{4}, \bar{y} + \frac{1}{4}, x + \frac{3}{4}$	(23) $\bar{z} + \frac{1}{4}, y + \frac{3}{4}, x + \frac{1}{4}$	(24) $\bar{z} + \frac{3}{4}, \bar{y} + \frac{3}{4}, \bar{x} + \frac{3}{4}$	
			(25) $\bar{x}, \bar{y}, \bar{z}$	(26) $x + \frac{1}{2}, y, \bar{z} + \frac{1}{2}$	(27) $x, \bar{y} + \frac{1}{2}, z + \frac{1}{2}$	(28) $\bar{x} + \frac{1}{2}, y + \frac{1}{2}, z$	
			(29) $\bar{z}, \bar{x}, \bar{y}$	(30) $\bar{z} + \frac{1}{2}, x + \frac{1}{2}, y$	(31) $z + \frac{1}{2}, x, \bar{y} + \frac{1}{2}$	(32) $z, \bar{x} + \frac{1}{2}, y + \frac{1}{2}$	
			(33) $\bar{y}, \bar{z}, \bar{x}$	(34) $y, \bar{z} + \frac{1}{2}, x + \frac{1}{2}$	(35) $\bar{y} + \frac{1}{2}, z + \frac{1}{2}, x$	(36) $y + \frac{1}{2}, z, \bar{x} + \frac{1}{2}$	
			(37) $\bar{y} + \frac{1}{4}, \bar{x} + \frac{3}{4}, z + \frac{3}{4}$	(38) $y + \frac{1}{4}, x + \frac{1}{4}, z + \frac{1}{4}$	(39) $\bar{y} + \frac{3}{4}, x + \frac{3}{4}, \bar{z} + \frac{1}{4}$	(40) $y + \frac{3}{4}, \bar{x} + \frac{1}{4}, \bar{z} + \frac{3}{4}$	
			(41) $\bar{x} + \frac{1}{4}, \bar{z} + \frac{3}{4}, y + \frac{3}{4}$	(42) $x + \frac{3}{4}, \bar{z} + \frac{1}{4}, \bar{y} + \frac{3}{4}$	(43) $x + \frac{1}{4}, z + \frac{1}{4}, y + \frac{1}{4}$	(44) $\bar{x} + \frac{3}{4}, z + \frac{3}{4}, \bar{y} + \frac{1}{4}$	
			(45) $\bar{z} + \frac{1}{4}, \bar{y} + \frac{3}{4}, x + \frac{3}{4}$	(46) $\bar{z} + \frac{3}{4}, y + \frac{3}{4}, \bar{x} + \frac{1}{4}$	(47) $z + \frac{3}{4}, \bar{y} + \frac{1}{4}, \bar{x} + \frac{3}{4}$	(48) $z + \frac{1}{4}, y + \frac{1}{4}, x + \frac{1}{4}$	

Special: as above, plus

48	$g$	$\dots 2$	$\frac{1}{8}, y, \bar{y} + \frac{1}{4}$	$\frac{3}{8}, \bar{y}, \bar{y} + \frac{3}{4}$	$\frac{7}{8}, y + \frac{1}{2}, y + \frac{1}{4}$	$\frac{5}{8}, \bar{y} + \frac{1}{2}, y + \frac{3}{4}$	$hkl : h = 2n + 1$
			$\bar{y} + \frac{1}{4}, \frac{1}{8}, y$	$\bar{y} + \frac{3}{4}, \frac{3}{8}, \bar{y}$	$y + \frac{1}{4}, \frac{7}{8}, y + \frac{1}{2}$	$y + \frac{3}{4}, \frac{5}{8}, \bar{y} + \frac{1}{2}$	or $h = 4n$
			$y, \bar{y} + \frac{1}{4}, \frac{1}{8}$	$\bar{y}, \bar{y} + \frac{3}{4}, \frac{3}{8}$	$y + \frac{1}{2}, y + \frac{1}{4}, \frac{7}{8}$	$\bar{y} + \frac{1}{2}, y + \frac{3}{4}, \frac{5}{8}$	
			$\frac{7}{8}, \bar{y}, y + \frac{3}{4}$	$\frac{5}{8}, y, y + \frac{1}{4}$	$\frac{1}{8}, \bar{y} + \frac{1}{2}, \bar{y} + \frac{3}{4}$	$\frac{3}{8}, y + \frac{1}{2}, \bar{y} + \frac{1}{4}$	
			$y + \frac{3}{4}, \frac{7}{8}, \bar{y}$	$y + \frac{1}{4}, \frac{5}{8}, y$	$\bar{y} + \frac{3}{4}, \frac{1}{8}, \bar{y} + \frac{1}{2}$	$\bar{y} + \frac{1}{4}, \frac{3}{8}, y + \frac{1}{2}$	
			$\bar{y}, y + \frac{3}{4}, \frac{7}{8}$	$y, y + \frac{1}{4}, \frac{5}{8}$	$\bar{y} + \frac{1}{2}, \bar{y} + \frac{3}{4}, \frac{1}{8}$	$y + \frac{1}{2}, \bar{y} + \frac{1}{4}, \frac{3}{8}$	

48	$f$	$2 \dots$	$x, 0, \frac{1}{4}$	$\bar{x} + \frac{1}{2}, 0, \frac{3}{4}$	$\frac{1}{4}, x, 0$	$\frac{3}{4}, \bar{x} + \frac{1}{2}, 0$	$0, \frac{1}{4}, x$	$0, \frac{3}{4}, \bar{x} + \frac{1}{2}$	$hkl : 2h + l = 4n$
			$\frac{3}{4}, x + \frac{1}{4}, 0$	$\frac{3}{4}, \bar{x} + \frac{3}{4}, \frac{1}{2}$	$x + \frac{3}{4}, \frac{1}{2}, \frac{1}{4}$	$\bar{x} + \frac{1}{4}, 0, \frac{1}{4}$	$0, \frac{1}{4}, \bar{x} + \frac{1}{4}$	$\frac{1}{2}, \frac{1}{4}, x + \frac{3}{4}$	
			$\bar{x}, 0, \frac{3}{4}$	$x + \frac{1}{2}, 0, \frac{1}{4}$	$\frac{3}{4}, \bar{x}, 0$	$\frac{1}{4}, x + \frac{1}{2}, 0$	$0, \frac{3}{4}, \bar{x}$	$0, \frac{1}{4}, x + \frac{1}{2}$	
			$\frac{1}{4}, \bar{x} + \frac{3}{4}, 0$	$\frac{1}{4}, x + \frac{1}{4}, \frac{1}{2}$	$\bar{x} + \frac{1}{4}, \frac{1}{2}, \frac{3}{4}$	$x + \frac{3}{4}, 0, \frac{3}{4}$	$0, \frac{3}{4}, x + \frac{3}{4}$	$\frac{1}{2}, \frac{3}{4}, \bar{x} + \frac{1}{4}$	

32	$e$	$\dots 3 \dots$	$x, x, x$	$\bar{x} + \frac{1}{2}, \bar{x}, x + \frac{1}{2}$	$\bar{x}, x + \frac{1}{2}, \bar{x} + \frac{1}{2}$	$x + \frac{1}{2}, \bar{x} + \frac{1}{2}, \bar{x}$	$hkl : h = 2n + 1$
			$x + \frac{3}{4}, x + \frac{1}{4}, \bar{x} + \frac{1}{4}$	$\bar{x} + \frac{3}{4}, \bar{x} + \frac{3}{4}, \bar{x} + \frac{3}{4}$	$x + \frac{1}{4}, \bar{x} + \frac{1}{4}, x + \frac{3}{4}$	$\bar{x} + \frac{1}{4}, x + \frac{3}{4}, x + \frac{1}{4}$	or $h + k + l = 4n$
			$\bar{x}, \bar{x}, \bar{x}$	$x + \frac{1}{2}, x, \bar{x} + \frac{1}{2}$	$x, \bar{x} + \frac{1}{2}, x + \frac{1}{2}$	$\bar{x} + \frac{1}{2}, x + \frac{1}{2}, x$	
			$\bar{x} + \frac{1}{4}, \bar{x} + \frac{3}{4}, x + \frac{3}{4}$	$x + \frac{1}{4}, x + \frac{1}{4}, x + \frac{1}{4}$	$\bar{x} + \frac{3}{4}, x + \frac{3}{4}, \bar{x} + \frac{1}{4}$	$x + \frac{3}{4}, \bar{x} + \frac{1}{4}, \bar{x} + \frac{3}{4}$	

24	$d$	$\bar{4} \dots$	$\frac{3}{8}, 0, \frac{1}{4}$	$\frac{1}{8}, 0, \frac{3}{4}$	$\frac{1}{4}, \frac{3}{8}, 0$	$\frac{3}{4}, \frac{1}{8}, 0$	$0, \frac{1}{4}, \frac{3}{8}$	$0, \frac{3}{4}, \frac{1}{8}$	$hkl : h, k = 2n, h + k + l = 4n$ or $h, k = 2n + 1, l = 4n + 2$ or $h = 8n, k = 8n + 4$ and $h + k + l = 4n + 2$
			$\frac{3}{4}, \frac{5}{8}, 0$	$\frac{3}{4}, \frac{3}{8}, \frac{1}{2}$	$\frac{1}{8}, \frac{1}{2}, \frac{1}{4}$	$\frac{7}{8}, 0, \frac{1}{4}$	$0, \frac{1}{4}, \frac{7}{8}$	$\frac{1}{2}, \frac{1}{4}, \frac{1}{8}$	
24	$c$	$2 \dots 22$	$\frac{1}{8}, 0, \frac{1}{4}$	$\frac{3}{8}, 0, \frac{3}{4}$	$\frac{1}{4}, \frac{1}{8}, 0$	$\frac{3}{4}, \frac{3}{8}, 0$	$0, \frac{1}{4}, \frac{1}{8}$	$0, \frac{3}{4}, \frac{3}{8}$	
			$\frac{7}{8}, 0, \frac{3}{4}$	$\frac{5}{8}, 0, \frac{1}{4}$	$\frac{3}{4}, \frac{7}{8}, 0$	$\frac{1}{4}, \frac{5}{8}, 0$	$0, \frac{3}{4}, \frac{7}{8}$	$0, \frac{1}{4}, \frac{5}{8}$	

16	$b$	$\dots 3 2$	$\frac{1}{8}, \frac{1}{8}, \frac{1}{8}$	$\frac{3}{8}, \frac{7}{8}, \frac{5}{8}$	$\frac{7}{8}, \frac{5}{8}, \frac{3}{8}$	$\frac{5}{8}, \frac{3}{8}, \frac{7}{8}$	$\frac{7}{8}, \frac{7}{8}, \frac{7}{8}$	$\frac{5}{8}, \frac{1}{8}, \frac{3}{8}$	$\frac{1}{8}, \frac{3}{8}, \frac{5}{8}$	$\frac{3}{8}, \frac{5}{8}, \frac{1}{8}$	$hkl : h, k = 2n + 1, l = 4n + 2$ or $h, k, l = 4n$
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16	$a$	$\dots \bar{3} \dots$	$0, 0, 0$	$\frac{1}{2}, 0, \frac{1}{2}$	$0, \frac{1}{2}, \frac{1}{2}$	$\frac{1}{2}, \frac{1}{2}, 0$	$\frac{3}{4}, \frac{1}{4}, \frac{1}{4}$	$\frac{3}{4}, \frac{3}{4}, \frac{3}{4}$	$\frac{1}{4}, \frac{1}{4}, \frac{3}{4}$	$\frac{1}{4}, \frac{3}{4}, \frac{1}{4}$	$hkl : h, k = 2n, h + k + l = 4n$
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(Continued on page 715)

**Symmetry of special projections**

Along [001]  $p4mm$   
 $\mathbf{a}' = \frac{1}{2}\mathbf{a}$      $\mathbf{b}' = \frac{1}{2}\mathbf{b}$   
 Origin at  $\frac{1}{4}, 0, z$

Along [111]  $p6mm$   
 $\mathbf{a}' = \frac{1}{3}(2\mathbf{a} - \mathbf{b} - \mathbf{c})$      $\mathbf{b}' = \frac{1}{3}(-\mathbf{a} + 2\mathbf{b} - \mathbf{c})$   
 Origin at  $x, x, x$

Along [110]  $c2mm$   
 $\mathbf{a}' = \frac{1}{2}(-\mathbf{a} + \mathbf{b})$      $\mathbf{b}' = \frac{1}{2}\mathbf{c}$   
 Origin at  $x, x + \frac{1}{4}, \frac{1}{8}$

**Maximal non-isomorphic subgroups**

<b>I</b>	[2] $I\bar{4}3d$ (220)	(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] $I4_132$ (214)	(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] $Ia\bar{3}1$ ( $Ia\bar{3}$ , 206)	(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] $I4_1/a12/d$ ( $I4_1/acd$ , 142)	(1; 2; 3; 4; 13; 14; 15; 16; 25; 26; 27; 28; 37; 38; 39; 40)+
	{ [3] $I4_1/a12/d$ ( $I4_1/acd$ , 142)	(1; 2; 3; 4; 17; 18; 19; 20; 25; 26; 27; 28; 41; 42; 43; 44)+
	{ [3] $I4_1/a12/d$ ( $I4_1/acd$ , 142)	(1; 2; 3; 4; 21; 22; 23; 24; 25; 26; 27; 28; 45; 46; 47; 48)+
	{ [4] $I1\bar{3}2/d$ ( $R\bar{3}c$ , 167)	(1; 5; 9; 14; 19; 24; 25; 29; 33; 38; 43; 48)+
	{ [4] $I1\bar{3}2/d$ ( $R\bar{3}c$ , 167)	(1; 6; 12; 13; 18; 24; 25; 30; 36; 37; 42; 48)+
	{ [4] $I1\bar{3}2/d$ ( $R\bar{3}c$ , 167)	(1; 7; 10; 13; 19; 22; 25; 31; 34; 37; 43; 46)+
	{ [4] $I1\bar{3}2/d$ ( $R\bar{3}c$ , 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]  $Ia\bar{3}d$  ( $\mathbf{a}' = 3\mathbf{a}, \mathbf{b}' = 3\mathbf{b}, \mathbf{c}' = 3\mathbf{c}$ ) (230)

**Minimal non-isomorphic supergroups**

**I** none

**II** [4]  $Pm\bar{3}n$  ( $\mathbf{a}' = \frac{1}{2}\mathbf{a}, \mathbf{b}' = \frac{1}{2}\mathbf{b}, \mathbf{c}' = \frac{1}{2}\mathbf{c}$ ) (223)

**Symmetry operations**

For (0,0,0)+ set

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

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

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