

$I23$

T^3

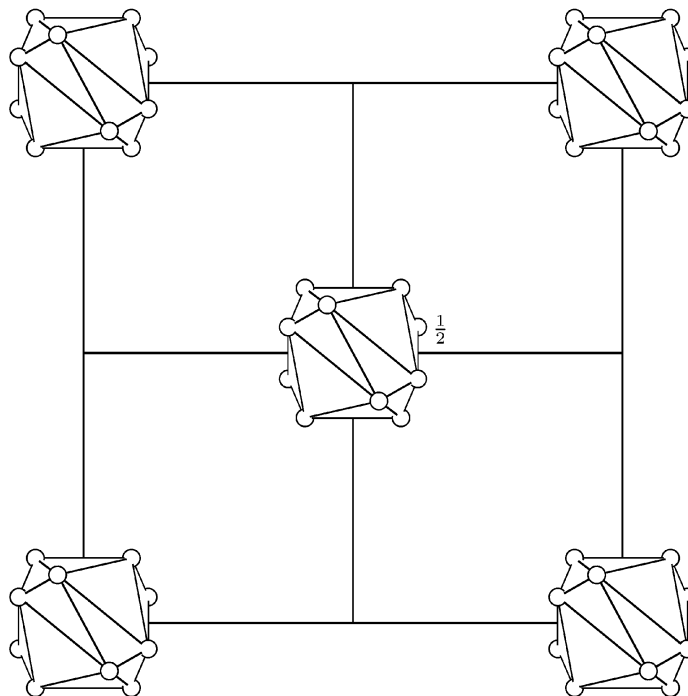
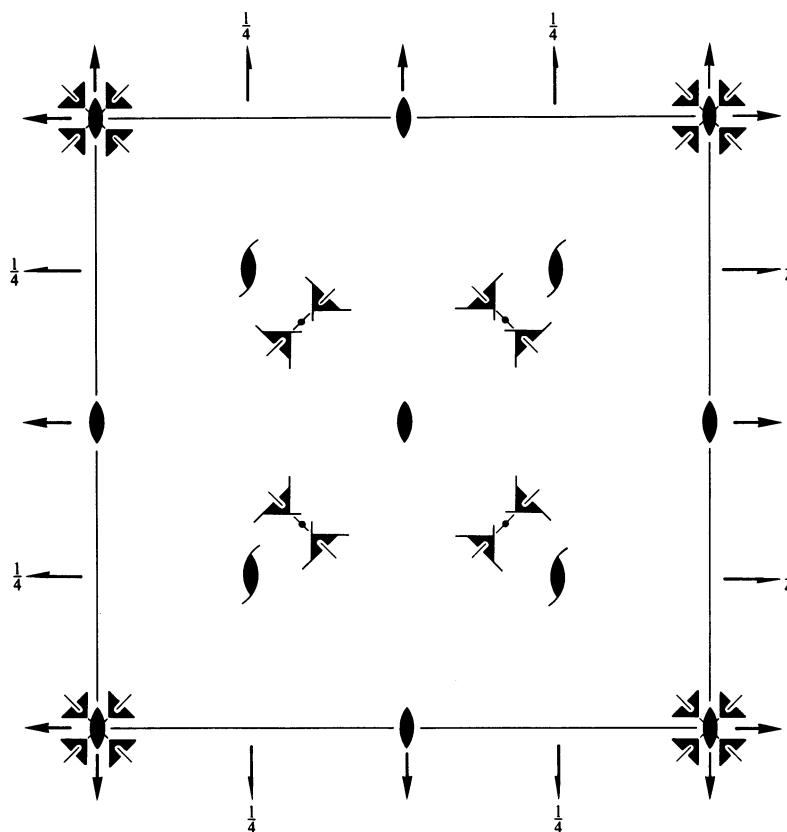
23

Cubic

No. 197

$I23$

Patterson symmetry $Im\bar{3}$



Origin at 23

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

Vertices $0,0,0 \quad 1,0,0 \quad \frac{1}{2}, \frac{1}{2}, 0 \quad \frac{1}{2}, \frac{1}{2}, \frac{1}{2}$

Symmetry operations

For (0,0,0)+ set

- | | | | |
|--------------------------|--|--|---|
| (1) 1 | (2) 2 0,0,z | (3) 2 0,y,0 | (4) 2 x,0,0 |
| (5) 3 ⁺ x,x,x | (6) 3 ⁺ \bar{x} ,x, \bar{x} | (7) 3 ⁺ x, \bar{x} , \bar{x} | (8) 3 ⁺ \bar{x} , \bar{x} ,x |
| (9) 3 ⁻ x,x,x | (10) 3 ⁻ x, \bar{x} , \bar{x} | (11) 3 ⁻ \bar{x} , \bar{x} ,x | (12) 3 ⁻ \bar{x} ,x, \bar{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(0,0, $\frac{1}{2}$) $\frac{1}{4}, \frac{1}{4}, z$ | (3) 2(0, $\frac{1}{2}$,0) $\frac{1}{4}, y, \frac{1}{4}$ | (4) 2($\frac{1}{2}$,0,0) $x, \frac{1}{4}, \frac{1}{4}$ |
| (5) 3 ⁺ ($\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$) x,x,x | (6) 3 ⁺ ($\frac{1}{6}, -\frac{1}{6}, \frac{1}{6}$) $\bar{x} + \frac{1}{3}, x + \frac{1}{3}, \bar{x}$ | (7) 3 ⁺ ($-\frac{1}{6}, \frac{1}{6}, \frac{1}{6}$) $x + \frac{2}{3}, \bar{x} - \frac{1}{3}, \bar{x}$ | (8) 3 ⁺ ($\frac{1}{6}, \frac{1}{6}, -\frac{1}{6}$) $\bar{x} + \frac{1}{3}, \bar{x} + \frac{2}{3}, x$ |
| (9) 3 ⁻ ($\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$) x,x,x | (10) 3 ⁻ ($-\frac{1}{6}, \frac{1}{6}, \frac{1}{6}$) $x + \frac{1}{3}, \bar{x} + \frac{1}{3}, \bar{x}$ | (11) 3 ⁻ ($\frac{1}{6}, \frac{1}{6}, -\frac{1}{6}$) $\bar{x} + \frac{2}{3}, \bar{x} + \frac{1}{3}, x$ | (12) 3 ⁻ ($\frac{1}{6}, -\frac{1}{6}, \frac{1}{6}$) $\bar{x} - \frac{1}{3}, x + \frac{2}{3}, \bar{x}$ |

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)**Positions**

Multiplicity,
Wyckoff letter,
Site symmetry

Coordinates

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

Reflection conditions

 h, k, l cyclically permutable

General:

- | | | | | | | |
|----|----------|---|-----------|----------------------------|----------------------------|----------------------------|
| 24 | <i>f</i> | 1 | (1) x,y,z | (2) \bar{x}, \bar{y}, z | (3) \bar{x}, y, \bar{z} | (4) x, \bar{y}, \bar{z} |
| | | | (5) z,x,y | (6) z, \bar{x}, \bar{y} | (7) \bar{z}, \bar{x}, y | (8) \bar{z}, x, \bar{y} |
| | | | (9) y,z,x | (10) \bar{y}, z, \bar{x} | (11) y, \bar{z}, \bar{x} | (12) \bar{y}, \bar{z}, x |

 $hkl: h+k+l=2n$ $OkI: k+l=2n$ $hhl: l=2n$ $h00: h=2n$

Special: no extra conditions

12	<i>e</i>	2..	$x, \frac{1}{2}, 0$	$\bar{x}, \frac{1}{2}, 0$	$0, x, \frac{1}{2}$	$0, \bar{x}, \frac{1}{2}$	$\frac{1}{2}, 0, x$	$\frac{1}{2}, 0, \bar{x}$
12	<i>d</i>	2..	$x, 0, 0$	$\bar{x}, 0, 0$	$0, x, 0$	$0, \bar{x}, 0$	$0, 0, x$	$0, 0, \bar{x}$
8	<i>c</i>	.3.	x, x, x	\bar{x}, \bar{x}, x	\bar{x}, x, \bar{x}	x, \bar{x}, \bar{x}		
6	<i>b</i>	222..	$0, \frac{1}{2}, \frac{1}{2}$	$\frac{1}{2}, 0, \frac{1}{2}$	$\frac{1}{2}, \frac{1}{2}, 0$			
2	<i>a</i>	23.	$0, 0, 0$					

Symmetry of special projectionsAlong [001] $c2mm$ $\mathbf{a}' = \mathbf{a}$ $\mathbf{b}' = \mathbf{b}$

Origin at 0,0,z

Along [111] $p3$ $\mathbf{a}' = \frac{1}{3}(2\mathbf{a} - \mathbf{b} - \mathbf{c})$

Origin at x,x,x

 $\mathbf{b}' = \frac{1}{3}(-\mathbf{a} + 2\mathbf{b} - \mathbf{c})$ Along [110] $p1m1$ $\mathbf{a}' = \frac{1}{2}(-\mathbf{a} + \mathbf{b})$ $\mathbf{b}' = \frac{1}{2}\mathbf{c}$

Origin at x,x,0