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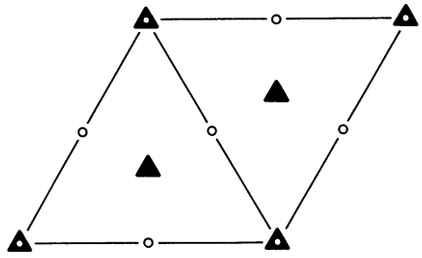
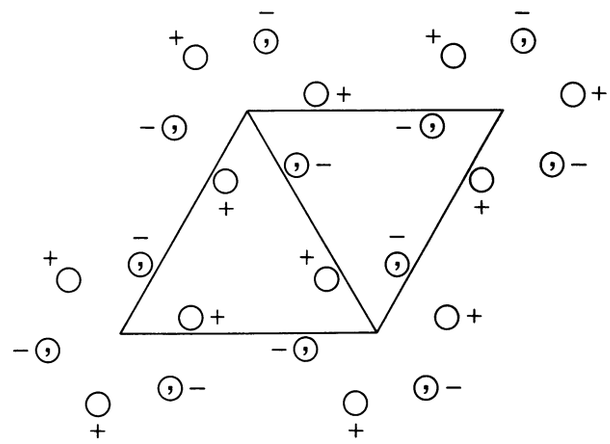
# $P\bar{3}$ $C_{3i}^{1}$ $\bar{3}$ Trigonal

## No. 147 $P\bar{3}$ Patterson symmetry $P\bar{3}$





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

**Asymmetric unit** $0 \le x \le \frac{2}{3}$; $0 \le y \le \frac{2}{3}$; $0 \le z \le \frac{1}{2}$; $x \le (1+y)/2$; $y \le \min(1-x, (1+x)/2)$

Vertices $0,0,0$ $\frac{1}{2},0,0$ $\frac{2}{3},\frac{1}{3},0$ $\frac{1}{3},\frac{2}{3},0$ $0,\frac{1}{2},0$

$0,0,\frac{1}{2}$ $\frac{1}{2},0,\frac{1}{2}$ $\frac{2}{3},\frac{1}{3},\frac{1}{2}$ $\frac{1}{3},\frac{2}{3},\frac{1}{2}$ $0,\frac{1}{2},\frac{1}{2}$

**Symmetry operations**

| | | |
|---|---|---|
| (1) $1$ | (2) $3^{+}$ $0,0,z$ | (3) $3^{-}$ $0,0,z$ |
| (4) $\bar{1}$ $0,0,0$ | (5) $\bar{3}^{+}$ $0,0,z$; $0,0,0$ | (6) $\bar{3}^{-}$ $0,0,z$; $0,0,0$ |

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**Generators selected** (1); $t(1,0,0)$; $t(0,1,0)$; $t(0,0,1)$; (2); (4)

**Positions**

| Multiplicity, Wyckoff letter, Site symmetry | | | Coordinates | | | Reflection conditions |
|---|---|---|---|---|---|---|
| | | | | | | General: |
| 6 | $g$ | 1 | (1) $x,y,z$ | (2) $\bar{y},x-y,z$ | (3) $\bar{x}+y,\bar{x},z$ | no conditions |
| | | | (4) $\bar{x},\bar{y},\bar{z}$ | (5) $y,\bar{x}+y,\bar{z}$ | (6) $x-y,x,\bar{z}$ | |
| | | | | | | Special: no extra conditions |
| 3 | $f$ | $\bar{1}$ | $\frac{1}{2},0,\frac{1}{2}$ | $0,\frac{1}{2},\frac{1}{2}$ | $\frac{1}{2},\frac{1}{2},\frac{1}{2}$ | |
| 3 | $e$ | $\bar{1}$ | $\frac{1}{2},0,0$ | $0,\frac{1}{2},0$ | $\frac{1}{2},\frac{1}{2},0$ | |
| 2 | $d$ | 3 . . | $\frac{1}{3},\frac{2}{3},z$ | $\frac{2}{3},\frac{1}{3},\bar{z}$ | | |
| 2 | $c$ | 3 . . | $0,0,z$ | $0,0,\bar{z}$ | | |
| 1 | $b$ | $\bar{3}$ . . | $0,0,\frac{1}{2}$ | | | |
| 1 | $a$ | $\bar{3}$ . . | $0,0,0$ | | | |

**Symmetry of special projections**

Along [001] $p6$
$\mathbf{a}'=\mathbf{a}$ $\mathbf{b}'=\mathbf{b}$
Origin at $0,0,z$

Along [100] $p2$
$\mathbf{a}'=\frac{1}{2}(\mathbf{a}+2\mathbf{b})$ $\mathbf{b}'=\mathbf{c}$
Origin at $x,0,0$

Along [210] $p2$
$\mathbf{a}'=\frac{1}{2}\mathbf{b}$ $\mathbf{b}'=\mathbf{c}$
Origin at $x,\frac{1}{2}x,0$

**Maximal non-isomorphic subgroups**

**I** [2] $P3$ (143) 1; 2; 3
[3] $P\bar{1}$ (2) 1; 4

**IIa** none

**IIb** [3] $R\bar{3}$ ($\mathbf{a}'=\mathbf{a}-\mathbf{b},\mathbf{b}'=\mathbf{a}+2\mathbf{b},\mathbf{c}'=3\mathbf{c}$) (148); [3] $R\bar{3}$ ($\mathbf{a}'=2\mathbf{a}+\mathbf{b},\mathbf{b}'=-\mathbf{a}+\mathbf{b},\mathbf{c}'=3\mathbf{c}$) (148)

**Maximal isomorphic subgroups of lowest index**

**IIc** [2] $P\bar{3}$ ($\mathbf{c}'=2\mathbf{c}$) (147); [3] $H\bar{3}$ ($\mathbf{a}'=3\mathbf{a},\mathbf{b}'=3\mathbf{b}$) ($P\bar{3}$, 147)

**Minimal non-isomorphic supergroups**

**I** [2] $P\bar{3}1m$ (162); [2] $P\bar{3}1c$ (163); [2] $P\bar{3}m1$ (164); [2] $P\bar{3}c1$ (165); [2] $P6/m$ (175); [2] $P6_3/m$ (176)

**II** [3] $R\bar{3}$ (obverse) (148); [3] $R\bar{3}$ (reverse) (148)