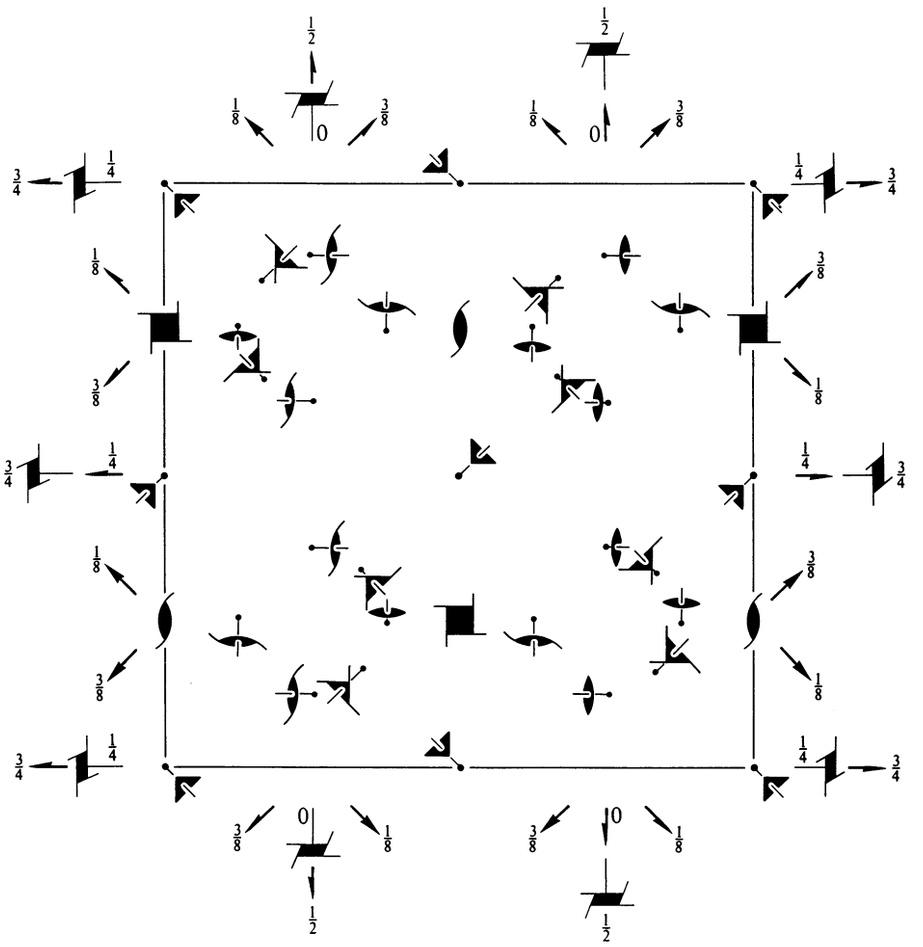
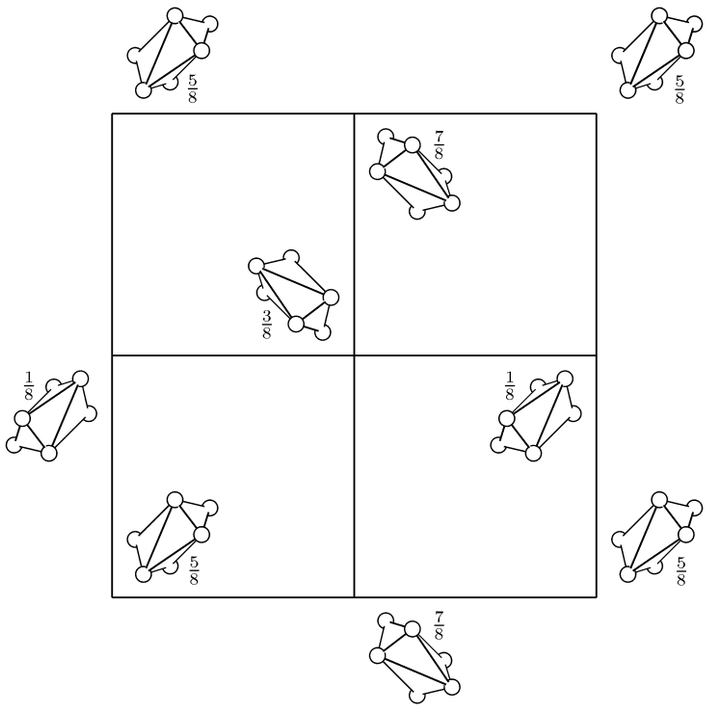
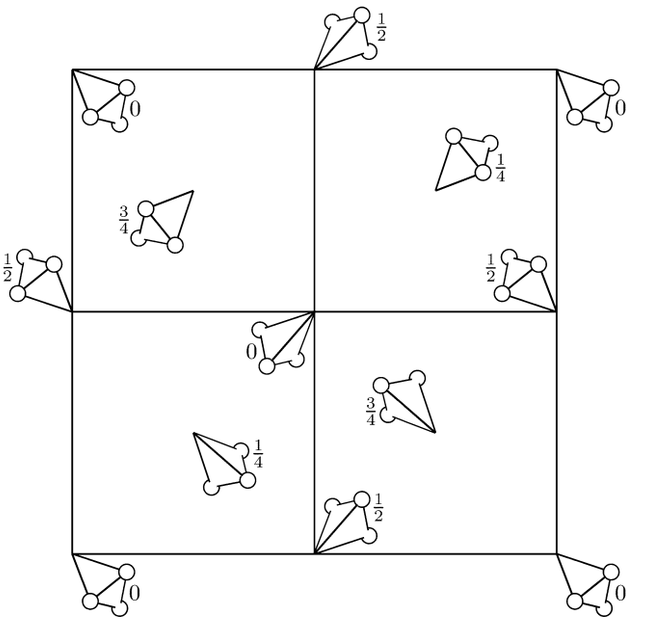
$P4_132$ O^7 432 Cubic

No. 213 $P4_132$ Patterson symmetry $Pm\bar{3}m$





Polyhedron centre at $\frac{3}{8},\frac{3}{8},\frac{3}{8}$



Polyhedron attached to 0, 0, 0

Origin on 3[111] at midpoint of three non-intersecting pairs of parallel screw axes 4_1 and 2_1

Asymmetric unit $-\frac{1}{4}\le x\le\frac{1}{2};\quad 0\le y\le\frac{3}{4};\quad 0\le z\le\frac{1}{2};\quad x\le y\le x+\frac{1}{2};\quad (y-x)/2\le z\le\min(y,(-4x-2y+3)/2,(3-2x-2y)/4)$

Vertices $0,0,0\quad \frac{1}{2},\frac{1}{2},0\quad \frac{1}{4},\frac{3}{4},\frac{1}{4}\quad -\frac{1}{4},\frac{1}{4},\frac{1}{4}\quad 0,\frac{1}{2},\frac{1}{2}\quad \frac{3}{8},\frac{3}{8},\frac{3}{8}$

Symmetry operations

(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 $\bar{x}+\frac{3}{4},\frac{3}{8},x$

Generators selected (1); $t(1,0,0)$; $t(0,1,0)$; $t(0,0,1)$; (2); (3); (5); (13)

Positions

Multiplicity, Wyckoff letter, Site symmetry			Coordinates				Reflection conditions
							h,k,l permutable
							General:
24	e	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) $x+\frac{1}{2},\bar{y}+\frac{1}{2},\bar{z}$	$h00$: $h=4n$
			(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) $\bar{z},x+\frac{1}{2},\bar{y}+\frac{1}{2}$	
			(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) $\bar{y}+\frac{1}{2},\bar{z},x+\frac{1}{2}$	
			(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) $\bar{y}+\frac{1}{4},x+\frac{3}{4},z+\frac{1}{4}$	
			(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) $\bar{z}+\frac{3}{4},\bar{y}+\frac{3}{4},\bar{x}+\frac{3}{4}$	
							Special: as above, plus
12	d	. . 2	$\frac{1}{8},y,y+\frac{1}{4}$	$\frac{3}{8},\bar{y},y+\frac{3}{4}$	$\frac{7}{8},y+\frac{1}{2},\bar{y}+\frac{1}{4}$	$\frac{5}{8},\bar{y}+\frac{1}{2},\bar{y}+\frac{3}{4}$	no extra conditions
			$y+\frac{1}{4},\frac{1}{8},y$	$y+\frac{3}{4},\frac{3}{8},\bar{y}$	$\bar{y}+\frac{1}{4},\frac{7}{8},y+\frac{1}{2}$	$\bar{y}+\frac{3}{4},\frac{5}{8},\bar{y}+\frac{1}{2}$	
			$y,y+\frac{1}{4},\frac{1}{8}$	$\bar{y},y+\frac{3}{4},\frac{3}{8}$	$y+\frac{1}{2},\bar{y}+\frac{1}{4},\frac{7}{8}$	$\bar{y}+\frac{1}{2},\bar{y}+\frac{3}{4},\frac{5}{8}$	
8	c	. 3 .	x,x,x	$\bar{x}+\frac{1}{2},\bar{x},x+\frac{1}{2}$	$\bar{x},x+\frac{1}{2},\bar{x}+\frac{1}{2}$	$x+\frac{1}{2},\bar{x}+\frac{1}{2},\bar{x}$	$0kl$: $k=2n+1$
			$x+\frac{3}{4},x+\frac{1}{4},\bar{x}+\frac{1}{4}$	$\bar{x}+\frac{3}{4},\bar{x}+\frac{3}{4},\bar{x}+\frac{3}{4}$	$x+\frac{1}{4},\bar{x}+\frac{1}{4},x+\frac{3}{4}$	$\bar{x}+\frac{1}{4},x+\frac{3}{4},x+\frac{1}{4}$	or $l=2n+1$
							or $k+l=4n$
4	b	. 3 2	$\frac{7}{8},\frac{7}{8},\frac{7}{8}$	$\frac{5}{8},\frac{1}{8},\frac{3}{8}$	$\frac{1}{8},\frac{3}{8},\frac{5}{8}$	$\frac{3}{8},\frac{5}{8},\frac{1}{8}$	hkl: $h,k=2n+1$
4	a	. 3 2	$\frac{3}{8},\frac{3}{8},\frac{3}{8}$	$\frac{1}{8},\frac{5}{8},\frac{7}{8}$	$\frac{5}{8},\frac{7}{8},\frac{1}{8}$	$\frac{7}{8},\frac{1}{8},\frac{5}{8}$	or $h=2n+1$, $k=4n$ and $l=4n+2$
							or $h,k,l=4n+2$
							or $h,k,l=4n$

Symmetry of special projections

Along [001] $p4gm$
$\mathbf{a}'=\mathbf{a}$ $\mathbf{b}'=\mathbf{b}$
Origin at $\frac{1}{4},0,z$

Along [111] $p3m1$
$\mathbf{a}'=\frac{1}{3}(2\mathbf{a}-\mathbf{b}-\mathbf{c})$ $\mathbf{b}'=\frac{1}{3}(-\mathbf{a}+2\mathbf{b}-\mathbf{c})$
Origin at x,x,x

Along [110] $p2gm$
$\mathbf{a}'=\frac{1}{2}(-\mathbf{a}+\mathbf{b})$ $\mathbf{b}'=\mathbf{c}$
Origin at $x,x+\frac{1}{4},\frac{1}{8}$