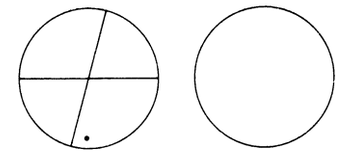
International Tables for Crystallography (2006). Vol. A, Table 10.1.2.2, pp. 770–790.

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups*

General, special and limiting face forms and *point forms* (italics), oriented face and site symmetries, and Miller indices (*hkl*) of equivalent faces [for trigonal and hexagonal groups Bravais–Miller indices (*hkil*) are used if referred to hexagonal axes]; for point coordinates see text.

TRICLINIC SYSTEM

1 C_1



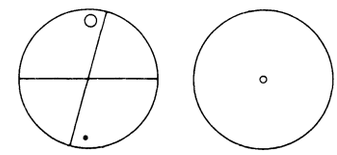
1	*a*	1	Pedion or monohedron *Single point* (*a*)	(*hkl*)

Symmetry of special projections

Along any direction

1

$\bar{1}$ C_i



2	*a*	1	Pinacoid or parallelohedron *Line segment through origin* (*i*)	(*hkl*) (\$\bar{h}\bar{k}\bar{l}\$)

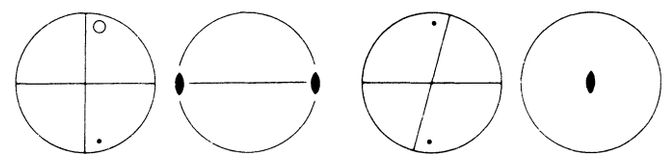
Symmetry of special projections

Along any direction

2

MONOCLINIC SYSTEM

2 C_2

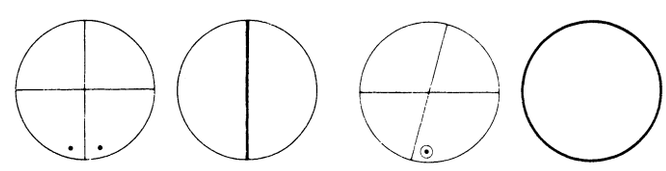


				Unique axis *b*	Unique axis *c*
2	*b*	1	Sphenoid or dihedron *Line segment* (*e*)	(*hkl*) (\$\bar{h}k\bar{l}\$)	(*hkl*) (\$\bar{h}\bar{k}l\$)
			Pinacoid or parallelohedron *Line segment through origin*	(*h*0*l*) (\$\bar{h}0\bar{l}\$)	(*hk*0) (\$\bar{h}\bar{k}0\$)
1	*a*	2	Pedion or monohedron *Single point* (*a*)	(010) or (0\$\bar{1}$0)	(001) or (00\$\bar{1}$)

Symmetry of special projections

	Along [100]	Along [010]	Along [001]
Unique axis *b*	*m*	2	*m*
c	*m*	*m*	2

m C_s



				Unique axis *b*	Unique axis *c*
2	*b*	1	Dome or dihedron *Line segment* (*c*)	(*hkl*) (\$h\bar{k}l\$)	(*hkl*) (\$hk\bar{l}\$)
			Pinacoid or parallelohedron *Line segment through origin*	(010) (0\$\bar{1}$0)	(001) (00\$\bar{1}$)
1	*a*	*m*	Pedion or monohedron *Single point* (*a*)	(*h*0*l*)	(*hk*0)

Symmetry of special projections

	Along [100]	Along [010]	Along [001]
Unique axis *b*	*m*	1	*m*
c	*m*	*m*	1

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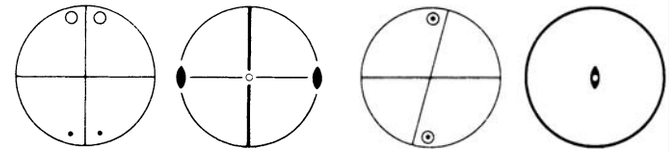
Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

MONOCLINIC SYSTEM (*cont.*)

$2/m$ C_{2h}



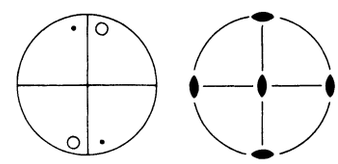
				Unique axis *b*	Unique axis *c*
4	*c*	1	Rhombic prism *Rectangle through origin* (*o*)	(hkl) $(\bar{h}k\bar{l})$ $(\bar{h}\bar{k}\bar{l})$ $(h\bar{k}l)$	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{h}\bar{k}\bar{l})$ $(hk\bar{l})$
2	*b*	*m*	Pinacoid or parallelohedron *Line segment through origin* (*m*)	$(h0l)$ $(\bar{h}0\bar{l})$	$(hk0)$ $(\bar{h}\bar{k}0)$
2	*a*	2	Pinacoid or parallelohedron *Line segment through origin* (*i*)	(010) $(0\bar{1}0)$	(001) $(00\bar{1})$

Symmetry of special projections

	Along [100]	Along [010]	Along [001]
Unique axis *b*	2*mm*	2	2*mm*
c	2*mm*	2*mm*	2

ORTHORHOMBIC SYSTEM

222 D_2



4	*d*	1	Rhombic disphenoid or rhombic tetrahedron *Rhombic tetrahedron* (*u*)	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{h}k\bar{l})$ $(h\bar{k}\bar{l})$
			Rhombic prism *Rectangle through origin*	$(hk0)$ $(\bar{h}\bar{k}0)$ $(\bar{h}k0)$ $(h\bar{k}0)$
			Rhombic prism *Rectangle through origin*	$(h0l)$ $(\bar{h}0l)$ $(\bar{h}0\bar{l})$ $(h0\bar{l})$
			Rhombic prism *Rectangle through origin*	$(0kl)$ $(0\bar{k}l)$ $(0k\bar{l})$ $(0\bar{k}\bar{l})$
2	*c*	..2	Pinacoid or parallelohedron *Line segment through origin* (*q*)	(001) $(00\bar{1})$
2	*b*	.2.	Pinacoid or parallelohedron *Line segment through origin* (*m*)	(010) $(0\bar{1}0)$
2	*a*	2..	Pinacoid or parallelohedron *Line segment through origin* (*i*)	(100) $(\bar{1}00)$

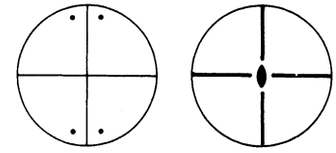
Symmetry of special projections

Along [100]	Along [010]	Along [001]
2*mm*	2*mm*	2*mm*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

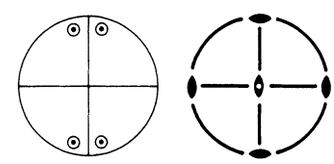
ORTHORHOMBIC SYSTEM (*cont.*)

$mm2$ C_{2v}



4	*d*	1	Rhombic pyramid *Rectangle* (*i*)	(hkl) $(\bar{h}\bar{k}l)$ $(h\bar{k}l)$ $(\bar{h}kl)$
			Rhombic prism *Rectangle through origin*	$(hk0)$ $(\bar{h}\bar{k}0)$ $(h\bar{k}0)$ $(\bar{h}k0)$
2	*c*	*m*..	Dome or dihedron *Line segment* (*g*)	$(0kl)$ $(0\bar{k}l)$
			Pinacoid or parallelohedron *Line segment through origin*	(010) $(0\bar{1}0)$
2	*b*	.*m*.	Dome or dihedron *Line segment* (*e*)	$(h0l)$ $(\bar{h}0l)$
			Pinacoid or parallelohedron *Line segment through origin*	(100) $(\bar{1}00)$
1	*a*	*mm*2	Pedion or monohedron *Single point* (*a*)	(001) or $(00\bar{1})$
			Symmetry of special projections Along [100] *m*; Along [010] *m*; Along [001] 2*mm*	

$\frac{m}{m}\frac{m}{m}\frac{m}{m}$ D_{2h}

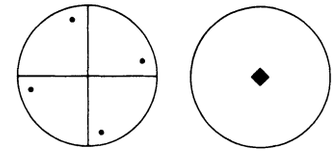


8	*g*	1	Rhombic dipyramid *Quad* (α)	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{h}k\bar{l})$ $(h\bar{k}\bar{l})$ $(\bar{h}\bar{k}\bar{l})$ $(hk\bar{l})$ $(h\bar{k}l)$ $(\bar{h}kl)$
4	*f*	..*m*	Rhombic prism *Rectangle through origin* (*y*)	$(hk0)$ $(\bar{h}\bar{k}0)$ $(\bar{h}k0)$ $(h\bar{k}0)$
4	*e*	.*m*.	Rhombic prism *Rectangle through origin* (*w*)	$(h0l)$ $(\bar{h}0l)$ $(\bar{h}0\bar{l})$ $(h0\bar{l})$
4	*d*	*m*..	Rhombic prism *Rectangle through origin* (*u*)	$(0kl)$ $(0\bar{k}l)$ $(0k\bar{l})$ $(0\bar{k}\bar{l})$
2	*c*	*mm*2	Pinacoid or parallelohedron *Line segment through origin* (*q*)	(001) $(00\bar{1})$
2	*b*	*m*2*m*	Pinacoid or parallelohedron *Line segment through origin* (*m*)	(010) $(0\bar{1}0)$
2	*a*	2*mm*	Pinacoid or parallelohedron *Line segment through origin* (*i*)	(100) $(\bar{1}00)$
			Symmetry of special projections Along [100] 2*mm*; Along [010] 2*mm*; Along [001] 2*mm*	

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

TETRAGONAL SYSTEM

4 C_4

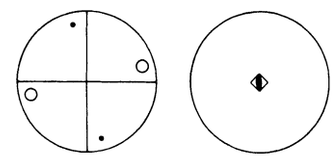


4	*b*	1	Tetragonal pyramid *Square* (*d*)	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{k}hl)$ $(k\bar{h}l)$
			Tetragonal prism *Square through origin*	$(hk0)$ $(\bar{h}\bar{k}0)$ $(\bar{k}h0)$ $(k\bar{h}0)$
1	*a*	4..	Pedion or monohedron *Single point* (*a*)	(001) or $(00\bar{1})$

Symmetry of special projections

Along [001]	Along [100]	Along [110]
4	*m*	*m*

$\bar{4}$ S_4

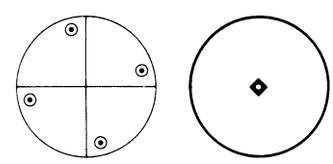


4	*b*	1	Tetragonal disphenoid or tetragonal tetrahedron *Tetragonal tetrahedron* (*h*)	(hkl) $(\bar{h}\bar{k}l)$ $(k\bar{h}\bar{l})$ $(\bar{k}h\bar{l})$
			Tetragonal prism *Square through origin*	$(hk0)$ $(\bar{h}\bar{k}0)$ $(k\bar{h}0)$ $(\bar{k}h0)$
2	*a*	2..	Pinacoid or parallelohedron *Line segment through origin* (*e*)	(001) $(00\bar{1})$

Symmetry of special projections

Along [001]	Along [100]	Along [110]
4	*m*	*m*

$4/m$ C_{4h}



8	*c*	1	Tetragonal dipyramid *Tetragonal prism* (*l*)	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{k}hl)$ $(k\bar{h}l)$ $(\bar{h}\bar{k}\bar{l})$ $(hk\bar{l})$ $(k\bar{h}\bar{l})$ $(\bar{k}h\bar{l})$
4	*b*	*m*..	Tetragonal prism *Square through origin* (*j*)	$(hk0)$ $(\bar{h}\bar{k}0)$ $(\bar{k}h0)$ $(k\bar{h}0)$
2	*a*	4..	Pinacoid or parallelohedron *Line segment through origin* (*g*)	(001) $(00\bar{1})$

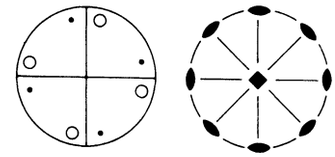
Symmetry of special projections

Along [001]	Along [100]	Along [110]
4	2*mm*	2*mm*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

TETRAGONAL SYSTEM (*cont.*)

422 D_4

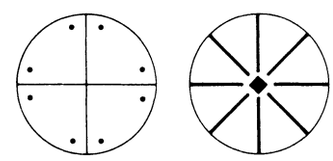


8	*d*	1	Tetragonal trapezohedron *Twisted tetragonal antiprism* (*p*)	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{k}hl)$ $(k\bar{h}l)$ $(\bar{h}k\bar{l})$ $(h\bar{k}\bar{l})$ $(kh\bar{l})$ $(\bar{k}\bar{h}\bar{l})$
			Ditetragonal prism *Truncated square through origin*	$(hk0)$ $(\bar{h}\bar{k}0)$ $(\bar{k}h0)$ $(k\bar{h}0)$ $(\bar{h}k0)$ $(h\bar{k}0)$ $(kh0)$ $(\bar{k}\bar{h}0)$
			Tetragonal dipyramid *Tetragonal prism*	$(h0l)$ $(\bar{h}0l)$ $(0hl)$ $(0\bar{h}l)$ $(\bar{h}0\bar{l})$ $(h0\bar{l})$ $(0h\bar{l})$ $(0\bar{h}\bar{l})$
			Tetragonal dipyramid *Tetragonal prism*	(hhl) $(\bar{h}\bar{h}l)$ $(\bar{h}hl)$ $(h\bar{h}l)$ $(\bar{h}h\bar{l})$ $(h\bar{h}\bar{l})$ $(hh\bar{l})$ $(\bar{h}\bar{h}\bar{l})$
4	*c*	.2.	Tetragonal prism *Square through origin* (*l*)	(100) $(\bar{1}00)$ (010) $(0\bar{1}0)$
4	*b*	..2	Tetragonal prism *Square through origin* (*j*)	(110) $(\bar{1}\bar{1}0)$ $(\bar{1}10)$ $(1\bar{1}0)$
2	*a*	4..	Pinacoid or parallelohedron *Line segment through origin* (*g*)	(001) $(00\bar{1})$

Symmetry of special projections

Along [001]	Along [100]	Along [110]
4*mm*	2*mm*	2*mm*

4*mm* C_{4v}



8	*d*	1	Ditetragonal pyramid *Truncated square* (*g*)	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{k}hl)$ $(k\bar{h}l)$ $(h\bar{k}l)$ $(\bar{h}kl)$ $(\bar{k}\bar{h}l)$ (khl)
			Ditetragonal prism *Truncated square through origin*	$(hk0)$ $(\bar{h}\bar{k}0)$ $(\bar{k}h0)$ $(k\bar{h}0)$ $(h\bar{k}0)$ $(\bar{h}k0)$ $(\bar{k}\bar{h}0)$ $(kh0)$
4	*c*	.*m*.	Tetragonal pyramid *Square* (*e*)	$(h0l)$ $(\bar{h}0l)$ $(0hl)$ $(0\bar{h}l)$
			Tetragonal prism *Square through origin*	(100) $(\bar{1}00)$ (010) $(0\bar{1}0)$
4	*b*	..*m*	Tetragonal pyramid *Square* (*d*)	(hhl) $(\bar{h}\bar{h}l)$ $(\bar{h}hl)$ $(h\bar{h}l)$
			Tetragonal prism *Square through origin*	(110) $(\bar{1}\bar{1}0)$ $(\bar{1}10)$ $(1\bar{1}0)$
1	*a*	4*mm*	Pedion or monohedron *Single point* (*a*)	(001) or $(00\bar{1})$

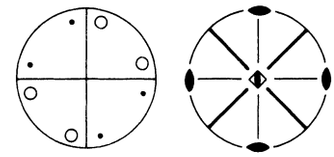
Symmetry of special projections

Along [001]	Along [100]	Along [110]
4*mm*	*m*	*m*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

TETRAGONAL SYSTEM (*cont.*)

$\bar{4}2m$ D_{2d}

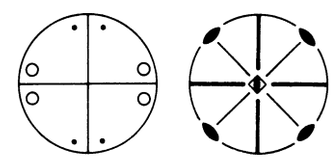


8	*d*	1	Tetragonal scalenohedron *Tetragonal tetrahedron cut off by pinacoid* (*o*)	(hkl) $(\bar{h}\bar{k}l)$ $(k\bar{h}\bar{l})$ $(\bar{k}h\bar{l})$ $(\bar{h}k\bar{l})$ $(h\bar{k}\bar{l})$ $(\bar{k}\bar{h}l)$ (khl)
			Ditetragonal prism *Truncated square through origin*	$(hk0)$ $(\bar{h}\bar{k}0)$ $(k\bar{h}0)$ $(\bar{k}h0)$ $(\bar{h}k0)$ $(h\bar{k}0)$ $(\bar{k}\bar{h}0)$ $(kh0)$
			Tetragonal dipyramid *Tetragonal prism*	$(h0l)$ $(\bar{h}0l)$ $(0\bar{h}\bar{l})$ $(0h\bar{l})$ $(\bar{h}0\bar{l})$ $(h0\bar{l})$ $(0\bar{h}l)$ $(0hl)$
4	*c*	..*m*	Tetragonal disphenoid or tetragonal tetrahedron *Tetragonal tetrahedron* (*n*)	(hhl) $(\bar{h}\bar{h}l)$ $(h\bar{h}\bar{l})$ $(\bar{h}h\bar{l})$
			Tetragonal prism *Square through origin*	(110) $(\bar{1}\bar{1}0)$ $(1\bar{1}0)$ $(\bar{1}10)$
4	*b*	.2.	Tetragonal prism *Square through origin* (*i*)	(100) $(\bar{1}00)$ $(0\bar{1}0)$ (010)
2	*a*	2.*mm*	Pinacoid or parallelohedron *Line segment through origin* (*g*)	(001) $(00\bar{1})$

Symmetry of special projections

Along [001]	Along [100]	Along [110]
4*mm*	2*mm*	*m*

$\bar{4}m2$ D_{2d}



8	*d*	1	Tetragonal scalenohedron *Tetragonal tetrahedron cut off by pinacoid* (*l*)	(hkl) $(\bar{h}\bar{k}l)$ $(k\bar{h}\bar{l})$ $(\bar{k}h\bar{l})$ $(h\bar{k}l)$ $(\bar{h}kl)$ $(kh\bar{l})$ $(\bar{k}\bar{h}\bar{l})$
			Ditetragonal prism *Truncated square through origin*	$(hk0)$ $(\bar{h}\bar{k}0)$ $(k\bar{h}0)$ $(\bar{k}h0)$ $(h\bar{k}0)$ $(\bar{h}k0)$ $(kh0)$ $(\bar{k}\bar{h}0)$
			Tetragonal dipyramid *Tetragonal prism*	(hhl) $(\bar{h}\bar{h}l)$ $(h\bar{h}\bar{l})$ $(\bar{h}h\bar{l})$ $(h\bar{h}l)$ $(\bar{h}hl)$ $(hh\bar{l})$ $(\bar{h}\bar{h}\bar{l})$
4	*c*	.*m*.	Tetragonal disphenoid or tetragonal tetrahedron *Tetragonal tetrahedron* (*j*)	$(h0l)$ $(\bar{h}0l)$ $(0\bar{h}\bar{l})$ $(0h\bar{l})$
			Tetragonal prism *Square through origin*	(100) $(\bar{1}00)$ $(0\bar{1}0)$ (010)
4	*b*	..2	Tetragonal prism *Square through origin* (*h*)	(110) $(\bar{1}\bar{1}0)$ $(1\bar{1}0)$ $(\bar{1}10)$
2	*a*	2*mm*.	Pinacoid or parallelohedron *Line segment through origin* (*e*)	(001) $(00\bar{1})$

Symmetry of special projections

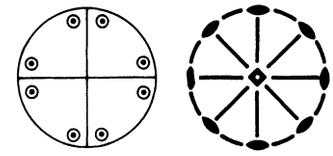
Along [001]	Along [100]	Along [110]
4*mm*	*m*	2*mm*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

TETRAGONAL SYSTEM (*cont.*)

$4/mmm$ $\quad D_{4h}$

$\frac{4}{m}\frac{2}{m}\frac{2}{m}$



16	*g*	1	Ditetragonal dipyramid *Edge-truncated tetragonal prism* (*u*)	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{k}hl)$ $(k\bar{h}l)$ $(\bar{h}k\bar{l})$ $(h\bar{k}\bar{l})$ $(kh\bar{l})$ $(\bar{k}\bar{h}\bar{l})$ $(\bar{h}\bar{k}\bar{l})$ $(hk\bar{l})$ $(k\bar{h}\bar{l})$ $(\bar{k}h\bar{l})$ $(h\bar{k}l)$ $(\bar{h}kl)$ $(\bar{k}\bar{h}l)$ (khl)
8	*f*	*.m.*	Tetragonal dipyramid *Tetragonal prism* (*s*)	$(h0l)$ $(\bar{h}0l)$ $(0hl)$ $(0\bar{h}l)$ $(\bar{h}0\bar{l})$ $(h0\bar{l})$ $(0h\bar{l})$ $(0\bar{h}\bar{l})$
8	*e*	*..m*	Tetragonal dipyramid *Tetragonal prism* (*r*)	(hhl) $(\bar{h}\bar{h}l)$ $(\bar{h}hl)$ $(h\bar{h}l)$ $(\bar{h}h\bar{l})$ $(h\bar{h}\bar{l})$ $(hh\bar{l})$ $(\bar{h}\bar{h}\bar{l})$
8	*d*	*m..*	Ditetragonal prism *Truncated square through origin* (*p*)	$(hk0)$ $(\bar{h}\bar{k}0)$ $(\bar{k}h0)$ $(k\bar{h}0)$ $(\bar{h}k0)$ $(h\bar{k}0)$ $(kh0)$ $(\bar{k}\bar{h}0)$
4	*c*	*m2m.*	Tetragonal prism *Square through origin* (*l*)	(100) $(\bar{1}00)$ (010) $(0\bar{1}0)$
4	*b*	*m.m2*	Tetragonal prism *Square through origin* (*j*)	(110) $(\bar{1}\bar{1}0)$ $(\bar{1}10)$ $(1\bar{1}0)$
2	*a*	*4mm*	Pinacoid or parallelohedron *Line segment through origin* (*g*)	(001) $(00\bar{1})$

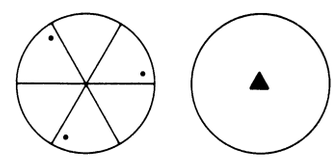
Symmetry of special projections

Along [001]	Along [100]	Along [110]
4mm	*2mm*	*2mm*

TRIGONAL SYSTEM

3 $\quad C_3$

HEXAGONAL AXES



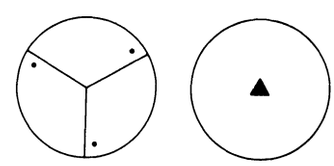
3	*b*	1	Trigonal pyramid *Trigon* (*d*)	$(hkil)$ $(ihkl)$ $(kihl)$
			Trigonal prism *Trigon through origin*	$(hki0)$ $(ihk0)$ $(kih0)$
1	*a*	3..	Pedion or monohedron *Single point* (*a*)	(0001) or $(000\bar{1})$

Symmetry of special projections

Along [001]	Along [100]	Along [210]
3	1	1

3 $\quad C_3$

RHOMBOHEDRAL AXES



3	*b*	1	Trigonal pyramid *Trigon* (*b*)	(hkl) (lhk) (klh)
			Trigonal prism *Trigon through origin*	$(hk(\overline{h+k}))$ $((\overline{h+k})hk)$ $(k(\overline{h+k})h)$
1	*a*	3.	Pedion or monohedron *Single point* (*a*)	(111) or $(\bar{1}\bar{1}\bar{1})$

Symmetry of special projections

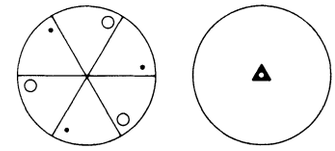
Along [111]	Along $[1\bar{1}0]$	Along $[2\bar{1}\bar{1}]$
3	1	1

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

TRIGONAL SYSTEM (*cont.*)

$\bar{3}$ C_{3i}

HEXAGONAL AXES



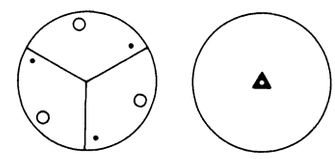
6	*b*	1	Rhombohedron	$(hkil)$ $(ihkl)$ $(kihl)$
			Trigonal antiprism (*g*)	$(\bar{h}\bar{k}\bar{i}\bar{l})$ $(\bar{i}\bar{h}\bar{k}\bar{l})$ $(\bar{k}\bar{i}\bar{h}\bar{l})$
			Hexagonal prism	$(hki0)$ $(ihk0)$ $(kih0)$
			Hexagon through origin	$(\bar{h}\bar{k}\bar{i}0)$ $(\bar{i}\bar{h}\bar{k}0)$ $(\bar{k}\bar{i}\bar{h}0)$
2	*a*	3..	Pinacoid or parallelohedron	(0001) $(000\bar{1})$
			Line segment through origin (*c*)	

Symmetry of special projections

Along [001]	Along [100]	Along [210]
6	2	2

$\bar{3}$ C_{3i}

RHOMBOHEDRAL AXES



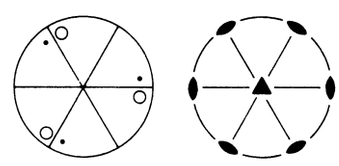
6	*b*	1	Rhombohedron	(hkl) (lhk) (klh)
			Trigonal antiprism (*f*)	$(\bar{h}\bar{k}\bar{l})$ $(\bar{l}\bar{h}\bar{k})$ $(\bar{k}\bar{l}\bar{h})$
			Hexagonal prism	$(hk(\overline{h+k}))$ $((\overline{h+k})hk)$ $(k(\overline{h+k})h)$
			Hexagon through origin	$(\bar{h}\bar{k}(h+k))$ $((h+k)\bar{h}\bar{k})$ $(\bar{k}(h+k)\bar{h})$
2	*a*	3.	Pinacoid or parallelohedron	(111) $(\bar{1}\bar{1}\bar{1})$
			Line segment through origin (*c*)	

Symmetry of special projections

Along [111]	Along $[1\bar{1}0]$	Along $[2\bar{1}\bar{1}]$
6	2	2

321 D_3

HEXAGONAL AXES



6	*c*	1	Trigonal trapezohedron	$(hkil)$ $(ihkl)$ $(kihl)$
			Twisted trigonal antiprism (*g*)	$(khi\bar{i}\bar{l})$ $(hik\bar{l})$ $(ikh\bar{l})$
			Ditrigonal prism	$(hki0)$ $(ihk0)$ $(kih0)$
			Truncated trigon through origin	$(khi0)$ $(hik0)$ $(ikh0)$
			Trigonal dipyramid	$(hh\overline{2h}l)$ $(\overline{2h}hhl)$ $(h\overline{2h}hl)$
			Trigonal prism	$(hh\overline{2h}\bar{l})$ $(h\overline{2h}h\bar{l})$ $(\overline{2h}hh\bar{l})$
			Rhombohedron	$(h0\bar{h}l)$ $(\bar{h}h0l)$ $(0\bar{h}hl)$
			Trigonal antiprism	$(0h\bar{h}\bar{l})$ $(h\bar{h}0\bar{l})$ $(\bar{h}0h\bar{l})$
			Hexagonal prism	$(10\bar{1}0)$ $(\bar{1}100)$ $(0\bar{1}10)$
			Hexagon through origin	$(01\bar{1}0)$ $(1\bar{1}00)$ $(\bar{1}010)$
3	*b*	.2.	Trigonal prism	$(11\bar{2}0)$ $(\bar{2}110)$ $(1\bar{2}10)$
			Trigon through origin (*e*)	or $(\bar{1}\bar{1}20)$ $(2\bar{1}\bar{1}0)$ $(\bar{1}2\bar{1}0)$
2	*a*	3..	Pinacoid or parallelohedron	(0001) $(000\bar{1})$
			Line segment through origin (*c*)	

Symmetry of special projections

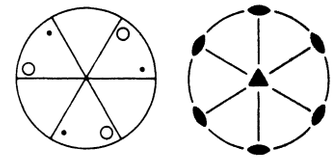
Along [001]	Along [100]	Along [210]
3*m*	2	1

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

TRIGONAL SYSTEM (*cont.*)

312 D_3

HEXAGONAL AXES



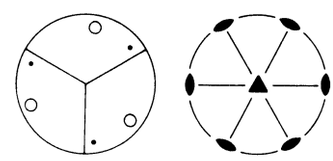
6	*c*	1	Trigonal trapezohedron	$(hkil)$	$(ihkl)$	$(kihl)$
			Twisted trigonal antiprism (l)	$(\bar{k}\bar{h}\bar{i}\bar{l})$	$(\bar{h}\bar{i}\bar{k}\bar{l})$	$(\bar{i}\bar{k}\bar{h}\bar{l})$
			Ditrigonal prism	$(hki0)$	$(ihk0)$	$(kih0)$
			Truncated trigon through origin	$(\bar{k}\bar{h}\bar{i}0)$	$(\bar{h}\bar{i}\bar{k}0)$	$(\bar{i}\bar{k}\bar{h}0)$
			Trigonal dipyramid	$(h0\bar{h}l)$	$(\bar{h}h0l)$	$(0\bar{h}hl)$
			Trigonal prism	$(0\bar{h}h\bar{l})$	$(\bar{h}h0\bar{l})$	$(h0\bar{h}\bar{l})$
			Rhombohedron	$(hh\overline{2h}l)$	$(\overline{2h}hhl)$	$(h\overline{2h}hl)$
			Trigonal antiprism	$(\bar{h}\bar{h}2h\bar{l})$	$(\bar{h}2h\bar{h}\bar{l})$	$(2h\bar{h}\bar{h}\bar{l})$
			Hexagonal prism	$(11\bar{2}0)$	$(\bar{2}110)$	$(1\bar{2}10)$
			Hexagon through origin	$(\bar{1}\bar{1}20)$	$(\bar{1}2\bar{1}0)$	$(2\bar{1}\bar{1}0)$
3	*b*	..2	Trigonal prism	$(10\bar{1}0)$	$(\bar{1}100)$	$(0\bar{1}10)$
			Trigon through origin (j)	or $(\bar{1}010)$	$(1\bar{1}00)$	$(01\bar{1}0)$
2	*a*	3..	Pinacoid or parallelohedron	(0001)	$(000\bar{1})$	
			Line segment through origin (g)			

Symmetry of special projections

Along [001]	Along [100]	Along [210]
$3m$	1	2

32 D_3

RHOMBOHEDRAL AXES



6	*c*	1	Trigonal trapezohedron	(hkl)	(lhk)	(klh)
			Twisted trigonal antiprism (f)	$(\bar{k}\bar{h}\bar{l})$	$(\bar{h}\bar{l}\bar{k})$	$(\bar{l}\bar{k}\bar{h})$
			Ditrigonal prism	$(hk(\overline{h+k}))$	$((\overline{h+k})hk)$	$(k(\overline{h+k})h)$
			Truncated trigon through origin	$(\bar{k}\bar{h}(h+k))$	$(\bar{h}(h+k)\bar{k})$	$((h+k)\bar{k}\bar{h})$
			Trigonal dipyramid	$(hk(2k-h))$	$((2k-h)hk)$	$(k(2k-h)h)$
			Trigonal prism	$(\bar{k}\bar{h}(h-2k))$	$(\bar{h}(h-2k)\bar{k})$	$((h-2k)\bar{k}\bar{h})$
			Rhombohedron	(hhl)	(lhh)	(hlh)
			Trigonal antiprism	$(\bar{h}\bar{h}\bar{l})$	$(\bar{h}\bar{l}\bar{h})$	$(\bar{l}\bar{h}\bar{h})$
			Hexagonal prism	$(11\bar{2})$	$(\bar{2}11)$	$(1\bar{2}1)$
			Hexagon through origin	$(\bar{1}\bar{1}2)$	$(\bar{1}2\bar{1})$	$(2\bar{1}\bar{1})$
3	*b*	.2	Trigonal prism	$(01\bar{1})$	$(\bar{1}01)$	$(1\bar{1}0)$
			Trigon through origin (d)	or $(0\bar{1}1)$	$(10\bar{1})$	$(\bar{1}10)$
2	*a*	3.	Pinacoid or parallelohedron	(111)	$(\bar{1}\bar{1}\bar{1})$	
			Line segment through origin (c)			

Symmetry of special projections

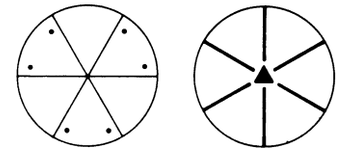
Along [111]	Along $[1\bar{1}0]$	Along $[2\bar{1}\bar{1}]$
$3m$	2	1

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

TRIGONAL SYSTEM (*cont.*)

$3m1$ C_{3v}

HEXAGONAL AXES



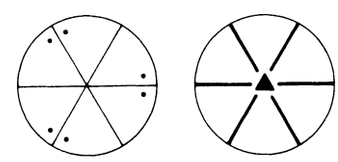
6	*c*	1	Ditrigonal pyramid *Truncated trigon* (*e*)	$(hkil)$ $(\bar{k}\bar{h}\bar{i}l)$	$(ihkl)$ $(\bar{h}\bar{i}\bar{k}l)$	$(kihl)$ $(\bar{i}\bar{k}\bar{h}l)$
			Ditrigonal prism *Truncated trigon through origin*	$(hki0)$ $(\bar{k}\bar{h}\bar{i}0)$	$(ihk0)$ $(\bar{h}\bar{i}\bar{k}0)$	$(kih0)$ $(\bar{i}\bar{k}\bar{h}0)$
			Hexagonal pyramid *Hexagon*	$(hh\overline{2h}l)$ $(\bar{h}\bar{h}2hl)$	$(\overline{2h}hhl)$ $(\bar{h}2h\bar{h}l)$	$(h\overline{2h}hl)$ $(2h\bar{h}\bar{h}l)$
			Hexagonal prism *Hexagon through origin*	$(11\bar{2}0)$ $(\bar{1}\bar{1}20)$	$(\bar{2}110)$ $(\bar{1}2\bar{1}0)$	$(1\bar{2}10)$ $(2\bar{1}\bar{1}0)$
3	*b*	*.m.*	Trigonal pyramid *Trigon* (*d*)	$(h0\bar{h}l)$	$(\bar{h}h0l)$	$(0\bar{h}hl)$
			Trigonal prism *Trigon through origin*	$(10\bar{1}0)$ or $(\bar{1}010)$	$(\bar{1}100)$ $(1\bar{1}00)$	$(0\bar{1}10)$ $(01\bar{1}0)$
1	*a*	3*m.*	Pedion or monohedron *Single point* (*a*)	(0001) or $(000\bar{1})$		

Symmetry of special projections

Along [001]	Along [100]	Along [210]
3*m*	1	*m*

$31m$ C_{3v}

HEXAGONAL AXES



6	*c*	1	Ditrigonal pyramid *Truncated trigon* (*d*)	$(hkil)$ $(khil)$	$(ihkl)$ $(hikl)$	$(kihl)$ $(ikhl)$
			Ditrigonal prism *Truncated trigon through origin*	$(hki0)$ $(khi0)$	$(ihk0)$ $(hik0)$	$(kih0)$ $(ikh0)$
			Hexagonal pyramid *Hexagon*	$(h0\bar{h}l)$ $(0h\bar{h}l)$	$(\bar{h}h0l)$ $(h\bar{h}0l)$	$(0\bar{h}hl)$ $(\bar{h}0hl)$
			Hexagonal prism *Hexagon through origin*	$(10\bar{1}0)$ $(01\bar{1}0)$	$(\bar{1}100)$ $(1\bar{1}00)$	$(0\bar{1}10)$ $(\bar{1}010)$
3	*b*	*..m*	Trigonal pyramid *Trigon* (*c*)	$(hh\overline{2h}l)$	$(\overline{2h}hhl)$	$(h\overline{2h}hl)$
			Trigonal prism *Trigon through origin*	$(11\bar{2}0)$ or $(\bar{1}\bar{1}20)$	$(\bar{2}110)$ $(2\bar{1}\bar{1}0)$	$(1\bar{2}10)$ $(\bar{1}2\bar{1}0)$
1	*a*	3.*m*	Pedion or monohedron *Single point* (*a*)	(0001) or $(000\bar{1})$		

Symmetry of special projections

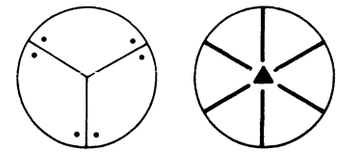
Along [001]	Along [100]	Along [210]
3*m*	*m*	1

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

TRIGONAL SYSTEM (*cont.*)

$3m$ C_{3v}

RHOMBOHEDRAL AXES



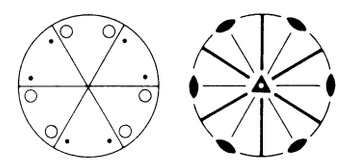
6	*c*	1	Ditrigonal pyramid *Truncated trigon* (*c*)	(hkl) (lhk) (klh) (khl) (hlk) (lkh)
			Ditrigonal prism *Truncated trigon through origin*	$(hk(\overline{h+k}))$ $((\overline{h+k})hk)$ $(k(\overline{h+k})h)$ $(kh(\overline{h+k}))$ $(h(\overline{h+k})k)$ $((\overline{h+k})kh)$
			Hexagonal pyramid *Hexagon*	$(hk(2k-h))$ $((2k-h)hk)$ $(k(2k-h)h)$ $(kh(2k-h))$ $(h(2k-h)k)$ $((2k-h)kh)$
			Hexagonal prism *Hexagon through origin*	$(01\bar{1})$ $(\bar{1}01)$ $(1\bar{1}0)$ $(10\bar{1})$ $(0\bar{1}1)$ $(\bar{1}10)$
3	*b*	.*m*	Trigonal pyramid *Trigon* (*b*)	(hhl) (lhh) (hlh)
			Trigonal prism *Trigon through origin*	$(11\bar{2})$ $(\bar{2}11)$ $(1\bar{2}1)$ or $(\bar{1}\bar{1}2)$ $(2\bar{1}\bar{1})$ $(\bar{1}2\bar{1})$
1	*a*	3*m*	Pedion or monohedron *Single point* (*a*)	(111) or $(\bar{1}\bar{1}\bar{1})$

Symmetry of special projections

Along [111]	Along $[1\bar{1}0]$	Along $[2\bar{1}\bar{1}]$
3*m*	1	*m*

$\bar{3}m1$ $\bar{3}\frac{2}{m}1$ D_{3d}

HEXAGONAL AXES



12	*d*	1	Ditrigonal scalenohedron or hexagonal scalenohedron *Trigonal antiprism sliced off by pinacoid* (*j*)	$(hkil)$ $(ihkl)$ $(kihl)$ $(khi\bar{l})$ $(hik\bar{l})$ $(ikh\bar{l})$ $(\bar{h}\bar{k}\bar{i}\bar{l})$ $(\bar{i}\bar{h}\bar{k}\bar{l})$ $(\bar{k}\bar{i}\bar{h}\bar{l})$ $(\bar{k}\bar{h}\bar{i}\bar{l})$ $(\bar{h}\bar{i}\bar{k}\bar{l})$ $(\bar{i}\bar{k}\bar{h}\bar{l})$
			Dihexagonal prism *Truncated hexagon through origin*	$(hki0)$ $(ihk0)$ $(kih0)$ $(khi0)$ $(hik0)$ $(ikh0)$ $(\bar{h}\bar{k}\bar{i}0)$ $(\bar{i}\bar{h}\bar{k}0)$ $(\bar{k}\bar{i}\bar{h}0)$ $(\bar{k}\bar{h}\bar{i}0)$ $(\bar{h}\bar{i}\bar{k}0)$ $(\bar{i}\bar{k}\bar{h}0)$
			Hexagonal dipyramid *Hexagonal prism*	$(hh\overline{2h}l)$ $(\overline{2h}hhl)$ $(h\overline{2h}hl)$ $(hh\overline{2h}\bar{l})$ $(h\overline{2h}h\bar{l})$ $(\overline{2h}hh\bar{l})$ $(\bar{h}\bar{h}2h\bar{l})$ $(2h\bar{h}\bar{h}\bar{l})$ $(\bar{h}2h\bar{h}\bar{l})$ $(\bar{h}\bar{h}2hl)$ $(\bar{h}2h\bar{h}l)$ $(2h\bar{h}\bar{h}l)$
6	*c*	.*m*.	Rhombohedron *Trigonal antiprism* (*i*)	$(h0\bar{h}l)$ $(\bar{h}h0l)$ $(0\bar{h}hl)$ $(0h\bar{h}\bar{l})$ $(h\bar{h}0\bar{l})$ $(\bar{h}0h\bar{l})$
			Hexagonal prism *Hexagon through origin*	$(10\bar{1}0)$ $(\bar{1}100)$ $(0\bar{1}10)$ $(01\bar{1}0)$ $(1\bar{1}00)$ $(\bar{1}010)$
6	*b*	.2.	Hexagonal prism *Hexagon through origin* (*g*)	$(11\bar{2}0)$ $(\bar{2}110)$ $(1\bar{2}10)$ $(\bar{1}\bar{1}20)$ $(\bar{1}2\bar{1}0)$ $(2\bar{1}\bar{1}0)$
2	*a*	3*m*.	Pinacoid or parallelohedron *Line segment through origin* (*c*)	(0001) $(000\bar{1})$

Symmetry of special projections

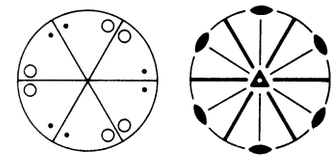
Along [001]	Along [100]	Along [210]
6*mm*	2	2*mm*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

TRIGONAL SYSTEM (*cont.*)

$\bar{3}1m$ D_{3d}

$\bar{3}1\dfrac{2}{m}$



HEXAGONAL AXES

12	*d*	1	Ditrigonal scalenohedron or hexagonal scalenohedron	$(hkil)$	$(ihkl)$	$(kihl)$
				$(\bar{k}\bar{h}\bar{i}\bar{l})$	$(\bar{h}\bar{i}\bar{k}\bar{l})$	$(\bar{i}\bar{k}\bar{h}\bar{l})$
			Trigonal antiprism sliced off by pinacoid (*l*)	$(\bar{h}\bar{k}\bar{i}\bar{l})$	$(\bar{i}\bar{h}\bar{k}\bar{l})$	$(\bar{k}\bar{i}\bar{h}\bar{l})$
				$(khil)$	$(hikl)$	$(ikhl)$
			Dihexagonal prism	$(hki0)$	$(ihk0)$	$(kih0)$
			Truncated hexagon through origin	$(\bar{k}\bar{h}\bar{i}0)$	$(\bar{h}\bar{i}\bar{k}0)$	$(\bar{i}\bar{k}\bar{h}0)$
				$(\bar{h}\bar{k}\bar{i}0)$	$(\bar{i}\bar{h}\bar{k}0)$	$(\bar{k}\bar{i}\bar{h}0)$
				$(khi0)$	$(hik0)$	$(ikh0)$
			Hexagonal dipyramid	$(h0\bar{h}l)$	$(\bar{h}h0l)$	$(0\bar{h}hl)$
			Hexagonal prism	$(0\bar{h}h\bar{l})$	$(\bar{h}h0\bar{l})$	$(h0\bar{h}\bar{l})$
				$(\bar{h}0h\bar{l})$	$(h\bar{h}0\bar{l})$	$(0h\bar{h}\bar{l})$
				$(0h\bar{h}l)$	$(h\bar{h}0l)$	$(\bar{h}0hl)$
6	*c*	..*m*	Rhombohedron	$(hh\overline{2h}l)$	$(\overline{2h}hhl)$	$(h\overline{2h}hl)$
			Trigonal antiprism (*k*)	$(\bar{h}\bar{h}2h\bar{l})$	$(\bar{h}2h\bar{h}\bar{l})$	$(2h\bar{h}\bar{h}\bar{l})$
			Hexagonal prism	$(11\bar{2}0)$	$(\bar{2}110)$	$(1\bar{2}10)$
			Hexagon through origin	$(\bar{1}\bar{1}20)$	$(\bar{1}2\bar{1}0)$	$(2\bar{1}\bar{1}0)$
6	*b*	..2	Hexagonal prism	$(10\bar{1}0)$	$(\bar{1}100)$	$(0\bar{1}10)$
			Hexagon through origin (*i*)	$(\bar{1}010)$	$(1\bar{1}00)$	$(01\bar{1}0)$
2	*a*	3.*m*	Pinacoid or parallelohedron	(0001)	$(000\bar{1})$	
			Line segment through origin (*e*)			

Symmetry of special projections

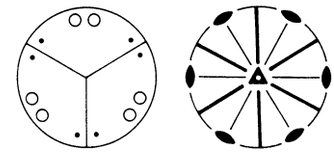
Along [001]	Along [100]	Along [210]
6*mm*	2*mm*	2

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

TRIGONAL SYSTEM (*cont.*)

$\bar{3}m$ D_{3d}

$\bar{3}\frac{2}{m}$



RHOMBOHEDRAL AXES

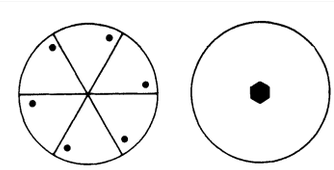
12	*d*	1	Ditrigonal scalenohedron or hexagonal scalenohedron *Trigonal antiprism sliced off by pinacoid* (*i*)	(hkl) $(\bar{k}\bar{h}\bar{l})$ $(\bar{h}\bar{k}\bar{l})$ (khl)	(lhk) $(\bar{h}\bar{l}\bar{k})$ $(\bar{l}\bar{h}\bar{k})$ (hlk)	(klh) $(\bar{l}\bar{k}\bar{h})$ $(\bar{k}\bar{l}\bar{h})$ (lkh)
			Dihexagonal prism *Truncated hexagon through origin*	$(hk(\overline{h+k}))$ $(\bar{k}\bar{h}(h+k))$ $(\bar{h}\bar{k}(h+k))$ $(kh(\overline{h+k}))$	$((\overline{h+k})hk)$ $(\bar{h}(h+k)\bar{k})$ $((h+k)\bar{h}\bar{k})$ $(h(\overline{h+k})k)$	$(k(\overline{h+k})h)$ $((h+k)\bar{k}\bar{h})$ $(\bar{k}(h+k)\bar{h})$ $((\overline{h+k})kh)$
			Hexagonal dipyramid *Hexagonal prism*	$(hk(2k-h))$ $(\bar{k}\bar{h}(h-2k))$ $(\bar{h}\bar{k}(h-2k))$ $(kh(2k-h))$	$((2k-h)hk)$ $(\bar{h}(h-2k)\bar{k})$ $((h-2k)\bar{h}\bar{k})$ $(h(2k-h)k)$	$(k(2k-h)h)$ $((h-2k)\bar{k}\bar{h})$ $(\bar{k}(h-2k)\bar{h})$ $((2k-h)kh)$
6	*c*	.*m*	Rhombohedron *Trigonal antiprism* (*h*)	(hhl) $(\bar{h}\bar{h}\bar{l})$	(lhh) $(\bar{h}\bar{l}\bar{h})$	(hlh) $(\bar{l}\bar{h}\bar{h})$
			Hexagonal prism *Hexagon through origin*	$(11\bar{2})$ $(\bar{1}\bar{1}2)$	$(\bar{2}11)$ $(\bar{1}2\bar{1})$	$(1\bar{2}1)$ $(2\bar{1}\bar{1})$
6	*b*	.2	Hexagonal prism *Hexagon through origin* (*f*)	$(01\bar{1})$ $(0\bar{1}1)$	$(\bar{1}01)$ $(10\bar{1})$	$(1\bar{1}0)$ $(\bar{1}10)$
2	*a*	3*m*	Pinacoid or parallelohedron *Line segment through origin* (*c*)	(111)	$(\bar{1}\bar{1}\bar{1})$	

Symmetry of special projections

Along [111]	Along $[1\bar{1}0]$	Along $[2\bar{1}\bar{1}]$
6*mm*	2	2*mm*

HEXAGONAL SYSTEM

6 C_6



6	*b*	1	Hexagonal pyramid *Hexagon* (*d*)	$(hkil)$	$(ihkl)$	$(kihl)$	$(\bar{h}\bar{k}\bar{i}\bar{l})$ $(\bar{i}\bar{h}\bar{k}\bar{l})$ $(\bar{k}\bar{i}\bar{h}\bar{l})$
			Hexagonal prism *Hexagon through origin*	$(hki0)$	$(ihk0)$	$(kih0)$	$(\bar{h}\bar{k}\bar{i}0)$ $(\bar{i}\bar{h}\bar{k}0)$ $(\bar{k}\bar{i}\bar{h}0)$
1	*a*	6..	Pedion or monohedron *Single point* (*a*)	(0001) or $(000\bar{1})$			

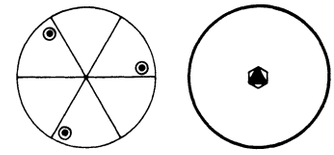
Symmetry of special projections

Along [001]	Along [100]	Along [210]
6	*m*	*m*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

HEXAGONAL SYSTEM (*cont.*)

$\bar{6}$ C_{3h}

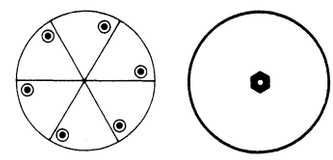


6	*c*	1	Trigonal dipyramid *Trigonal prism* (*l*)	$(hkil)$ $(ihkl)$ $(kihl)$ $(hki\bar{l})$ $(ihk\bar{l})$ $(kih\bar{l})$
3	*b*	*m*..	Trigonal prism *Trigon through origin* (*j*)	$(hki0)$ $(ihk0)$ $(kih0)$
2	*a*	3..	Pinacoid or parallelohedron *Line segment through origin* (*g*)	(0001) $(000\bar{1})$

Symmetry of special projections

Along [001]	Along [100]	Along [210]
3	*m*	*m*

$6/m$ C_{6h}

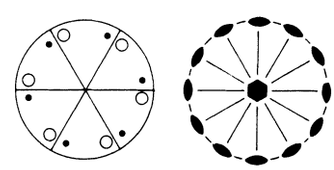


12	*c*	1	Hexagonal dipyramid *Hexagonal prism* (*l*)	$(hkil)$ $(ihkl)$ $(kihl)$ $(\bar{h}\bar{k}\bar{i}l)$ $(\bar{i}\bar{h}\bar{k}l)$ $(\bar{k}\bar{i}\bar{h}l)$ $(hki\bar{l})$ $(ihk\bar{l})$ $(kih\bar{l})$ $(\bar{h}\bar{k}\bar{i}\bar{l})$ $(\bar{i}\bar{h}\bar{k}\bar{l})$ $(\bar{k}\bar{i}\bar{h}\bar{l})$
6	*b*	*m*..	Hexagonal prism *Hexagon through origin* (*j*)	$(hki0)$ $(ihk0)$ $(kih0)$ $(\bar{h}\bar{k}\bar{i}0)$ $(\bar{i}\bar{h}\bar{k}0)$ $(\bar{k}\bar{i}\bar{h}0)$
2	*a*	6..	Pinacoid or parallelohedron *Line segment through origin* (*e*)	(0001) $(000\bar{1})$

Symmetry of special projections

Along [001]	Along [100]	Along [210]
6	2*mm*	2*mm*

622 D_6



12	*d*	1	Hexagonal trapezohedron *Twisted hexagonal antiprism* (*n*)	$(hkil)$ $(ihkl)$ $(kihl)$ $(\bar{h}\bar{k}\bar{i}l)$ $(\bar{i}\bar{h}\bar{k}l)$ $(\bar{k}\bar{i}\bar{h}l)$ $(khi\bar{l})$ $(hik\bar{l})$ $(ikh\bar{l})$ $(\bar{k}\bar{h}\bar{i}\bar{l})$ $(\bar{h}\bar{i}\bar{k}\bar{l})$ $(\bar{i}\bar{k}\bar{h}\bar{l})$
			Dihexagonal prism *Truncated hexagon through origin*	$(hki0)$ $(ihk0)$ $(kih0)$ $(\bar{h}\bar{k}\bar{i}0)$ $(\bar{i}\bar{h}\bar{k}0)$ $(\bar{k}\bar{i}\bar{h}0)$ $(khi0)$ $(hik0)$ $(ikh0)$ $(\bar{k}\bar{h}\bar{i}0)$ $(\bar{h}\bar{i}\bar{k}0)$ $(\bar{i}\bar{k}\bar{h}0)$
			Hexagonal dipyramid *Hexagonal prism*	$(h0\bar{h}l)$ $(\bar{h}h0l)$ $(0\bar{h}hl)$ $(\bar{h}0hl)$ $(h\bar{h}0l)$ $(0h\bar{h}l)$ $(0h\bar{h}\bar{l})$ $(h\bar{h}0\bar{l})$ $(\bar{h}0h\bar{l})$ $(0\bar{h}h\bar{l})$ $(\bar{h}h0\bar{l})$ $(h0\bar{h}\bar{l})$
			Hexagonal dipyramid *Hexagonal prism*	$(hh\overline{2h}l)$ $(\overline{2h}hhl)$ $(h\overline{2h}hl)$ $(\bar{h}\bar{h}2hl)$ $(2h\bar{h}\bar{h}l)$ $(\bar{h}2h\bar{h}l)$ $(hh\overline{2h}\bar{l})$ $(h\overline{2h}h\bar{l})$ $(\overline{2h}hh\bar{l})$ $(\bar{h}\bar{h}2h\bar{l})$ $(\bar{h}2h\bar{h}\bar{l})$ $(2h\bar{h}\bar{h}\bar{l})$
6	*c*	..2	Hexagonal prism *Hexagon through origin* (*l*)	$(10\bar{1}0)$ $(\bar{1}100)$ $(0\bar{1}10)$ $(\bar{1}010)$ $(1\bar{1}00)$ $(01\bar{1}0)$
6	*b*	.2.	Hexagonal prism *Hexagon through origin* (*j*)	$(11\bar{2}0)$ $(\bar{2}110)$ $(1\bar{2}10)$ $(\bar{1}\bar{1}20)$ $(2\bar{1}\bar{1}0)$ $(\bar{1}2\bar{1}0)$
2	*a*	6..	Pinacoid or parallelohedron *Line segment through origin* (*e*)	(0001) $(000\bar{1})$

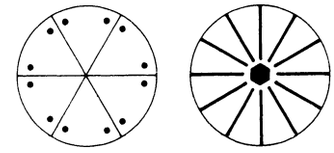
Symmetry of special projections

Along [001]	Along [100]	Along [210]
6*mm*	2*mm*	2*mm*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

HEXAGONAL SYSTEM (*cont.*)

$6mm$ C_{6v}

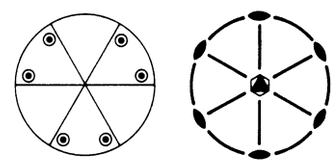


12	*d*	1	Dihexagonal pyramid *Truncated hexagon* (*f*)	$(hkil)$ $(khil)$	$(ihkl)$ $(hikl)$	$(kihl)$ $(ikhl)$	$(\bar{h}\bar{k}\bar{i}l)$ $(\bar{k}\bar{h}\bar{i}l)$	$(\bar{i}\bar{h}\bar{k}l)$ $(\bar{h}\bar{i}\bar{k}l)$	$(\bar{k}\bar{i}\bar{h}l)$ $(\bar{i}\bar{k}\bar{h}l)$
			Dihexagonal prism *Truncated hexagon through origin*	$(hki0)$ $(khi0)$	$(ihk0)$ $(hik0)$	$(kih0)$ $(ikh0)$	$(\bar{h}\bar{k}\bar{i}0)$ $(\bar{k}\bar{h}\bar{i}0)$	$(\bar{i}\bar{h}\bar{k}0)$ $(\bar{h}\bar{i}\bar{k}0)$	$(\bar{k}\bar{i}\bar{h}0)$ $(\bar{i}\bar{k}\bar{h}0)$
6	*c*	*.m.*	Hexagonal pyramid *Hexagon* (*e*)	$(h0\bar{h}l)$	$(\bar{h}h0l)$	$(0\bar{h}hl)$	$(\bar{h}0hl)$	$(h\bar{h}0l)$	$(0h\bar{h}l)$
			Hexagonal prism *Hexagon through origin*	$(10\bar{1}0)$	$(\bar{1}100)$	$(0\bar{1}10)$	$(\bar{1}010)$	$(1\bar{1}00)$	$(01\bar{1}0)$
6	*b*	*..m*	Hexagonal pyramid *Hexagon* (*d*)	$(hh\overline{2h}l)$	$(\overline{2h}hhl)$	$(h\overline{2h}hl)$	$(\bar{h}\bar{h}2hl)$	$(2h\bar{h}\bar{h}l)$	$(\bar{h}2h\bar{h}l)$
			Hexagonal prism *Hexagon through origin*	$(11\bar{2}0)$	$(\bar{2}110)$	$(1\bar{2}10)$	$(\bar{1}\bar{1}20)$	$(2\bar{1}\bar{1}0)$	$(\bar{1}2\bar{1}0)$
1	*a*	$6mm$	Pedion or monohedron *Single point* (*a*)	(0001) or $(000\bar{1})$					

Symmetry of special projections

Along [001]	Along [100]	Along [210]
$6mm$	m	m

$\bar{6}m2$ D_{3h}



12	*e*	1	Ditrigonal dipyramid *Edge-truncated trigonal prism* (*o*)	$(hkil)$ $(hki\bar{l})$ $(\bar{k}\bar{h}\bar{i}l)$ $(\bar{k}\bar{h}\bar{i}\bar{l})$	$(ihkl)$ $(ihk\bar{l})$ $(\bar{i}\bar{h}\bar{k}l)$ $(\bar{i}\bar{h}\bar{k}\bar{l})$	$(kihl)$ $(kih\bar{l})$ $(\bar{i}\bar{k}\bar{h}l)$ $(\bar{i}\bar{k}\bar{h}\bar{l})$
			Hexagonal dipyramid *Hexagonal prism*	$(hh\overline{2h}l)$ $(hh\overline{2h}\bar{l})$ $(\bar{h}\bar{h}2hl)$ $(\bar{h}\bar{h}2h\bar{l})$	$(\overline{2h}hhl)$ $(\overline{2h}hh\bar{l})$ $(\bar{h}2h\bar{h}l)$ $(\bar{h}2h\bar{h}\bar{l})$	$(h\overline{2h}hl)$ $(h\overline{2h}h\bar{l})$ $(2h\bar{h}\bar{h}l)$ $(2h\bar{h}\bar{h}\bar{l})$
6	*d*	*m..*	Ditrigonal prism *Truncated trigon through origin* (*l*)	$(hki0)$ $(\bar{k}\bar{h}\bar{i}0)$	$(ihk0)$ $(\bar{i}\bar{h}\bar{k}0)$	$(kih0)$ $(\bar{i}\bar{k}\bar{h}0)$
			Hexagonal prism *Hexagon through origin*	$(11\bar{2}0)$ $(\bar{1}\bar{1}20)$	$(\bar{2}110)$ $(\bar{1}2\bar{1}0)$	$(1\bar{2}10)$ $(2\bar{1}\bar{1}0)$
6	*c*	*.m.*	Trigonal dipyramid *Trigonal prism* (*n*)	$(h0\bar{h}l)$ $(h0\bar{h}\bar{l})$	$(\bar{h}h0l)$ $(\bar{h}h0\bar{l})$	$(0\bar{h}hl)$ $(0\bar{h}h\bar{l})$
3	*b*	$mm2$	Trigonal prism *Trigon through origin* (*j*)	$(10\bar{1}0)$ or $(\bar{1}010)$	$(\bar{1}100)$ $(1\bar{1}00)$	$(0\bar{1}10)$ $(01\bar{1}0)$
2	*a*	$3m.$	Pinacoid or parallelohedron *Line segment through origin* (*g*)	(0001)	$(000\bar{1})$	

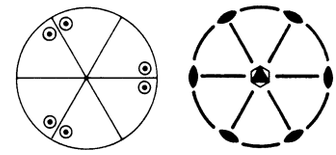
Symmetry of special projections

Along [001]	Along [100]	Along [210]
$3m$	m	$2mm$

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

HEXAGONAL SYSTEM (*cont.*)

$\bar{6}2m$ D_{3h}



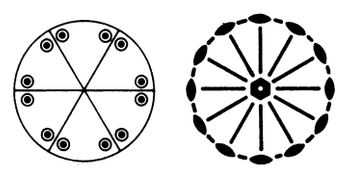
12	*e*	1	Ditrigonal dipyramid *Edge-truncated trigonal prism* (*l*)	$(hkil)$ $(hki\bar{l})$ $(khi\bar{l})$ $(khil)$	$(ihkl)$ $(ihk\bar{l})$ $(hik\bar{l})$ $(hikl)$	$(kihl)$ $(kih\bar{l})$ $(ikh\bar{l})$ $(ikhl)$
			Hexagonal dipyramid *Hexagonal prism*	$(h0\bar{h}l)$ $(h0\bar{h}\bar{l})$ $(0h\bar{h}\bar{l})$ $(0h\bar{h}l)$	$(\bar{h}h0l)$ $(\bar{h}h0\bar{l})$ $(h\bar{h}0\bar{l})$ $(h\bar{h}0l)$	$(0\bar{h}hl)$ $(0\bar{h}h\bar{l})$ $(\bar{h}0hl)$ $(\bar{h}0hl)$
6	*d*	*m*..	Ditrigonal prism *Truncated trigon through origin* (*j*)	$(hki0)$ $(khi0)$	$(ihk0)$ $(hik0)$	$(kih0)$ $(ikh0)$
			Hexagonal prism *Hexagon through origin*	$(10\bar{1}0)$ $(01\bar{1}0)$	$(\bar{1}100)$ $(1\bar{1}00)$	$(0\bar{1}10)$ $(\bar{1}010)$
6	*c*	..*m*	Trigonal dipyramid *Trigonal prism* (*i*)	$(hh\overline{2h}l)$ $(hh\overline{2h}\bar{l})$	$(\overline{2h}hhl)$ $(\overline{2h}hh\bar{l})$	$(h\overline{2h}hl)$ $(h\overline{2h}h\bar{l})$
3	*b*	*m*2*m*	Trigonal prism *Trigon through origin* (*f*)	$(11\bar{2}0)$ or $(\bar{1}\bar{1}20)$	$(\bar{2}110)$ $(2\bar{1}\bar{1}0)$	$(1\bar{2}10)$ $(\bar{1}2\bar{1}0)$
2	*a*	3.*m*	Pinacoid or parallelohedron *Line segment through origin* (*e*)	(0001)	$(000\bar{1})$	

Symmetry of special projections

Along [001]	Along [100]	Along [210]
3*m*	2*mm*	*m*

$6/mmm$ D_{6h}

$$\frac{6}{m}\frac{2}{m}\frac{2}{m}$$



24	*g*	1	Dihexagonal dipyramid *Edge-truncated hexagonal prism* (*r*)	$(hkil)$ $(khi\bar{l})$ $(h\bar{k}\bar{i}\bar{l})$ $(\bar{k}\bar{h}\bar{i}l)$	$(ihkl)$ $(hik\bar{l})$ $(\bar{i}\bar{h}\bar{k}\bar{l})$ $(\bar{h}\bar{i}\bar{k}l)$	$(kihl)$ $(ikh\bar{l})$ $(\bar{k}\bar{i}\bar{h}\bar{l})$ $(\bar{i}\bar{k}\bar{h}l)$	$(\bar{h}\bar{k}\bar{i}l)$ $(\bar{k}\bar{h}\bar{i}\bar{l})$ $(khil)$ $(khil)$	$(\bar{i}\bar{h}\bar{k}l)$ $(\bar{h}\bar{i}\bar{k}\bar{l})$ $(ihk\bar{l})$ $(hikl)$	$(\bar{k}\bar{i}\bar{h}l)$ $(\bar{i}\bar{k}\bar{h}\bar{l})$ $(kih\bar{l})$ $(ikhl)$
12	*f*	*m*..	Dihexagonal prism *Truncated hexagon through origin* (*p*)	$(hki0)$ $(khi0)$	$(ihk0)$ $(hik0)$	$(kih0)$ $(ikh0)$	$(\bar{h}\bar{k}\bar{i}0)$ $(\bar{k}\bar{h}\bar{i}0)$	$(\bar{i}\bar{h}\bar{k}0)$ $(\bar{h}\bar{i}\bar{k}0)$	$(\bar{k}\bar{i}\bar{h}0)$ $(\bar{i}\bar{k}\bar{h}0)$
12	*e*	.*m*.	Hexagonal dipyramid *Hexagonal prism* (*o*)	$(h0\bar{h}l)$ $(0h\bar{h}\bar{l})$	$(\bar{h}h0l)$ $(h\bar{h}0\bar{l})$	$(0\bar{h}hl)$ $(\bar{h}0h\bar{l})$	$(\bar{h}0hl)$ $(0\bar{h}h\bar{l})$	$(h\bar{h}0l)$ $(\bar{h}h0\bar{l})$	$(0h\bar{h}l)$ $(h0\bar{h}\bar{l})$
12	*d*	..*m*	Hexagonal dipyramid *Hexagonal prism* (*n*)	$(hh\overline{2h}l)$ $(hh\overline{2h}\bar{l})$	$(\overline{2h}hhl)$ $(h\overline{2h}h\bar{l})$	$(h\overline{2h}hl)$ $(\overline{2h}hh\bar{l})$	$(\bar{h}\bar{h}2hl)$ $(\bar{h}h2h\bar{l})$	$(2h\bar{h}\bar{h}l)$ $(\bar{h}2h\bar{h}\bar{l})$	$(\bar{h}2h\bar{h}l)$ $(2h\bar{h}\bar{h}\bar{l})$
6	*c*	*mm*2	Hexagonal prism *Hexagon through origin* (*l*)	$(10\bar{1}0)$	$(\bar{1}100)$	$(0\bar{1}10)$	$(\bar{1}010)$	$(1\bar{1}00)$	$(01\bar{1}0)$
6	*b*	*m*2*m*	Hexagonal prism *Hexagon through origin* (*j*)	$(11\bar{2}0)$	$(\bar{2}110)$	$(1\bar{2}10)$	$(\bar{1}\bar{1}20)$	$(2\bar{1}\bar{1}0)$	$(\bar{1}2\bar{1}0)$
2	*a*	6*mm*	Pinacoid or parallelohedron *Line segment through origin* (*e*)	(0001)	$(000\bar{1})$				

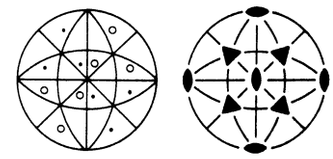
Symmetry of special projections

Along [001]	Along [100]	Along [210]
6*mm*	2*mm*	2*mm*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

CUBIC SYSTEM

23 *T*



12	*c*	1	Pentagon-tritetrahedron or tetartoid or tetrahedral pentagon-dodecahedron *Snub tetrahedron* (= *pentagon-tritetrahedron* + *two tetrahedra*) (*j*)	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{h}k\bar{l})$ $(h\bar{k}\bar{l})$ (lhk) $(l\bar{h}\bar{k})$ $(\bar{l}\bar{h}k)$ $(\bar{l}h\bar{k})$ (klh) $(\bar{k}l\bar{h})$ $(k\bar{l}\bar{h})$ $(\bar{k}\bar{l}h)$
			Trigon-tritetrahedron or tristetrahedron (for $\|h\| < \|l\|$) *Tetrahedron truncated by tetrahedron* (*for* $\|x\| < \|z\|$) Tetragon-tritetrahedron or deltohedron or deltoid-dodecahedron (for $\|h\| > \|l\|$) *Cube* & *two tetrahedra* (*for* $\|x\| > \|z\|$)	(hhl) $(\bar{h}\bar{h}l)$ $(\bar{h}h\bar{l})$ $(h\bar{h}\bar{l})$ (lhh) $(l\bar{h}\bar{h})$ $(\bar{l}\bar{h}h)$ $(\bar{l}h\bar{h})$ (hlh) $(\bar{h}l\bar{h})$ $(h\bar{l}\bar{h})$ $(\bar{h}\bar{l}h)$
			Pentagon-dodecahedron or dihexahedron or pyritohedron *Irregular icosahedron* (= *pentagon-dodecahedron* + *octahedron*)	$(0kl)$ $(0\bar{k}l)$ $(0k\bar{l})$ $(0\bar{k}\bar{l})$ $(l0k)$ $(l0\bar{k})$ $(\bar{l}0k)$ $(\bar{l}0\bar{k})$ $(kl0)$ $(\bar{k}l0)$ $(k\bar{l}0)$ $(\bar{k}\bar{l}0)$
			Rhomb-dodecahedron *Cuboctahedron*	(011) $(0\bar{1}1)$ $(01\bar{1})$ $(0\bar{1}\bar{1})$ (101) $(10\bar{1})$ $(\bar{1}01)$ $(\bar{1}0\bar{1})$ (110) $(\bar{1}10)$ $(1\bar{1}0)$ $(\bar{1}\bar{1}0)$
6	*b*	2..	Cube or hexahedron *Octahedron* (*f*)	(100) $(\bar{1}00)$ (010) $(0\bar{1}0)$ (001) $(00\bar{1})$
4	*a*	.3.	Tetrahedron *Tetrahedron* (*e*)	(111) $(\bar{1}\bar{1}1)$ $(\bar{1}1\bar{1})$ $(1\bar{1}\bar{1})$ or $(\bar{1}\bar{1}\bar{1})$ $(11\bar{1})$ $(1\bar{1}1)$ $(\bar{1}11)$

Symmetry of special projections

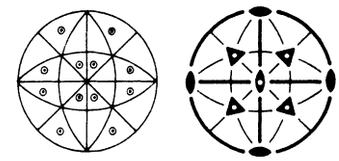
Along [001]	Along [111]	Along [110]
2*mm*	3	*m*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

CUBIC SYSTEM (*cont.*)

$m\bar{3}$ T_h

$\frac{2}{m}\bar{3}$



24	*d*	1	Didodecahedron or diploid or dyakisdodecahedron *Cube* & *octahedron* & *pentagon-dodecahedron* (*l*)	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{h}k\bar{l})$ $(h\bar{k}\bar{l})$ (lhk) $(l\bar{h}\bar{k})$ $(\bar{l}\bar{h}k)$ $(\bar{l}h\bar{k})$ (klh) $(\bar{k}l\bar{h})$ $(k\bar{l}\bar{h})$ $(\bar{k}\bar{l}h)$ $(\bar{h}\bar{k}\bar{l})$ $(hk\bar{l})$ $(h\bar{k}l)$ $(\bar{h}kl)$ $(\bar{l}\bar{h}\bar{k})$ $(\bar{l}hk)$ $(lh\bar{k})$ $(l\bar{h}k)$ $(\bar{k}\bar{l}\bar{h})$ $(k\bar{l}h)$ $(\bar{k}lh)$ $(kl\bar{h})$
			Tetragon-trioctahedron or trapezohedron or deltoid-icositetrahedron (for $\|h\| < \|l\|$) *Cube* & *octahedron* & *rhomb-dodecahedron* (*for* $\|x\| < \|z\|$) Trigon-trioctahedron or trisoctahedron (for $\|h\| > \|l\|$) *Cube truncated by octahedron* (*for* $\|x\| > \|z\|$)	(hhl) $(\bar{h}\bar{h}l)$ $(\bar{h}h\bar{l})$ $(h\bar{h}\bar{l})$ (lhh) $(l\bar{h}\bar{h})$ $(\bar{l}\bar{h}h)$ $(\bar{l}h\bar{h})$ (hlh) $(\bar{h}l\bar{h})$ $(h\bar{l}\bar{h})$ $(\bar{h}\bar{l}h)$ $(\bar{h}\bar{h}\bar{l})$ $(hh\bar{l})$ $(h\bar{h}l)$ $(\bar{h}hl)$ $(\bar{l}\bar{h}\bar{h})$ $(\bar{l}hh)$ $(lh\bar{h})$ $(l\bar{h}h)$ $(\bar{h}\bar{l}\bar{h})$ $(h\bar{l}h)$ $(\bar{h}lh)$ $(hl\bar{h})$
12	*c*	*m*..	Pentagon-dodecahedron or dihexahedron or pyritohedron *Irregular icosahedron* (= *pentagon-dodecahedron* + *octahedron*) (*j*)	$(0kl)$ $(0\bar{k}l)$ $(0k\bar{l})$ $(0\bar{k}\bar{l})$ $(l0k)$ $(l0\bar{k})$ $(\bar{l}0k)$ $(\bar{l}0\bar{k})$ $(kl0)$ $(\bar{k}l0)$ $(k\bar{l}0)$ $(\bar{k}\bar{l}0)$
			Rhomb-dodecahedron *Cuboctahedron*	(011) $(0\bar{1}1)$ $(01\bar{1})$ $(0\bar{1}\bar{1})$ (101) $(10\bar{1})$ $(\bar{1}01)$ $(\bar{1}0\bar{1})$ (110) $(\bar{1}10)$ $(1\bar{1}0)$ $(\bar{1}\bar{1}0)$
8	*b*	.3.	Octahedron *Cube* (*i*)	(111) $(\bar{1}\bar{1}1)$ $(\bar{1}1\bar{1})$ $(1\bar{1}\bar{1})$ $(\bar{1}\bar{1}\bar{1})$ $(11\bar{1})$ $(1\bar{1}1)$ $(\bar{1}11)$
6	*a*	2*mm*..	Cube or hexahedron *Octahedron* (*e*)	(100) $(\bar{1}00)$ (010) $(0\bar{1}0)$ (001) $(00\bar{1})$

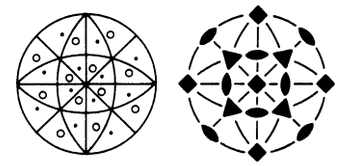
Symmetry of special projections

Along [001]	Along [111]	Along [110]
2*mm*	6	2*mm*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

CUBIC SYSTEM (*cont.*)

432 *O*



24	*d*	1	Pentagon-trioctahedron or gyroid or pentagon-icositetrahedron *Snub cube*(= *cube* + *octahedron* + *pentagon-trioctahedron*) (*k*)	(hkl) (lhk) (klh)	$(\bar{h}\bar{k}l)$ $(l\bar{h}\bar{k})$ $(\bar{k}l\bar{h})$	$(\bar{h}k\bar{l})$ $(\bar{l}hk)$ $(k\bar{l}h)$	$(h\bar{k}\bar{l})$ $(\bar{l}h\bar{k})$ $(\bar{k}\bar{l}h)$	$(kh\bar{l})$ $(\bar{l}kh)$ $(h\bar{l}k)$	$(\bar{k}\bar{h}\bar{l})$ $(\bar{l}\bar{k}\bar{h})$ $(\bar{h}\bar{l}\bar{k})$	$(k\bar{h}l)$ $(lk\bar{h})$ $(\bar{h}lk)$	$(\bar{k}hl)$ $(l\bar{k}h)$ $(hl\bar{k})$
			Tetragon-trioctahedron or trapezohedron or deltoid-icositetrahedron (for $\|h\| < \|l\|$) *Cube* & *octahedron* & *rhomb-dodecahedron* (*for* $\|x\| < \|z\|$) Trigon-trioctahedron or trisoctahedron (for $\|h\| > \|l\|$) *Cube truncated by octahedron* (*for* $\|x\| > \|z\|$)	(hhl) (lhh) (hlh)	$(\bar{h}\bar{h}l)$ $(l\bar{h}\bar{h})$ $(\bar{h}l\bar{h})$	$(\bar{h}hl)$ $(\bar{l}hh)$ $(h\bar{l}h)$	$(h\bar{h}\bar{l})$ $(\bar{l}h\bar{h})$ $(\bar{h}\bar{l}h)$	$(hh\bar{l})$ $(\bar{l}hh)$ $(h\bar{l}h)$	$(\bar{h}\bar{h}\bar{l})$ $(\bar{l}\bar{h}\bar{h})$ $(\bar{h}\bar{l}\bar{h})$	$(h\bar{h}l)$ $(lh\bar{h})$ $(\bar{h}lh)$	$(\bar{h}hl)$ $(l\bar{h}h)$ $(hl\bar{h})$
			Tetrahexahedron or tetrakishexahedron *Octahedron truncated by cube*	$(0kl)$ $(l0k)$ $(kl0)$	$(0\bar{k}l)$ $(l0\bar{k})$ $(\bar{k}l0)$	$(0k\bar{l})$ $(\bar{l}0k)$ $(k\bar{l}0)$	$(0\bar{k}\bar{l})$ $(\bar{l}0\bar{k})$ $(\bar{k}\bar{l}0)$	$(k0\bar{l})$ $(\bar{l}k0)$ $(0\bar{l}k)$	$(\bar{k}0\bar{l})$ $(\bar{l}\bar{k}0)$ $(0\bar{l}\bar{k})$	$(k0l)$ $(lk0)$ $(0lk)$	$(\bar{k}0l)$ $(l\bar{k}0)$ $(0l\bar{k})$
12	*c*	..2	Rhomb-dodecahedron *Cuboctahedron* (*i*)	(011) (101) (110)	$(0\bar{1}1)$ $(10\bar{1})$ $(\bar{1}10)$	$(01\bar{1})$ $(\bar{1}01)$ $(1\bar{1}0)$	$(0\bar{1}\bar{1})$ $(\bar{1}0\bar{1})$ $(\bar{1}\bar{1}0)$				
8	*b*	.3.	Octahedron *Cube* (*g*)	(111) $(\bar{1}\bar{1}\bar{1})$	$(\bar{1}\bar{1}1)$ $(11\bar{1})$	$(\bar{1}1\bar{1})$ $(1\bar{1}1)$	$(1\bar{1}\bar{1})$ $(\bar{1}11)$				
6	*a*	4..	Cube or hexahedron *Octahedron* (*e*)	(100) (010) (001)	$(\bar{1}00)$ $(0\bar{1}0)$ $(00\bar{1})$						

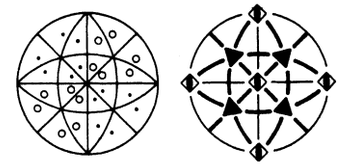
Symmetry of special projections

Along [001]	Along [111]	Along [110]
4*mm*	3*m*	2*mm*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

CUBIC SYSTEM (*cont.*)

$\bar{4}3m$ T_d



24	*d*	1	Hexatetrahedron or hexakistetrahedron *Cube truncated by* *two tetrahedra* (*j*)	(hkl) (lhk) (klh)	$(\bar{h}\bar{k}l)$ $(l\bar{h}\bar{k})$ $(\bar{k}l\bar{h})$	$(\bar{h}k\bar{l})$ $(\bar{l}\bar{h}k)$ $(k\bar{l}\bar{h})$	$(h\bar{k}\bar{l})$ $(\bar{l}h\bar{k})$ $(\bar{k}\bar{l}h)$	(khl) (lkh) (hlk)	$(\bar{k}\bar{h}l)$ $(l\bar{k}\bar{h})$ $(\bar{h}l\bar{k})$	$(k\bar{h}\bar{l})$ $(\bar{l}k\bar{h})$ $(\bar{h}\bar{l}k)$	$(\bar{k}h\bar{l})$ $(\bar{l}\bar{k}h)$ $(h\bar{l}\bar{k})$
			Tetrahexahedron or tetrakishexahedron *Octahedron truncated by cube*	$(0kl)$ $(l0k)$ $(kl0)$	$(0\bar{k}l)$ $(l0\bar{k})$ $(\bar{k}l0)$	$(0k\bar{l})$ $(\bar{l}0k)$ $(k\bar{l}0)$	$(0\bar{k}\bar{l})$ $(\bar{l}0\bar{k})$ $(\bar{k}\bar{l}0)$	$(k0l)$ $(lk0)$ $(0lk)$	$(\bar{k}0l)$ $(l\bar{k}0)$ $(0l\bar{k})$	$(k0\bar{l})$ $(\bar{l}k0)$ $(0\bar{l}k)$	$(\bar{k}0\bar{l})$ $(\bar{l}\bar{k}0)$ $(0\bar{l}\bar{k})$
12	c	..*m*	Trigon-tritetrahedron or tristetrahedron (for $\|h\| < \|l\|$) *Tetrahedron truncated* *by tetrahedron* (*i*) (*for* $\|x\| < \|z\|$) Tetragon-tritetrahedron or deltohedron or deltoid-dodecahedron (for $\|h\| > \|l\|$) *Cube & two tetrahedra* (*i*) (*for* $\|x\| > \|z\|$)	(hhl) (lhh) (hlh)	$(\bar{h}\bar{h}l)$ $(l\bar{h}\bar{h})$ $(\bar{h}l\bar{h})$	$(\bar{h}h\bar{l})$ $(\bar{l}\bar{h}h)$ $(h\bar{l}\bar{h})$	$(h\bar{h}\bar{l})$ $(\bar{l}h\bar{h})$ $(\bar{h}\bar{l}h)$				
			Rhomb-dodecahedron *Cuboctahedron*	(110) (011) (101)	$(\bar{1}\bar{1}0)$ $(0\bar{1}\bar{1})$ $(\bar{1}0\bar{1})$	$(\bar{1}10)$ $(0\bar{1}1)$ $(10\bar{1})$	$(1\bar{1}0)$ $(01\bar{1})$ $(\bar{1}01)$				
6	*b*	2.*mm*	Cube or hexahedron *Octahedron* (*f*)	(100) (010) (001)	$(\bar{1}00)$ $(0\bar{1}0)$ $(00\bar{1})$						
4	*a*	.3*m*	Tetrahedron *Tetrahedron* (*e*)	(111) or $(\bar{1}\bar{1}\bar{1})$	$(\bar{1}\bar{1}1)$ $(11\bar{1})$	$(\bar{1}1\bar{1})$ $(1\bar{1}1)$	$(1\bar{1}\bar{1})$ $(\bar{1}11)$				

Symmetry of special projections

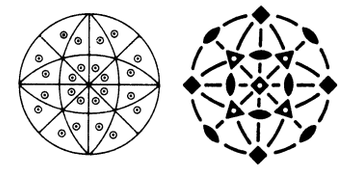
Along [001]	Along [111]	Along [110]
4*mm*	3*m*	*m*

Table 10.1.2.2. *The 32 three-dimensional crystallographic point groups* (*cont.*)

CUBIC SYSTEM (*cont.*)

$m\bar{3}m$ $\quad O_h$

$\frac{4}{m}\bar{3}\frac{2}{m}$



48	*f*	*l*	Hexaoctahedron or hexakisoctahedron *Cube truncated by octahedron and by rhomb-dodecahedron* (*n*)	(hkl) $(\bar{h}\bar{k}l)$ $(\bar{h}k\bar{l})$ $(h\bar{k}\bar{l})$ $(kh\bar{l})$ $(\bar{k}\bar{h}\bar{l})$ $(k\bar{h}l)$ $(\bar{k}hl)$ (lhk) $(l\bar{h}\bar{k})$ $(\bar{l}\bar{h}k)$ $(\bar{l}h\bar{k})$ $(\bar{l}kh)$ $(\bar{l}\bar{k}\bar{h})$ $(lk\bar{h})$ $(l\bar{k}h)$ (klh) $(\bar{k}l\bar{h})$ $(k\bar{l}\bar{h})$ $(\bar{k}\bar{l}h)$ $(h\bar{l}k)$ $(\bar{h}\bar{l}\bar{k})$ $(\bar{h}lk)$ $(h\bar{l}\bar{k})$ $(\bar{h}\bar{k}\bar{l})$ $(hk\bar{l})$ $(h\bar{k}l)$ $(\bar{h}kl)$ $(\bar{k}\bar{h}l)$ (khl) $(\bar{k}h\bar{l})$ $(k\bar{h}\bar{l})$ $(\bar{l}\bar{h}\bar{k})$ $(\bar{l}hk)$ $(lh\bar{k})$ $(l\bar{h}k)$ $(l\bar{k}\bar{h})$ (lkh) $(\bar{l}k\bar{h})$ $(\bar{l}\bar{k}h)$ $(\bar{k}\bar{l}\bar{h})$ $(k\bar{l}h)$ $(\bar{k}lh)$ $(kl\bar{h})$ $(\bar{h}l\bar{k})$ (hlk) $(h\bar{l}\bar{k})$ $(\bar{h}\bar{l}k)$
24	*e*	..*m*	Tetragon-trioctahedron or trapezohedron or deltoid-icositetrahedron (for $\lvert h\rvert < \lvert l\rvert$) *Cube & octahedron & rhomb-dodecahedron* (*m*) (*for* $\lvert x\rvert < \lvert z\rvert$) Trigon-trioctahedron or trisoctahedron (for $\lvert h\rvert > \lvert l\rvert$) *Cube truncated by octahedron* (*m*) (*for* $\lvert x\rvert > \lvert z\rvert$)	(hhl) $(\bar{h}\bar{h}l)$ $(\bar{h}h\bar{l})$ $(h\bar{h}\bar{l})$ $(hh\bar{l})$ $(\bar{h}\bar{h}\bar{l})$ $(h\bar{h}l)$ $(\bar{h}hl)$ (lhh) $(l\bar{h}\bar{h})$ $(\bar{l}\bar{h}h)$ $(\bar{l}h\bar{h})$ $(\bar{l}hh)$ $(\bar{l}\bar{h}\bar{h})$ $(lh\bar{h})$ $(l\bar{h}h)$ (hlh) $(\bar{h}l\bar{h})$ $(h\bar{l}\bar{h})$ $(\bar{h}\bar{l}h)$ $(h\bar{l}h)$ $(\bar{h}\bar{l}\bar{h})$ $(\bar{h}lh)$ $(h\bar{l}\bar{h})$
24	*d*	*m*..	Tetrahexahedron or tetrakishexahedron *Octahedron truncated by cube* (*k*)	$(0kl)$ $(0\bar{k}l)$ $(0k\bar{l})$ $(0\bar{k}\bar{l})$ $(k0\bar{l})$ $(\bar{k}0\bar{l})$ $(k0l)$ $(\bar{k}0l)$ $(l0k)$ $(l0\bar{k})$ $(\bar{l}0k)$ $(\bar{l}0\bar{k})$ $(\bar{l}k0)$ $(\bar{l}\bar{k}0)$ $(lk0)$ $(l\bar{k}0)$ $(kl0)$ $(\bar{k}l0)$ $(k\bar{l}0)$ $(\bar{k}\bar{l}0)$ $(0\bar{l}k)$ $(0\bar{l}\bar{k})$ $(0lk)$ $(0l\bar{k})$
12	*c*	*m.m*2	Rhomb-dodecahedron *Cuboctahedron* (*i*)	(011) $(0\bar{1}1)$ $(01\bar{1})$ $(0\bar{1}\bar{1})$ (101) $(10\bar{1})$ $(\bar{1}01)$ $(\bar{1}0\bar{1})$ (110) $(\bar{1}10)$ $(1\bar{1}0)$ $(\bar{1}\bar{1}0)$
8	*b*	.3*m*	Octahedron *Cube* (*g*)	(111) $(\bar{1}\bar{1}1)$ $(\bar{1}1\bar{1})$ $(1\bar{1}\bar{1})$ $(11\bar{1})$ $(\bar{1}\bar{1}\bar{1})$ $(1\bar{1}1)$ $(\bar{1}11)$
6	*a*	4*m.m*	Cube or hexahedron *Octahedron* (*e*)	(100) $(\bar{1}00)$ (010) $(0\bar{1}0)$ (001) $(00\bar{1})$

Symmetry of special projections

Along [001]	Along [111]	Along [110]
4*mm*	6*mm*	2*mm*

references