

Cubic  $m\bar{3}m$

$F4_1/d\bar{3}2/m$

No. 227

$Fd\bar{3}m$   
 $O_h^7$

Origin at centre ( $\bar{3}m$ ), at  $\frac{1}{8}, \frac{1}{8}, \frac{1}{8}$  from  $\bar{4}3m$  (compare previous page for alternative origin)

Number of positions,  
Wyckoff notation,  
and point symmetry

Co-ordinates of equivalent positions

Conditions limiting  
possible reflections

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

General:

$hkl: h+k, k+l, (l+h)=2n$

$hhl: (l+h=2n); \text{C}$

$0kl: (k, l=2n); k+l=4n$

$\text{C}$

192 *i* 1  $x, y, z; x, \frac{1}{4}-y, \frac{1}{4}-z; \frac{1}{4}-x, y, \frac{1}{4}-z; \frac{1}{4}-x, \frac{1}{4}-y, z;$   
 $z, x, y; z, \frac{1}{4}-x, \frac{1}{4}-y; \frac{1}{4}-z, x, \frac{1}{4}-y; \frac{1}{4}-z, \frac{1}{4}-x, y;$   
 $y, z, x; y, \frac{1}{4}-z, \frac{1}{4}-x; \frac{1}{4}-y, z, \frac{1}{4}-x; \frac{1}{4}-y, \frac{1}{4}-z, x;$   
 $x, z, y; x, \frac{1}{4}-z, \frac{1}{4}-y; \frac{1}{4}-x, z, \frac{1}{4}-y; \frac{1}{4}-x, \frac{1}{4}-z, y;$   
 $y, x, z; y, \frac{1}{4}-x, \frac{1}{4}-z; \frac{1}{4}-y, x, \frac{1}{4}-z; \frac{1}{4}-y, \frac{1}{4}-x, z;$   
 $z, y, x; z, \frac{1}{4}-y, \frac{1}{4}-x; \frac{1}{4}-z, y, \frac{1}{4}-x; \frac{1}{4}-z, \frac{1}{4}-y, x;$   
 $\bar{x}, \bar{y}, \bar{z}; \bar{x}, \frac{3}{4}+y, \frac{3}{4}+z; \frac{3}{4}+x, \bar{y}, \frac{3}{4}+z; \frac{3}{4}+x, \frac{3}{4}+y, \bar{z};$   
 $\bar{z}, \bar{x}, \bar{y}; \bar{z}, \frac{3}{4}+x, \frac{3}{4}+y; \frac{3}{4}+z, \bar{x}, \frac{3}{4}+y; \frac{3}{4}+z, \frac{3}{4}+x, \bar{y};$   
 $\bar{y}, \bar{z}, \bar{x}; \bar{y}, \frac{3}{4}+z, \frac{3}{4}+x; \frac{3}{4}+y, \bar{z}, \frac{3}{4}+x; \frac{3}{4}+y, \frac{3}{4}+z, \bar{x};$   
 $\bar{x}, \bar{z}, \bar{y}; \bar{x}, \frac{3}{4}+z, \frac{3}{4}+y; \frac{3}{4}+x, \bar{z}, \frac{3}{4}+y; \frac{3}{4}+x, \frac{3}{4}+z, \bar{y};$   
 $\bar{y}, \bar{x}, \bar{z}; \bar{y}, \frac{3}{4}+x, \frac{3}{4}+z; \frac{3}{4}+y, \bar{x}, \frac{3}{4}+z; \frac{3}{4}+y, \frac{3}{4}+x, \bar{z};$   
 $\bar{z}, \bar{y}, \bar{x}; \bar{z}, \frac{3}{4}+y, \frac{3}{4}+x; \frac{3}{4}+z, \bar{y}, \frac{3}{4}+x; \frac{3}{4}+z, \frac{3}{4}+y, \bar{x}.$

96 *h* 2  $0, x, \bar{x}; 0, \frac{1}{4}-x, \frac{1}{4}+x; \frac{1}{4}, x, \frac{1}{4}+x; \frac{1}{4}, \frac{1}{4}-x, \bar{x};$   
 $\bar{x}, 0, x; \frac{1}{4}+x, 0, \frac{1}{4}-x; \frac{1}{4}+x, \frac{1}{4}, x; \bar{x}, \frac{1}{4}, \frac{1}{4}-x;$   
 $x, \bar{x}, 0; \frac{1}{4}-x, \frac{1}{4}+x, 0; x, \frac{1}{4}+x, \frac{1}{4}; \frac{1}{4}-x, \bar{x}, \frac{1}{4};$   
 $0, \bar{x}, x; 0, \frac{3}{4}+x, \frac{3}{4}-x; \frac{3}{4}, \bar{x}, \frac{3}{4}-x; \frac{3}{4}, \frac{3}{4}+x, x;$   
 $x, 0, \bar{x}; \frac{3}{4}-x, 0, \frac{3}{4}+x; \frac{3}{4}-x, \frac{3}{4}, \bar{x}; x, \frac{3}{4}, \frac{3}{4}+x;$   
 $\bar{x}, x, 0; \frac{3}{4}+x, \frac{3}{4}-x, 0; \bar{x}, \frac{3}{4}-x, \frac{3}{4}; \frac{3}{4}+x, x, \frac{3}{4}.$

96 *g* *m*  $x, x, z; x, \frac{1}{4}-x, \frac{1}{4}-z; \frac{1}{4}-x, x, \frac{1}{4}-z; \frac{1}{4}-x, \frac{1}{4}-x, z;$   
 $z, x, x; z, \frac{1}{4}-x, \frac{1}{4}-x; \frac{1}{4}-z, x, \frac{1}{4}-x; \frac{1}{4}-z, \frac{1}{4}-x, x;$   
 $x, z, x; x, \frac{1}{4}-z, \frac{1}{4}-x; \frac{1}{4}-x, z, \frac{1}{4}-x; \frac{1}{4}-x, \frac{1}{4}-z, x;$   
 $\bar{x}, \bar{x}, \bar{z}; \bar{x}, \frac{3}{4}+x, \frac{3}{4}+z; \frac{3}{4}+x, \bar{x}, \frac{3}{4}+z; \frac{3}{4}+x, \frac{3}{4}+x, \bar{z};$   
 $\bar{z}, \bar{x}, \bar{x}; \bar{z}, \frac{3}{4}+x, \frac{3}{4}+x; \frac{3}{4}+z, \bar{x}, \frac{3}{4}+x; \frac{3}{4}+z, \frac{3}{4}+x, \bar{x};$   
 $\bar{x}, \bar{z}, \bar{x}; \bar{x}, \frac{3}{4}+z, \frac{3}{4}+x; \frac{3}{4}+x, \bar{z}, \frac{3}{4}+x; \frac{3}{4}+x, \frac{3}{4}+z, \bar{x}.$

48 *f* *mm*  $x, \frac{1}{8}, \frac{1}{8}; \bar{x}, \frac{7}{8}, \frac{7}{8}; \frac{1}{4}-x, \frac{1}{8}, \frac{1}{8}; \frac{3}{4}+x, \frac{7}{8}, \frac{7}{8};$   
 $\frac{1}{8}, x, \frac{1}{8}; \frac{7}{8}, \bar{x}, \frac{7}{8}; \frac{1}{8}, \frac{1}{4}-x, \frac{1}{8}; \frac{7}{8}, \frac{3}{4}+x, \frac{7}{8};$   
 $\frac{1}{8}, \frac{1}{8}, x; \frac{7}{8}, \frac{7}{8}, \bar{x}; \frac{1}{8}, \frac{1}{8}, \frac{1}{4}-x; \frac{7}{8}, \frac{7}{8}, \frac{3}{4}+x.$

32 *e*  $\bar{3}m$   $x, x, x; x, \frac{1}{4}-x, \frac{1}{4}-x; \frac{1}{4}-x, x, \frac{1}{4}-x; \frac{1}{4}-x, \frac{1}{4}-x, x;$   
 $\bar{x}, \bar{x}, \bar{x}; \bar{x}, \frac{3}{4}+x, \frac{3}{4}+x; \frac{3}{4}+x, \bar{x}, \frac{3}{4}+x; \frac{3}{4}+x, \frac{3}{4}+x, \bar{x}.$

16 *d*  $\bar{3}m$   $\frac{1}{2}, \frac{1}{2}, \frac{1}{2}; \frac{1}{2}, \frac{1}{4}, \frac{1}{4}; \frac{1}{4}, \frac{1}{2}, \frac{1}{4}; \frac{1}{4}, \frac{1}{4}, \frac{1}{2}.$

16 *c*  $\bar{3}m$   $0, 0, 0; 0, \frac{1}{2}, \frac{1}{2}; \frac{1}{2}, 0, \frac{1}{2}; \frac{1}{2}, \frac{1}{2}, 0.$

8 *b*  $\bar{4}3m$   $\frac{3}{8}, \frac{3}{8}, \frac{3}{8}; \frac{5}{8}, \frac{5}{8}, \frac{5}{8}.$

8 *a*  $\bar{4}3m$   $\frac{1}{8}, \frac{1}{8}, \frac{1}{8}; \frac{7}{8}, \frac{7}{8}, \frac{7}{8}.$

Special: as above, plus

no extra conditions

$hkl: h+k+l=2n+1$  or  $4n$

no extra conditions

$hkl: \left. \begin{matrix} h=2n+1 \\ k=2n+1 \\ l=2n+1 \end{matrix} \right\} \left. \begin{matrix} 4n+2 \\ \text{or } 4n+2 \\ 4n+2 \end{matrix} \right\} \left. \begin{matrix} 4n \\ \text{or } 4n \\ 4n \end{matrix} \right\}$

$hkl: h+k+l=2n+1$  or  $4n$