MSG No. 208.44 $P4_232$ [Type I, cubic]

Table 1: Wyckoff site: 2a, site symmetry: 23.

No.	position	mapping
1	[0, 0, 0]	[1,8,9,10,17,18,19,20,21,22,23,24]
2	$\left[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right]$	[2,3,4,5,6,7,11,12,13,14,15,16]

Table 2: Wyckoff site: 4b, site symmetry: .32

No.	position	mapping
1	$\left[\frac{1}{4}, \frac{1}{4}, \frac{1}{4}\right]$	[1,12,14,16,17,18]
2	$\left[\frac{3}{4}, \frac{1}{4}, \frac{3}{4}\right]$	[2,7,9,15,19,24]
3	$\left[\frac{3}{4}, \frac{3}{4}, \frac{1}{4}\right]$	[3,4,10,11,20,21]
4	$\left[\frac{1}{4}, \frac{3}{4}, \frac{3}{4}\right]$	[5,6,8,13,22,23]

Table 3: Wyckoff site: 4c, site symmetry: .32

No.	position	mapping
1	$\left[\frac{3}{4}, \frac{3}{4}, \frac{3}{4}\right]$	[1,12,14,16,17,18]
2	$\left[\frac{1}{4}, \frac{3}{4}, \frac{1}{4}\right]$	[2,7,9,15,19,24]
3	$\left[\frac{1}{4}, \frac{1}{4}, \frac{3}{4}\right]$	[3,4,10,11,20,21]
4	$\left[\frac{3}{4}, \frac{1}{4}, \frac{1}{4}\right]$	[5,6,8,13,22,23]

Table 4: Wyckoff site: 6d, site symmetry: 222..

No.	position	mapping
1	$\left[0, \frac{1}{2}, \frac{1}{2}\right]$	[1,8,9,10]
2	$\left[\frac{1}{2}, 0, 0\right]$	[2,3,13,14]
3	$\left[0, 0, \frac{1}{2}\right]$	[4,5,15,16]
4	$\left[0, \frac{1}{2}, 0\right]$	[6,7,11,12]
5	$\left[\frac{1}{2}, 0, \frac{1}{2}\right]$	[17,20,22,24]
6	$\left[\frac{1}{2}, \frac{1}{2}, 0\right]$	[18,19,21,23]

Table 5: Wyckoff site: 6e, site symmetry: 2.22

No.	position	mapping
1	$\left[\frac{1}{4}, 0, \frac{1}{2}\right]$	[1,8,13,14]
2	$\left[\frac{3}{4}, 0, \frac{1}{2}\right]$	[2,3,9,10]

continued ...

Table 5

No.	position	mapping
3	$\left[0,\ \frac{1}{2},\ \frac{1}{4}\right]$	`[4,16,18,21]`
4	$\left[0,\ \frac{1}{2},\ \frac{3}{4}\right]$	`[5,15,19,23]`
5	$\left[\frac{1}{2},\ \frac{3}{4},\ 0\right]$	`[6,11,20,22]`
6	$\left[\frac{1}{2},\ \frac{1}{4},\ 0\right]$	`[7,12,17,24]`

Table 6: Wyckoff site: `6f`, site symmetry: `2.22`

No.	position	mapping
1	$\left[\frac{1}{4},\ \frac{1}{2},\ 0\right]$	`[1,8,13,14]`
2	$\left[\frac{3}{4},\ \frac{1}{2},\ 0\right]$	`[2,3,9,10]`
3	$\left[\frac{1}{2},\ 0,\ \frac{1}{4}\right]$	`[4,16,18,21]`
4	$\left[\frac{1}{2},\ 0,\ \frac{3}{4}\right]$	`[5,15,19,23]`
5	$\left[0,\ \frac{3}{4},\ \frac{1}{2}\right]$	`[6,11,20,22]`
6	$\left[0,\ \frac{1}{4},\ \frac{1}{2}\right]$	`[7,12,17,24]`

Table 7: Wyckoff site: `8g`, site symmetry: `.3.`

No.	position	mapping
1	$[x,\ x,\ x]$	`[1,17,18]`
2	$\left[x+\frac{1}{2},\ \frac{1}{2}-x,\ x+\frac{1}{2}\right]$	`[2,7,15]`
3	$\left[x+\frac{1}{2},\ x+\frac{1}{2},\ \frac{1}{2}-x\right]$	`[3,4,11]`
4	$\left[\frac{1}{2}-x,\ x+\frac{1}{2},\ x+\frac{1}{2}\right]$	`[5,6,13]`
5	$[x,\ -x,\ -x]$	`[8,22,23]`
6	$[-x,\ x,\ -x]$	`[9,19,24]`
7	$[-x,\ -x,\ x]$	`[10,20,21]`
8	$\left[\frac{1}{2}-x,\ \frac{1}{2}-x,\ \frac{1}{2}-x\right]$	`[12,14,16]`

Table 8: Wyckoff site: `12h`, site symmetry: `2..`

No.	position	mapping
1	$[x,\ 0,\ 0]$	`[1,8]`
2	$\left[x+\frac{1}{2},\ \frac{1}{2},\ \frac{1}{2}\right]$	`[2,3]`
3	$\left[\frac{1}{2},\ \frac{1}{2},\ \frac{1}{2}-x\right]$	`[4,16]`
4	$\left[\frac{1}{2},\ \frac{1}{2},\ x+\frac{1}{2}\right]$	`[5,15]`
5	$\left[\frac{1}{2},\ x+\frac{1}{2},\ \frac{1}{2}\right]$	`[6,11]`
6	$\left[\frac{1}{2},\ \frac{1}{2}-x,\ \frac{1}{2}\right]$	`[7,12]`
7	$[-x,\ 0,\ 0]$	`[9,10]`
8	$\left[\frac{1}{2}-x,\ \frac{1}{2},\ \frac{1}{2}\right]$	`[13,14]`
9	$[0,\ x,\ 0]$	`[17,24]`

continued ...

Table 8

No.	position	mapping
10	$[0,\ 0,\ x]$	`[18,21]`
11	$[0,\ 0,\ -x]$	`[19,23]`
12	$[0,\ -x,\ 0]$	`[20,22]`

Table 9: Wyckoff site: `12i`, site symmetry: `2..`

No.	position	mapping
1	$\left[x,\ 0,\ \frac{1}{2}\right]$	`[1,8]`
2	$\left[x+\frac{1}{2},\ 0,\ \frac{1}{2}\right]$	`[2,3]`
3	$\left[0,\ \frac{1}{2},\ \frac{1}{2}-x\right]$	`[4,16]`
4	$\left[0,\ \frac{1}{2},\ x+\frac{1}{2}\right]$	`[5,15]`
5	$\left[\frac{1}{2},\ x+\frac{1}{2},\ 0\right]$	`[6,11]`
6	$\left[\frac{1}{2},\ \frac{1}{2}-x,\ 0\right]$	`[7,12]`
7	$\left[-x,\ 0,\ \frac{1}{2}\right]$	`[9,10]`
8	$\left[\frac{1}{2}-x,\ 0,\ \frac{1}{2}\right]$	`[13,14]`
9	$\left[\frac{1}{2},\ x,\ 0\right]$	`[17,24]`
10	$\left[0,\ \frac{1}{2},\ x\right]$	`[18,21]`
11	$\left[0,\ \frac{1}{2},\ -x\right]$	`[19,23]`
12	$\left[\frac{1}{2},\ -x,\ 0\right]$	`[20,22]`

Table 10: Wyckoff site: `12j`, site symmetry: `2..`

No.	position	mapping
1	$\left[x,\ \frac{1}{2},\ 0\right]$	`[1,8]`
2	$\left[x+\frac{1}{2},\ \frac{1}{2},\ 0\right]$	`[2,3]`
3	$\left[\frac{1}{2},\ 0,\ \frac{1}{2}-x\right]$	`[4,16]`
4	$\left[\frac{1}{2},\ 0,\ x+\frac{1}{2}\right]$	`[5,15]`
5	$\left[0,\ x+\frac{1}{2},\ \frac{1}{2}\right]$	`[6,11]`
6	$\left[0,\ \frac{1}{2}-x,\ \frac{1}{2}\right]$	`[7,12]`
7	$\left[-x,\ \frac{1}{2},\ 0\right]$	`[9,10]`
8	$\left[\frac{1}{2}-x,\ \frac{1}{2},\ 0\right]$	`[13,14]`
9	$\left[0,\ x,\ \frac{1}{2}\right]$	`[17,24]`
10	$\left[\frac{1}{2},\ 0,\ x\right]$	`[18,21]`
11	$\left[\frac{1}{2},\ 0,\ -x\right]$	`[19,23]`
12	$\left[0,\ -x,\ \frac{1}{2}\right]$	`[20,22]`

Table 11: Wyckoff site: `12k`, site symmetry: `..2`

No.	position	mapping
1	$\left[\frac{1}{4},\ y,\ \frac{1}{2}-y\right]$	`[1,14]`
2	$\left[\frac{3}{4},\ y,\ y+\frac{1}{2}\right]$	`[2,9]`
3	$\left[\frac{3}{4},\ -y,\ \frac{1}{2}-y\right]$	`[3,10]`
4	$\left[-y,\ y+\frac{1}{2},\ \frac{1}{4}\right]$	`[4,21]`
5	$\left[y,\ y+\frac{1}{2},\ \frac{3}{4}\right]$	`[5,23]`
6	$\left[\frac{1}{2}-y,\ \frac{3}{4},\ -y\right]$	`[6,22]`
7	$\left[y+\frac{1}{2},\ \frac{1}{4},\ -y\right]$	`[7,24]`
8	$\left[\frac{1}{4},\ -y,\ y+\frac{1}{2}\right]$	`[8,13]`
9	$\left[y+\frac{1}{2},\ \frac{3}{4},\ y\right]$	`[11,20]`
10	$\left[\frac{1}{2}-y,\ \frac{1}{4},\ y\right]$	`[12,17]`
11	$\left[-y,\ \frac{1}{2}-y,\ \frac{3}{4}\right]$	`[15,19]`
12	$\left[y,\ \frac{1}{2}-y,\ \frac{1}{4}\right]$	`[16,18]`

Table 12: Wyckoff site: `12l`, site symmetry: `..2`

No.	position	mapping
1	$\left[\frac{1}{4},\ y,\ y+\frac{1}{2}\right]$	`[1,13]`
2	$\left[\frac{3}{4},\ -y,\ y+\frac{1}{2}\right]$	`[2,10]`
3	$\left[\frac{3}{4},\ y,\ \frac{1}{2}-y\right]$	`[3,9]`
4	$\left[y,\ y+\frac{1}{2},\ \frac{1}{4}\right]$	`[4,18]`
5	$\left[-y,\ y+\frac{1}{2},\ \frac{3}{4}\right]$	`[5,19]`
6	$\left[\frac{1}{2}-y,\ \frac{3}{4},\ y\right]$	`[6,20]`
7	$\left[y+\frac{1}{2},\ \frac{1}{4},\ y\right]$	`[7,17]`
8	$\left[\frac{1}{4},\ -y,\ \frac{1}{2}-y\right]$	`[8,14]`
9	$\left[y+\frac{1}{2},\ \frac{3}{4},\ -y\right]$	`[11,22]`
10	$\left[\frac{1}{2}-y,\ \frac{1}{4},\ -y\right]$	`[12,24]`
11	$\left[y,\ \frac{1}{2}-y,\ \frac{3}{4}\right]$	`[15,23]`
12	$\left[-y,\ \frac{1}{2}-y,\ \frac{1}{4}\right]$	`[16,21]`

Table 13: Wyckoff site: `24m`, site symmetry: `1`

No.	position	mapping
1	$[x,\ y,\ z]$	`[1]`
2	$\left[x+\frac{1}{2},\ \frac{1}{2}-z,\ y+\frac{1}{2}\right]$	`[2]`
3	$\left[x+\frac{1}{2},\ z+\frac{1}{2},\ \frac{1}{2}-y\right]$	`[3]`
4	$\left[z+\frac{1}{2},\ y+\frac{1}{2},\ \frac{1}{2}-x\right]$	`[4]`
5	$\left[\frac{1}{2}-z,\ y+\frac{1}{2},\ x+\frac{1}{2}\right]$	`[5]`
6	$\left[\frac{1}{2}-y,\ x+\frac{1}{2},\ z+\frac{1}{2}\right]$	`[6]`
7	$\left[y+\frac{1}{2},\ \frac{1}{2}-x,\ z+\frac{1}{2}\right]$	`[7]`
8	$[x,\ -y,\ -z]$	`[8]`
9	$[-x,\ y,\ -z]$	`[9]`

continued ...

Table 13

No.	position	mapping
10	$[-x, -y, z]$	[10]
11	$\left[y+\frac{1}{2}, x+\frac{1}{2}, \frac{1}{2}-z\right]$	[11]
12	$\left[\frac{1}{2}-y, \frac{1}{2}-x, \frac{1}{2}-z\right]$	[12]
13	$\left[\frac{1}{2}-x, z+\frac{1}{2}, y+\frac{1}{2}\right]$	[13]
14	$\left[\frac{1}{2}-x, \frac{1}{2}-z, \frac{1}{2}-y\right]$	[14]
15	$\left[z+\frac{1}{2}, \frac{1}{2}-y, x+\frac{1}{2}\right]$	[15]
16	$\left[\frac{1}{2}-z, \frac{1}{2}-y, \frac{1}{2}-x\right]$	[16]
17	$[z, x, y]$	[17]
18	$[y, z, x]$	[18]
19	$[-y, z, -x]$	[19]
20	$[-z, -x, y]$	[20]
21	$[-y, -z, x]$	[21]
22	$[z, -x, -y]$	[22]
23	$[y, -z, -x]$	[23]
24	$[-z, x, -y]$	[24]