

MSG No. 203.28 $Fd'3'$ [Type III, cubic]

Table 1: Wyckoff site: 8a, site symmetry: 23.

No.	position	mapping
1	$[\frac{1}{8}, \frac{1}{8}, \frac{1}{8}]$	[1,5,6,26,34,35,51,55,60,76,80,81]
2	$[\frac{1}{8}, \frac{5}{8}, \frac{5}{8}]$	[2,10,11,25,29,30,52,56,57,75,79,84]
3	$[\frac{5}{8}, \frac{1}{8}, \frac{5}{8}]$	[3,7,12,28,32,33,49,53,54,74,82,83]
4	$[\frac{5}{8}, \frac{5}{8}, \frac{1}{8}]$	[4,8,9,27,31,36,50,58,59,73,77,78]
5	$[\frac{7}{8}, \frac{7}{8}, \frac{7}{8}]$	[13,17,18,38,46,47,63,67,72,88,92,93]
6	$[\frac{7}{8}, \frac{3}{8}, \frac{3}{8}]$	[14,22,23,37,41,42,64,68,69,87,91,96]
7	$[\frac{3}{8}, \frac{7}{8}, \frac{3}{8}]$	[15,19,24,40,44,45,61,65,66,86,94,95]
8	$[\frac{3}{8}, \frac{3}{8}, \frac{7}{8}]$	[16,20,21,39,43,48,62,70,71,85,89,90]

Table 2: Wyckoff site: 8b, site symmetry: 23.

No.	position	mapping
1	$[\frac{5}{8}, \frac{5}{8}, \frac{5}{8}]$	[1,5,6,26,34,35,51,55,60,76,80,81]
2	$[\frac{5}{8}, \frac{1}{8}, \frac{1}{8}]$	[2,10,11,25,29,30,52,56,57,75,79,84]
3	$[\frac{1}{8}, \frac{5}{8}, \frac{1}{8}]$	[3,7,12,28,32,33,49,53,54,74,82,83]
4	$[\frac{1}{8}, \frac{1}{8}, \frac{5}{8}]$	[4,8,9,27,31,36,50,58,59,73,77,78]
5	$[\frac{3}{8}, \frac{3}{8}, \frac{3}{8}]$	[13,17,18,38,46,47,63,67,72,88,92,93]
6	$[\frac{3}{8}, \frac{7}{8}, \frac{7}{8}]$	[14,22,23,37,41,42,64,68,69,87,91,96]
7	$[\frac{7}{8}, \frac{3}{8}, \frac{7}{8}]$	[15,19,24,40,44,45,61,65,66,86,94,95]
8	$[\frac{7}{8}, \frac{7}{8}, \frac{3}{8}]$	[16,20,21,39,43,48,62,70,71,85,89,90]

Table 3: Wyckoff site: 16c, site symmetry: .-3'.

No.	position	mapping
1	$[0, 0, 0]$	[1,5,6,13,17,18]
2	$[0, \frac{3}{4}, \frac{3}{4}]$	[2,10,11,38,46,47]
3	$[\frac{3}{4}, 0, \frac{3}{4}]$	[3,7,12,63,67,72]
4	$[\frac{3}{4}, \frac{3}{4}, 0]$	[4,8,9,88,92,93]
5	$[0, \frac{1}{4}, \frac{1}{4}]$	[14,22,23,26,34,35]
6	$[\frac{1}{4}, 0, \frac{1}{4}]$	[15,19,24,51,55,60]
7	$[\frac{1}{4}, \frac{1}{4}, 0]$	[16,20,21,76,80,81]
8	$[0, \frac{1}{2}, \frac{1}{2}]$	[25,29,30,37,41,42]
9	$[\frac{3}{4}, \frac{1}{2}, \frac{1}{4}]$	[27,31,36,87,91,96]
10	$[\frac{3}{4}, \frac{1}{4}, \frac{1}{2}]$	[28,32,33,64,68,69]
11	$[\frac{1}{4}, \frac{1}{2}, \frac{3}{4}]$	[39,43,48,75,79,84]
12	$[\frac{1}{4}, \frac{3}{4}, \frac{1}{2}]$	[40,44,45,52,56,57]
13	$[\frac{1}{2}, 0, \frac{1}{2}]$	[49,53,54,61,65,66]
14	$[\frac{1}{2}, \frac{3}{4}, \frac{1}{4}]$	[50,58,59,86,94,95]
15	$[\frac{1}{2}, \frac{1}{4}, \frac{3}{4}]$	[62,70,71,74,82,83]

continued ...

Table 3

No.	position	mapping
16	$[\frac{1}{2}, \frac{1}{2}, 0]$	[73, 77, 78, 85, 89, 90]

Table 4: Wyckoff site: 16d, site symmetry: .-3'.

No.	position	mapping
1	$[\frac{1}{2}, \frac{1}{2}, \frac{1}{2}]$	[1, 5, 6, 13, 17, 18]
2	$[\frac{1}{2}, \frac{1}{4}, \frac{1}{4}]$	[2, 10, 11, 38, 46, 47]
3	$[\frac{1}{4}, \frac{1}{2}, \frac{1}{4}]$	[3, 7, 12, 63, 67, 72]
4	$[\frac{1}{4}, \frac{1}{4}, \frac{1}{2}]$	[4, 8, 9, 88, 92, 93]
5	$[\frac{1}{2}, \frac{3}{4}, \frac{3}{4}]$	[14, 22, 23, 26, 34, 35]
6	$[\frac{3}{4}, \frac{1}{2}, \frac{3}{4}]$	[15, 19, 24, 51, 55, 60]
7	$[\frac{3}{4}, \frac{3}{4}, \frac{1}{2}]$	[16, 20, 21, 76, 80, 81]
8	$[\frac{1}{2}, 0, 0]$	[25, 29, 30, 37, 41, 42]
9	$[\frac{1}{4}, 0, \frac{3}{4}]$	[27, 31, 36, 87, 91, 96]
10	$[\frac{1}{4}, \frac{3}{4}, 0]$	[28, 32, 33, 64, 68, 69]
11	$[\frac{3}{4}, 0, \frac{1}{4}]$	[39, 43, 48, 75, 79, 84]
12	$[\frac{3}{4}, \frac{1}{4}, 0]$	[40, 44, 45, 52, 56, 57]
13	$[0, \frac{1}{2}, 0]$	[49, 53, 54, 61, 65, 66]
14	$[0, \frac{1}{4}, \frac{3}{4}]$	[50, 58, 59, 86, 94, 95]
15	$[0, \frac{3}{4}, \frac{1}{4}]$	[62, 70, 71, 74, 82, 83]
16	$[0, 0, \frac{1}{2}]$	[73, 77, 78, 85, 89, 90]

Table 5: Wyckoff site: 32e, site symmetry: .3.

No.	position	mapping
1	$[x, x, x]$	[1, 5, 6]
2	$[x, \frac{3}{4} - x, \frac{3}{4} - x]$	[2, 10, 11]
3	$[\frac{3}{4} - x, x, \frac{3}{4} - x]$	[3, 7, 12]
4	$[\frac{3}{4} - x, \frac{3}{4} - x, x]$	[4, 8, 9]
5	$[-x, -x, -x]$	[13, 17, 18]
6	$[-x, x + \frac{1}{4}, x + \frac{1}{4}]$	[14, 22, 23]
7	$[x + \frac{1}{4}, -x, x + \frac{1}{4}]$	[15, 19, 24]
8	$[x + \frac{1}{4}, x + \frac{1}{4}, -x]$	[16, 20, 21]
9	$[x, x + \frac{1}{2}, x + \frac{1}{2}]$	[25, 29, 30]
10	$[x, \frac{1}{4} - x, \frac{1}{4} - x]$	[26, 34, 35]
11	$[\frac{3}{4} - x, x + \frac{1}{2}, \frac{1}{4} - x]$	[27, 31, 36]
12	$[\frac{3}{4} - x, \frac{1}{4} - x, x + \frac{1}{2}]$	[28, 32, 33]
13	$[-x, \frac{1}{2} - x, \frac{1}{2} - x]$	[37, 41, 42]
14	$[-x, x + \frac{3}{4}, x + \frac{3}{4}]$	[38, 46, 47]
15	$[x + \frac{1}{4}, \frac{1}{2} - x, x + \frac{3}{4}]$	[39, 43, 48]
16	$[x + \frac{1}{4}, x + \frac{3}{4}, \frac{1}{2} - x]$	[40, 44, 45]
17	$[x + \frac{1}{2}, x, x + \frac{1}{2}]$	[49, 53, 54]

continued ...

Table 5

No.	position	mapping
18	$[x + \frac{1}{2}, \frac{3}{4} - x, \frac{1}{4} - x]$	[50,58,59]
19	$[\frac{1}{4} - x, x, \frac{1}{4} - x]$	[51,55,60]
20	$[\frac{1}{4} - x, \frac{3}{4} - x, x + \frac{1}{2}]$	[52,56,57]
21	$[\frac{1}{2} - x, -x, \frac{1}{2} - x]$	[61,65,66]
22	$[\frac{1}{2} - x, x + \frac{1}{4}, x + \frac{3}{4}]$	[62,70,71]
23	$[x + \frac{3}{4}, -x, x + \frac{3}{4}]$	[63,67,72]
24	$[x + \frac{3}{4}, x + \frac{1}{4}, \frac{1}{2} - x]$	[64,68,69]
25	$[x + \frac{1}{2}, x + \frac{1}{2}, x]$	[73,77,78]
26	$[x + \frac{1}{2}, \frac{1}{4} - x, \frac{3}{4} - x]$	[74,82,83]
27	$[\frac{1}{4} - x, x + \frac{1}{2}, \frac{3}{4} - x]$	[75,79,84]
28	$[\frac{1}{4} - x, \frac{1}{4} - x, x]$	[76,80,81]
29	$[\frac{1}{2} - x, \frac{1}{2} - x, -x]$	[85,89,90]
30	$[\frac{1}{2} - x, x + \frac{3}{4}, x + \frac{1}{4}]$	[86,94,95]
31	$[x + \frac{3}{4}, \frac{1}{2} - x, x + \frac{1}{4}]$	[87,91,96]
32	$[x + \frac{3}{4}, x + \frac{3}{4}, -x]$	[88,92,93]

Table 6: Wyckoff site: 48f, site symmetry: 2..

No.	position	mapping
1	$[x, \frac{1}{8}, \frac{1}{8}]$	[1,26]
2	$[x, \frac{5}{8}, \frac{5}{8}]$	[2,25]
3	$[\frac{3}{4} - x, \frac{1}{8}, \frac{5}{8}]$	[3,28]
4	$[\frac{3}{4} - x, \frac{5}{8}, \frac{1}{8}]$	[4,27]
5	$[\frac{1}{8}, x, \frac{1}{8}]$	[5,60]
6	$[\frac{1}{8}, \frac{1}{8}, x]$	[6,81]
7	$[\frac{5}{8}, \frac{1}{8}, \frac{3}{4} - x]$	[7,83]
8	$[\frac{5}{8}, \frac{3}{4} - x, \frac{1}{8}]$	[8,58]
9	$[\frac{5}{8}, \frac{5}{8}, x]$	[9,78]
10	$[\frac{1}{8}, \frac{3}{4} - x, \frac{5}{8}]$	[10,56]
11	$[\frac{1}{8}, \frac{5}{8}, \frac{3}{4} - x]$	[11,79]
12	$[\frac{5}{8}, x, \frac{5}{8}]$	[12,53]
13	$[-x, \frac{7}{8}, \frac{7}{8}]$	[13,38]
14	$[-x, \frac{3}{8}, \frac{3}{8}]$	[14,37]
15	$[x + \frac{1}{4}, \frac{7}{8}, \frac{3}{8}]$	[15,40]
16	$[x + \frac{1}{4}, \frac{3}{8}, \frac{7}{8}]$	[16,39]
17	$[\frac{7}{8}, -x, \frac{7}{8}]$	[17,72]
18	$[\frac{7}{8}, \frac{7}{8}, -x]$	[18,93]
19	$[\frac{3}{8}, \frac{7}{8}, x + \frac{1}{4}]$	[19,95]
20	$[\frac{3}{8}, x + \frac{1}{4}, \frac{7}{8}]$	[20,70]
21	$[\frac{3}{8}, \frac{3}{8}, -x]$	[21,90]
22	$[\frac{7}{8}, x + \frac{1}{4}, \frac{3}{8}]$	[22,68]
23	$[\frac{7}{8}, \frac{3}{8}, x + \frac{1}{4}]$	[23,91]
24	$[\frac{3}{8}, -x, \frac{3}{8}]$	[24,65]
25	$[\frac{1}{8}, x + \frac{1}{2}, \frac{5}{8}]$	[29,84]

continued ...

Table 6

No.	position	mapping
26	$[\frac{1}{8}, \frac{5}{8}, x + \frac{1}{2}]$	[30,57]
27	$[\frac{5}{8}, \frac{5}{8}, \frac{1}{4} - x]$	[31,59]
28	$[\frac{5}{8}, \frac{1}{4} - x, \frac{5}{8}]$	[32,82]
29	$[\frac{5}{8}, \frac{1}{8}, x + \frac{1}{2}]$	[33,54]
30	$[\frac{1}{8}, \frac{1}{4} - x, \frac{1}{8}]$	[34,80]
31	$[\frac{1}{8}, \frac{1}{8}, \frac{1}{4} - x]$	[35,55]
32	$[\frac{5}{8}, x + \frac{1}{2}, \frac{1}{8}]$	[36,77]
33	$[\frac{7}{8}, \frac{1}{2} - x, \frac{3}{8}]$	[41,96]
34	$[\frac{7}{8}, \frac{3}{8}, \frac{1}{2} - x]$	[42,69]
35	$[\frac{3}{8}, \frac{3}{8}, x + \frac{3}{4}]$	[43,71]
36	$[\frac{3}{8}, x + \frac{3}{4}, \frac{3}{8}]$	[44,94]
37	$[\frac{3}{8}, \frac{7}{8}, \frac{1}{2} - x]$	[45,66]
38	$[\frac{7}{8}, x + \frac{3}{4}, \frac{7}{8}]$	[46,92]
39	$[\frac{7}{8}, \frac{7}{8}, x + \frac{3}{4}]$	[47,67]
40	$[\frac{3}{8}, \frac{1}{2} - x, \frac{7}{8}]$	[48,89]
41	$[x + \frac{1}{2}, \frac{1}{8}, \frac{5}{8}]$	[49,74]
42	$[x + \frac{1}{2}, \frac{5}{8}, \frac{1}{8}]$	[50,73]
43	$[\frac{1}{4} - x, \frac{1}{8}, \frac{1}{8}]$	[51,76]
44	$[\frac{1}{4} - x, \frac{5}{8}, \frac{5}{8}]$	[52,75]
45	$[\frac{1}{2} - x, \frac{7}{8}, \frac{3}{8}]$	[61,86]
46	$[\frac{1}{2} - x, \frac{3}{8}, \frac{7}{8}]$	[62,85]
47	$[x + \frac{3}{4}, \frac{7}{8}, \frac{7}{8}]$	[63,88]
48	$[x + \frac{3}{4}, \frac{3}{8}, \frac{3}{8}]$	[64,87]

Table 7: Wyckoff site: 96g, site symmetry: 1

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

continued ...

Table 7

No.	position	mapping
18	$[-y, -z, -x]$	[18]
19	$[y + \frac{1}{4}, -z, x + \frac{1}{4}]$	[19]
20	$[z + \frac{1}{4}, x + \frac{1}{4}, -y]$	[20]
21	$[y + \frac{1}{4}, z + \frac{1}{4}, -x]$	[21]
22	$[-z, x + \frac{1}{4}, y + \frac{1}{4}]$	[22]
23	$[-y, z + \frac{1}{4}, x + \frac{1}{4}]$	[23]
24	$[z + \frac{1}{4}, -x, y + \frac{1}{4}]$	[24]
25	$[x, y + \frac{1}{2}, z + \frac{1}{2}]$	[25]
26	$[x, \frac{1}{4} - y, \frac{1}{4} - z]$	[26]
27	$[\frac{3}{4} - x, y + \frac{1}{2}, \frac{1}{4} - z]$	[27]
28	$[\frac{3}{4} - x, \frac{1}{4} - y, z + \frac{1}{2}]$	[28]
29	$[z, x + \frac{1}{2}, y + \frac{1}{2}]$	[29]
30	$[y, z + \frac{1}{2}, x + \frac{1}{2}]$	[30]
31	$[\frac{3}{4} - y, z + \frac{1}{2}, \frac{1}{4} - x]$	[31]
32	$[\frac{3}{4} - z, \frac{1}{4} - x, y + \frac{1}{2}]$	[32]
33	$[\frac{3}{4} - y, \frac{1}{4} - z, x + \frac{1}{2}]$	[33]
34	$[z, \frac{1}{4} - x, \frac{1}{4} - y]$	[34]
35	$[y, \frac{1}{4} - z, \frac{1}{4} - x]$	[35]
36	$[\frac{3}{4} - z, x + \frac{1}{2}, \frac{1}{4} - y]$	[36]
37	$[-x, \frac{1}{2} - y, \frac{1}{2} - z]$	[37]
38	$[-x, y + \frac{3}{4}, z + \frac{3}{4}]$	[38]
39	$[x + \frac{1}{4}, \frac{1}{2} - y, z + \frac{3}{4}]$	[39]
40	$[x + \frac{1}{4}, y + \frac{3}{4}, \frac{1}{2} - z]$	[40]
41	$[-z, \frac{1}{2} - x, \frac{1}{2} - y]$	[41]
42	$[-y, \frac{1}{2} - z, \frac{1}{2} - x]$	[42]
43	$[y + \frac{1}{4}, \frac{1}{2} - z, x + \frac{3}{4}]$	[43]
44	$[z + \frac{1}{4}, x + \frac{3}{4}, \frac{1}{2} - y]$	[44]
45	$[y + \frac{1}{4}, z + \frac{3}{4}, \frac{1}{2} - x]$	[45]
46	$[-z, x + \frac{3}{4}, y + \frac{3}{4}]$	[46]
47	$[-y, z + \frac{3}{4}, x + \frac{3}{4}]$	[47]
48	$[z + \frac{1}{4}, \frac{1}{2} - x, y + \frac{3}{4}]$	[48]
49	$[x + \frac{1}{2}, y, z + \frac{1}{2}]$	[49]
50	$[x + \frac{1}{2}, \frac{3}{4} - y, \frac{1}{4} - z]$	[50]
51	$[\frac{1}{4} - x, y, \frac{1}{4} - z]$	[51]
52	$[\frac{1}{4} - x, \frac{3}{4} - y, z + \frac{1}{2}]$	[52]
53	$[z + \frac{1}{2}, x, y + \frac{1}{2}]$	[53]
54	$[y + \frac{1}{2}, z, x + \frac{1}{2}]$	[54]
55	$[\frac{1}{4} - y, z, \frac{1}{4} - x]$	[55]
56	$[\frac{1}{4} - z, \frac{3}{4} - x, y + \frac{1}{2}]$	[56]
57	$[\frac{1}{4} - y, \frac{3}{4} - z, x + \frac{1}{2}]$	[57]
58	$[z + \frac{1}{2}, \frac{3}{4} - x, \frac{1}{4} - y]$	[58]
59	$[y + \frac{1}{2}, \frac{3}{4} - z, \frac{1}{4} - x]$	[59]
60	$[\frac{1}{4} - z, x, \frac{1}{4} - y]$	[60]
61	$[\frac{1}{2} - x, -y, \frac{1}{2} - z]$	[61]
62	$[\frac{1}{2} - x, y + \frac{1}{4}, z + \frac{3}{4}]$	[62]
63	$[x + \frac{3}{4}, -y, z + \frac{3}{4}]$	[63]
64	$[x + \frac{3}{4}, y + \frac{1}{4}, \frac{1}{2} - z]$	[64]

continued ...

Table 7

No.	position	mapping
65	$[\frac{1}{2} - z, -x, \frac{1}{2} - y]$	[65]
66	$[\frac{1}{2} - y, -z, \frac{1}{2} - x]$	[66]
67	$[y + \frac{3}{4}, -z, x + \frac{3}{4}]$	[67]
68	$[z + \frac{3}{4}, x + \frac{1}{4}, \frac{1}{2} - y]$	[68]
69	$[y + \frac{3}{4}, z + \frac{1}{4}, \frac{1}{2} - x]$	[69]
70	$[\frac{1}{2} - z, x + \frac{1}{4}, y + \frac{3}{4}]$	[70]
71	$[\frac{1}{2} - y, z + \frac{1}{4}, x + \frac{3}{4}]$	[71]
72	$[z + \frac{3}{4}, -x, y + \frac{3}{4}]$	[72]
73	$[x + \frac{1}{2}, y + \frac{1}{2}, z]$	[73]
74	$[x + \frac{1}{2}, \frac{1}{4} - y, \frac{3}{4} - z]$	[74]
75	$[\frac{1}{4} - x, y + \frac{1}{2}, \frac{3}{4} - z]$	[75]
76	$[\frac{1}{4} - x, \frac{1}{4} - y, z]$	[76]
77	$[z + \frac{1}{2}, x + \frac{1}{2}, y]$	[77]
78	$[y + \frac{1}{2}, z + \frac{1}{2}, x]$	[78]
79	$[\frac{1}{4} - y, z + \frac{1}{2}, \frac{3}{4} - x]$	[79]
80	$[\frac{1}{4} - z, \frac{1}{4} - x, y]$	[80]
81	$[\frac{1}{4} - y, \frac{1}{4} - z, x]$	[81]
82	$[z + \frac{1}{2}, \frac{1}{4} - x, \frac{3}{4} - y]$	[82]
83	$[y + \frac{1}{2}, \frac{1}{4} - z, \frac{3}{4} - x]$	[83]
84	$[\frac{1}{4} - z, x + \frac{1}{2}, \frac{3}{4} - y]$	[84]
85	$[\frac{1}{2} - x, \frac{1}{2} - y, -z]$	[85]
86	$[\frac{1}{2} - x, y + \frac{3}{4}, z + \frac{1}{4}]$	[86]
87	$[x + \frac{3}{4}, \frac{1}{2} - y, z + \frac{1}{4}]$	[87]
88	$[x + \frac{3}{4}, y + \frac{3}{4}, -z]$	[88]
89	$[\frac{1}{2} - z, \frac{1}{2} - x, -y]$	[89]
90	$[\frac{1}{2} - y, \frac{1}{2} - z, -x]$	[90]
91	$[y + \frac{3}{4}, \frac{1}{2} - z, x + \frac{1}{4}]$	[91]
92	$[z + \frac{3}{4}, x + \frac{3}{4}, -y]$	[92]
93	$[y + \frac{3}{4}, z + \frac{3}{4}, -x]$	[93]
94	$[\frac{1}{2} - z, x + \frac{3}{4}, y + \frac{1}{4}]$	[94]
95	$[\frac{1}{2} - y, z + \frac{3}{4}, x + \frac{1}{4}]$	[95]
96	$[z + \frac{3}{4}, \frac{1}{2} - x, y + \frac{1}{4}]$	[96]