

Determination of Term symbol for different d electron system:

1) d^1 -

1				
2	1	0	-1	-2

$S = \frac{1}{2}$

$L = 2$ Term symbol $2S+1$
 $= D$ L
 5

$J = L + S = 2 + \frac{1}{2} = \frac{5}{2}$

$L + S - 1 = \frac{5}{2} - 1 = \frac{3}{2}$

Spin multiplicity $2S + 1 = 2 \times \frac{1}{2} + 1 = 2$

Possible Term symbol $2D_{5/2}$ $2D_{3/2}$

Ground state Term $= 2D_{3/2}$

2) d^2 -

1	1			
2	1	0	-1	-2

$S = \frac{1}{2} + \frac{1}{2} = 1$

$L = 2 + 1 = 3$

Term = F $2S+1$
 symbol L
 5

$J = L + S = 3 + 1 = 4$

$L + S - 1 = 4 - 1 = 3$

$L + S - 2 = 4 - 2 = 2$

Spin multiplicity $2S + 1 = 2 \times 1 + 1 = 3$

Possible Term symbol $3F_4, 3F_3, 3F_2$

Ground state term $3F_2$

Determination of Term Symbol

d3

1	1	1		
2	1	0	-1	-2

Term symbol
 $2S+1$
 L
 J

$$S = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{3}{2}$$

$$L = 2 + 1 + 0 = 3$$

symbol F

$$J = \frac{L+S}{L+S-1} = \frac{3+\frac{3}{2}}{3+\frac{3}{2}-1} = \frac{9/2}{7/2} = \frac{9}{7}$$

$$\text{Spin multiplicity } 2S+1 = 2 \times \frac{3}{2} + 1 = 4$$

$$\text{Possible term symbol} = {}^4F_{9/2}, {}^4F_{7/2},$$

$${}^4F_{5/2}, {}^4F_{3/2}$$

Ground state Term symbol = ${}^4F_{3/2}$

d4

1	1	1	1	
2	1	0	-1	-2

Term symbol -
 $2S+1$
 L
 J

$$S = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 2$$

$$L = 3 + 0 - 1 = 2, \text{ symbol - D}$$

$$J = L + S = 2 + 2 = 4$$

$$L + S - 1 = 4 - 1 = 3$$

$$L + S - 2 = 4 - 2 = 2$$

$$\text{Spin multiplicity } 2S+1 = 2 \times 2 + 1 = 5$$

Possible Term symbol - ${}^5D_4, {}^5D_3, {}^5D_2$

Ground state Term symbol - 5D_2