Date :- 03/07/2020

* Calculation of "S" values for single multielectron System :-

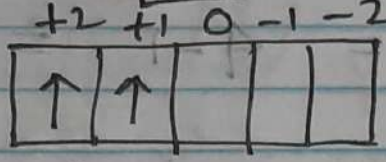
Restricted our discussions for 1st row transition metal Series

$d^1 \rightarrow$

No. of unpaired electron = 1

$S = n_s \Rightarrow S = \boxed{\frac{1}{2}}$ ($s = \frac{1}{2}$, Spin quantum No.)

$d^2 \rightarrow$

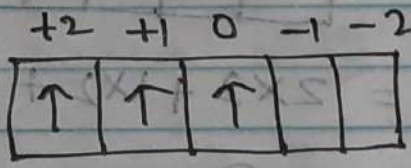


No of unpaired electrons = 2

$n = 2$

Total Spin quantum no: $(S) = 2 \times \frac{1}{2} = \boxed{1}$

$d^3 \rightarrow$

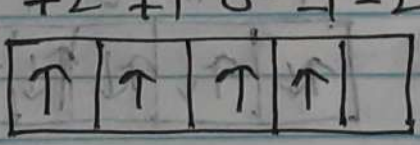


No. of unpaired electrons = 3

$n = 3$

$S = 3 \times \frac{1}{2} = \boxed{\frac{3}{2}}$

$d^4 \rightarrow$

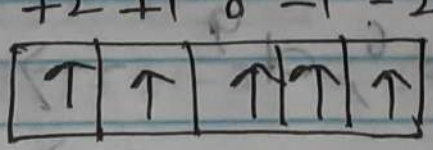


No. of unpaired electrons = 4

$n = 4$

$S = 4 \times \frac{1}{2} = \boxed{2}$

$d^5 \rightarrow$

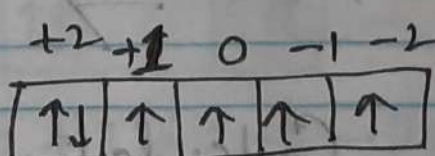


No. of unpaired electrons = 5

$n = 5$

$S = 5 \times \frac{1}{2} = \boxed{\frac{5}{2}}$

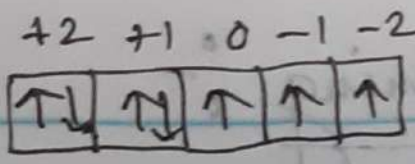
$d^6 \rightarrow$



No. of unpaired electrons = 4

$n = 4$

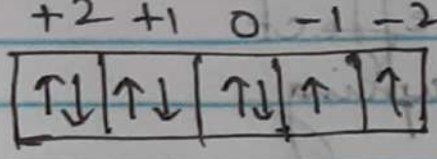
$S = 4 \times \frac{1}{2} = \boxed{2}$

$d^7 \rightarrow$ 

No. of unpaired electrons = 3

$n = 3$

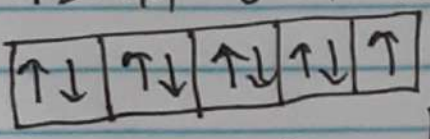
$S = 3 \times \frac{1}{2} = \boxed{\frac{3}{2}}$

$d^8 \rightarrow$ 

No. of unpaired electrons = 2

$n = 2$

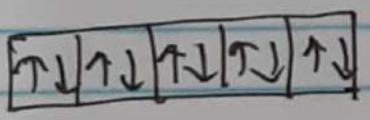
$S = 2 \times \frac{1}{2} = \boxed{1}$

$d^9 \rightarrow$ 

No. of unpaired electron = 1

$n = 1$

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

$d^{10} \rightarrow$ 

No. of unpaired electron = 0

$S = 0 \times \frac{1}{2} = \boxed{0}$

$d^{10} \rightarrow 0$, $d^5 = 5/2$

$d^1, d^9 \rightarrow \frac{1}{2}$, $d^2, d^8 = 1$, $d^3, d^7 \rightarrow \frac{3}{2}$

$d^4, d^6 = 2$

Table :

e^- Config?	L value / State	S value	2S+1	$(2S+1)L$ → Only Ground State
d^1	2, D	$\frac{1}{2}$	2	^2D
d^2	3, F	1	3	^3F
d^3	3, F	3/2	4	^4F
d^4	2, D	2	5	^5D
d^5	0, S	5/2	6	^6S
d^1	2, D	2	5	^5D
d^7	3, F	3/2	4	^4F
d^8	3, F	1	3	^3F
d^9	2, D	1/2	2	^2D
d^{10}	0, S	0	1	^1S

J value will be discussed later