

For a multi-electron system, s is replaced by S = Total Spin quantum no. = $n s$, where n = no. of unpaired electrons and $s = \frac{1}{2}$. Hence μ_s value depends on the no. of unpaired electron in the system.

Now,

$$\mu_s = 2 \sqrt{S(S+1)} \text{ Bm}$$

<u>n</u>	<u>$S = n \times s$</u>	<u>$\mu_s \text{ (Bm)}$</u>
1	$\frac{1}{2}$	1.73
2	1	2.83
3	$\frac{3}{2}$	3.87
4	2	4.90
5	$\frac{5}{2}$	5.92
6	3	6.93

Hence, in the system where orbital contribution to the total magnetic moment is nil or very poor, the μ value becomes very close to μ_s value.

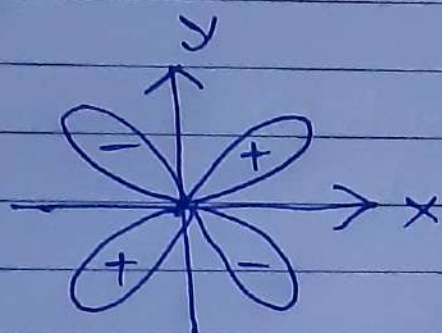
Generally, however, experimental values differ from the μ_s values, because of the orbital contribution of e^- to the total moment assuming full contribution of the orbital motion of e^- to the total magnetic moment.

$$\mu_{s+L} = \sqrt{4S(S+1) + L(L+1)} \text{ BM}$$

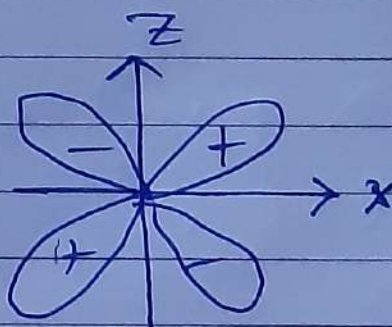
Where, S and L represents the total spin and orbital angular momentum no. respectively. However, it has been observed that the experimental μ values (μ_{obs}) of the common transition metal ion of first series frequently exceed μ_s but seldom are as high as μ_{s+L} . This is because the electric fields of other atoms, ions and molecules surrounding the metal ion restrict the orbital

motion of the unpaired e^- so that the orbital moment is ~~is~~ fully or partially quenched. In case of quenching of orbital motion, $\mu_{obs} \sim \mu_s$ and in other cases

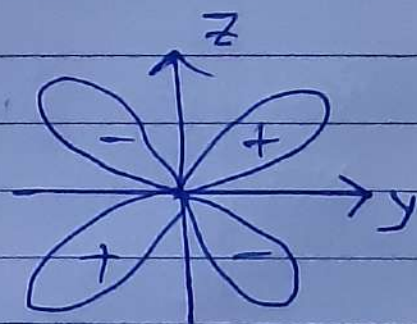
$$\mu_{s+l} > \mu_{obs.} > \mu_s$$



d_{xy}



d_{xz}



d_{yz}

90° - interconvertible

These orbitals contribute to orbital contribution to the magnetic moment. These orbitals contribute to T-term (triply degenerate). But $d_{x^2-y^2}$ and d_{z^2} orbitals do not contribute to the orbital motion.