

## 2. Magnetic property - Most of

paramagnetic character - Most of the TM and their compounds are paramagnetic in nature. (Attracted by magnetic field) because they have unpaired electrons in  $(n-1)d$  orbitals.

Paramagnetic character increases with increasing number of unpaired electrons hence from left to right in a period it increases from  $d^1$  to  $d^5$  and then decreases from  $d^6$  to  $d^9$ . Transition metal which have  $d^0$  or  $d^{10}$  electronic configuration have all paired electrons and are diamagnetic in nature (repell by magnetic field). Eg -  $Ti(IV)$  ;  $Cu(I)$  ;

$Zn$

$3d^{10}4s^2$

paramagnetism is expressed in magnetic moment ( $\mu$ ). Magnetic moment arises due to electron motion in an atom or ion. Electron motion are of two types of magnetic moment.

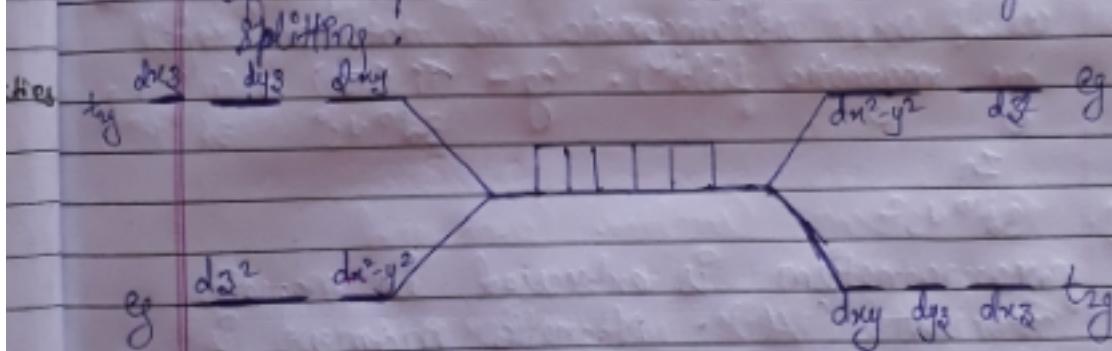
- (i) Spin magnetic moment ( $\mu_s$ )
- (ii) orbital magnetic moment ( $\mu_l$ )

In 3d series ( $1^{st}$  Transition series) orbital <sup>contribution</sup> ~~motion~~ is quenched hence only spin contribution is taken. So the effective magnetic moment is given by

When it absorbs a portion of white light from visible reason. The colour of substance is the colour of transmitted light known as Complementary colour of absorb light. There are three main cause of colour

- (i) d-d transition
- (ii) Charge transfer
- (iii) Structure defects

~~(i)~~ d-d transition — The transition metal have five degenerate d-orbitals when compound is found the d-orbitals split into two or more sets depending on geometry of compound. This is called Crystal field splitting.



### Tetrahedral splitting

### Octahedral splitting

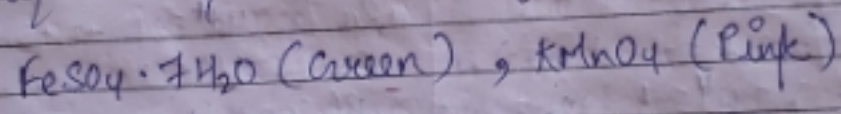
When light falls on the compounds, e's of lower d-orbital promoted into higher d-orbital absorb promotion portion of light from visible reason and jumps to higher d-level. They emits another portion of visible radiation as coloured light. Hence compounds becomes coloured. This is called colour due to d-d transition.

77	Ir	$5d^9 6s^1$	+2, +3
78	Pt	$5d^{10} 6s^1$	+1, +2
79	Au	$5d^{10} 6s^1$	+2
80	Hg	$5d^{10} 6s^2$	

### Some important physical and chemical properties of transition metal -

1. T.M forms Coloured Compounds.
2. T.M show Magnetic property.
3. T.M form Complex Compound.
4. T.M forms alloys.

Transition metal forms Coloured Compounds. why?  
 Most of the transition metal compounds are coloured both in the solid state and in aqueous solution as for example -  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  (Blue)



Causes of the colour - A substance is coloured