They have large charge
Thus have high charge / radius ratio
They have vacant d – orbitals which can accept lone pair of electrons donated by the ligands.

Ex. $[Cu(NH_3)_4]$ Cupramine sulphate
$K_4[Fe(CN)_6]$ Potassium ferro cyanide
$[Ag(NH_3)_2]Cl$ Silveramine chloride
$Na_2[Ni(CN)_4]$ Sodium Nickelo cyanide
$[Ni(CO)_4]$ Nickel tetra carbonyl.

Transition metals act as catalyst. Why ?

Most of the transition metals and their compounds are used as catalyst. They act as catalyst because of the following :-

(a) T. M. adsorbs one of the reactants on its surface and increase its concentration and decrease bond strength which increases rate of reaction. (b) T.M. provides large surface area of reaction (c) T.M. with varying oxidation states may form intermediate compunds with one of the reactant. These intermediates provide a new path with lower activation energy. Hence, rate of reaction increases.

Ex. (i) Iron catalyst and Mo promoter is used in the synthesis of NH_3 by Haber's process (ii) Spongy platinum is used as catalyst in (a) manufacture of H_2SO_4 by contact process (b) manufacture of HNO_3 by ostwald's process (iii) Finely divided Ni is used in hydrogenation reaction eg. Hydrogenation of oils and fats (iv) V_2O_5 in the manufacture of H_2SO_4 by contact process (v) Co – Th in Fischer – Tropsch synthesis of gasoline.

Transition metals show paramagnetism. Why ?

Magnetic properties : Most of the transition metal ion and their compounds are paramagnetic (attracted by the magnetic field) because they have unpaired electrons in (n – 1)d orbitals.

Paramagnetic character increases with increasing number of unpaired electorns. Hence from left to right in a period it increases from d^1 to d^5 and then decreases for d^5 to d^9. Transition metals which have d^0 or d^{10} electronic configuratins, have all paired elctrons and are diamagnetic (repelled by the magnetic)

Ex.	Ti (IV).	Zn (II)	Cu (I)
	$3d^0$	$3d^{10}$	$3d^{10}$

Paramagnetism is expressed in magnetic moment (μ). Magnetic moment arises due to electron motion in an atom or ion. Electron has two types of motion. So it has two types of magnetic moment (i) Spin magnetic moment (μ_s) (ii) orbital magnetic moments (μ_l)

CHAPTER - 2

What are transition metals:-

Elements which has incompletely filled d sub-orbit in elemental or most common ionic state are called "transition metals."

Transition metals are also called 'd-block elements' since in these elements last electron enters into 2nd last d sub-orbit.

These are called transition metals because their properties represent a change from most electropositive element of s-block to most electronegative p block elements. Actually their properties are intermediate between s and p block.

In periodic table there are four main transition series:-

1. First transition series (3d series) $_{21}Sc$ - $_{30}Zn$
2. 2nd transition series (4d series) $_{39}Y$ - $_{48}Cd$
3. 3rd transition series (5d series) $_{57}La$ $_{72}Hf$ - $_{80}Hg$
4. 4th transition series (6d series) $_{89}Ac$ $_{104}Rf$ - $_{112}Uab$

Transition metals show variable oxidation state, why ?

All transition metals show variable oxidation state except first and last elements General electronic configuration of transition elements are $(n-1)d^{1-10}\ ns^2$. Transition metals show a common oxidation state of +2 using two electrons of ns orbital. But they may show higher oxidation states by the gradual use of (n-1) d electrons we observe that (i) oxidation state changes by one units in each step (ii) Compounds of metals in highest oxidation states are formed with most electronegative element like F_2 and O_2. (iii) Compounds of T.M. in lower oxidation state (+2, and +3) are mostly ionic. (iv) Compounds in higher oxidation states are covalent and are formed by sharing of d – electrons. (v) T. M. also show low oxidation state of +1 and 'O' in their compounds. Ex $Ni(CO)_4$.

(vi) Stability of oxidatian state can be seen from E^O (electrode potential) values. The state having lower E^O value will be more stable.

Ex $E^O cu^+/cu = 0.52$ V

$E^O cu^{++}/cu = 0.34$V

Hence Cu^{++} is more stable than Cu^+.

Transition metal form complex compounds, Why ?

Transition metal ions form a large number of complex compounds. They form complex compounds in C.N = 2, 4, 6 with all type of ligands. T. M form complexes due to the following reasons.