Coordination componds

On Tip Notes

- The compounds like K,[Fe(CN),] which does not give all the ions on dissolving in water are called coordinate or complex compound. They are different from double salt.
- According to Werner theory there are two types of valencies which are primary (oxidation state) and secondary (coordination number).

- The metal ions which accept electrons is central metal ion and donors are ligands.
- Ligands can be catagorized as
- Monodentate and polydentate
- (b)Positive, negative and neutral
- Ambidentate
- Coordination entity: It constitutes a central metal atom/ion bonded to a fixed number of ligands with coordinate bonds.
- Primary valency: Normally, it is ionizable valency and satisfied by anions only.
- Secondary valency: Non-ionizable valency, satisfied by ligands only. The types of isomerism
- which comes under structural isomerism shown by these compounds are
- Ionisation isomerism
- Linkage isomerism
- Hydration isomerism
- Coordination isomerism
- Stereo isomerism shown by complex ions are
- Geometrical isomerism
- Optical isomerism
- Valence Bond Theory (VBT): According to this theory, the metal atom/ion can use (n - 1)d, ns, np,
- nd orbitals for hybridisation, under the influence of ligands, to yield a set of equivalent orbitals, in
- definite geometry. Valence bond theory (V.B.T) explains the following properties of complex compounds.
- Outer or inner orbital complex
- Diamagnetism or paramagnetism
- Hybridization, $desp^3$ sp^3d sp^3.dsp^2 etc.
- Magnetic moment
- The limitations of V.B.T. were overcome by C.F.T.
- Crystal Field Theory (CFT): CFT is an electrostatic model which describes electronic structure of
- metal ion in ionic crystals.
- CFSE (A): Difference between energies of e, orbitals and orbitals is called crystal field stabilization energy.

- **The quantitative estimation of strength of ligand w.r.t. different metal ion is judged by Crystal**
- **Field Theory (C.F.T.). This supports the loss of degeneration of orbitals in d-subshell into between**
- **the central metal ion and ligands are electrostatic.**
- **Spectrochemical series: Series in which ligands are arranged in order of increasing**
- **In general the strength of ligand is**
- **<Br<SCN-< CI <S2-< F-< OH < $C_20,2$ < H_2O < en < CN-< CO.**
- **Kinetic stability of a complex The compounds in which metal is directly attached to the carbon atom is called organometallic compound. e.g..**
- **CH,MgBr (a bonded)**
- **Ferrocene (bonded)**
- **Ni(CO), (o and я bonded)**
- **Carbonyl compounds are also included in this catageory.**
- **Metal carbonyls: Complexes forms by most of transition metals with carbon monoxide through**
- **both o- and -bonds, to form homoleptic carbonyls.**
- **Synergic bonding: Bonding between metal and ligand due to donation of electron pair from ligand**
- **to metal atom/ion and acceptence of electron pair from d-orbital of metal to ligand.**
- **The ligands like CO, NO* etc can accept electron pairs from central metal ion and forms synergic bonding and these ligands are called -acid ligands.**