TDC Part II
Paper I, Group B
Inorganic Chemistry

Department of Chemistry

L.S COLLEGE MUZAFFARPUR
B. R. A. BIHAR UNIVERSITY

Dr. Priyanka

TOPIC:- Complex Formation Tendency & Magnetic Behaviour

Complex Formation Tendency:

The elements of first transition series fulfill all conditions of complex formation and are, thus, most suitable for this purpose. As a result, the cations of these elements have a strong tendency to form complexes with certain molecules (e.g. CO, NO, NH_3, etc.) or several ions (e.g. F^-, Cl^-, CN^- etc.). These molecules and ions are called ligands (L) and have one or more lone pairs of electrons on their donor atom (usually central atom) which they donate to the metal ion/atom (M) during the process of complex formation via M←L coordinate covalent bonds. This happens because the metal ions are electron deficient in most of their oxidation states or even the atoms are electron acceptors. Small size and high charge density of the metal ions facilitate the formation of the complexes which also depends on the basicity of the ligands. The complex formation tendency increases as the positive oxidation state of the metal ion increases.

The nature of the complexes depends on the orbitals available on the metal ion / atom for bonding. These orbitals are s, p and d type. The structures commonly found in the complexes of the elements of first transition series are linear, square planar, tetrahedral and octahedral. This shows that the metal orbitals are hybridized before bonding with the ligand orbitals, e.g. $[Ni(CN)_4]^{2-}$ ion is square planar while $[NiCl_4]^{2-}$ ion is tetrahedral (detail of the complexes have been given ahead in this section).

Magnetic Behaviou :

As has been mentioned earlier, there are several kinds of magnetism observed in the ions /compounds or complexes of transition metals. Among the transition metal compounds paramagnetism is common though some metals in the elemental form also show ferromagnetism.