

## Answer on Question#43775 - Chemistry - Inorganic Chemistry

### Question:

$K_4[Fe(CN)_6]$  Coordinate covalent bond.

### Solution:

This compound is called coordination complex. There are central atom – ion  $Fe^{2+}$ , ligands – cyanide ions  $CN^-$ , which are connected to central atom. The particle  $[Fe(CN)_6]^{4-}$  is called coordination sphere. Potassium ions  $K^+$  compensate the negative charge of the coordination sphere. The chemical bond between central atom and ligands is rather strong in contrast to bond between coordination sphere and compensating ions. The number of ligands is coordination number.

Formation of the coordination sphere can be explained by dipolar bond. The central atom – ion  $Fe^{2+}$  has the following electronic configuration:  $1s^2 2s^2 2p^6 3d^6 4s^0 4p^0$ . Six electron pairs can occupy ferrous vacant orbitals. Cyanide ion  $CN^-$  has lone pair of electrons and this pair can occupy the vacant orbital of the donor ( $Fe^{2+}$ ), forming dipolar (or complex or coordinate) bond. Complete electronic configuration  $1s^2 2s^2 2p^6 3d^{10} 4s^2 4p^6$  and combined electron pairs adduce to stable chemical particle – complex.

The coordination sphere has octahedral geometry and can be illustrated as regular octahedron – square bipyramid with CN-groups in the vertices and ion  $Fe^{2+}$  in the center of the plane square.

