

What type of bond (like covalent, coordinate, ionic) is present in  $K_4[Fe(CN)_6]$  and why?

Answer: In the molecule of  $K_4[Fe(CN)_6]$  all three types of bonds mentioned above are present.

Covalent bonds are in the cyanide ions between the atoms of carbon and nitrogen which have medium difference in electronegativities :  $N\equiv C^-$ . Coordinate bonds are between the central atom of iron and surrounding cyanide ions; iron has free electron orbitals, and carbon of the cyanide ion has a pair of valent electrons which are forming together the coordinate bond:  $N\equiv C^- \rightarrow \square Fe^{2+}$ . And ionic (electrovalent) bonds are between outer potassium ions  $K^+$  and complex ferrocyanide ion  $[Fe(CN)_6]^{4-}$ , because they have a large difference in the electronegativities of potassium and carbon.

Molecular structure of the potassium ferrocyanide can be shown as:

