

## Hapticity

A single organic ligand may interact with a central metal atom using one or more of its atoms simultaneously. The number of atoms in a ligand attached to the metal atom is denoted by the prefix  $\eta$  (the Greek letter eta) followed by a superscript indicating the number of ligand atoms attached to the metal atom. This is called hapticity. Most ligands attach through one atom only, therefore, they are called as monohapto ( $\eta^1$ ). Cyclopentadienyl ligand,  $C_5H_5^-$  or Cp, for example, can attach to metal atom through one, three or five carbon atoms. Therefore, it may act as mono ( $\eta^1$ ), tri ( $\eta^3$ ) or pentahapto ( $\eta^5$ ) ligand (Fig. 1.3).

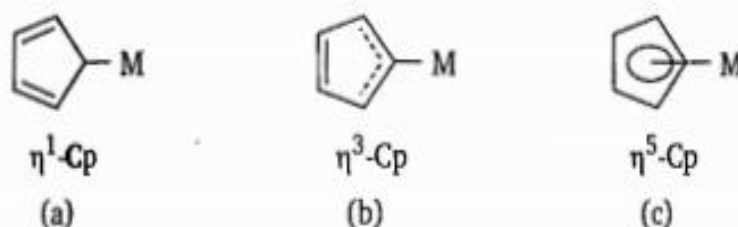


Fig. 1.3

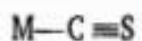
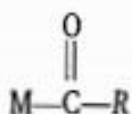
The term hapto comes from the Greek word haptain meaning to fasten. Therefore, pentahapto means fastened in five places.

The hapticity of various ligands is shown below :

(1)  $\eta^1$ -(monohapto ligands) :

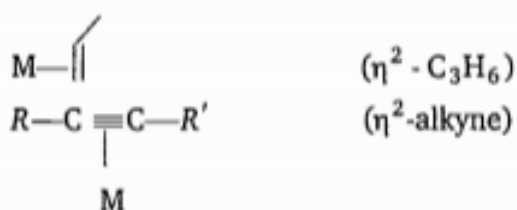


(where  $R = -CH_3, -CH_2-CH_3, -C_6H_5$  etc.)

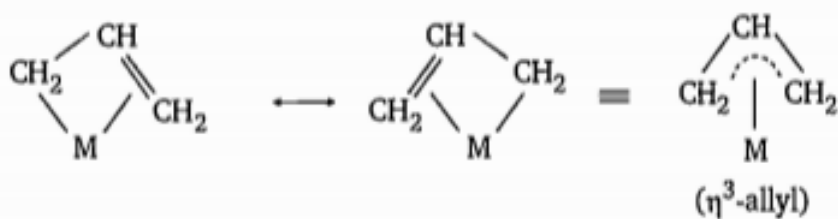




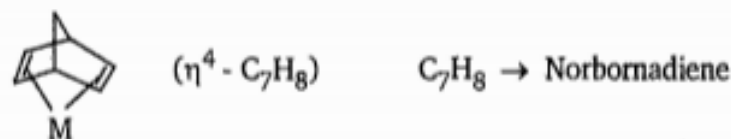
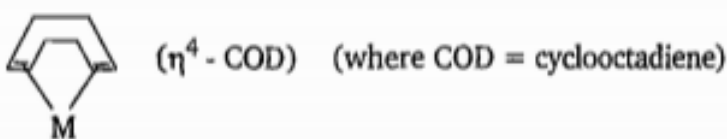
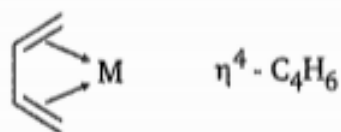
**(2)  $\eta^2$ -(Dihapto ligands) :**



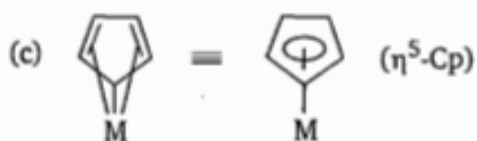
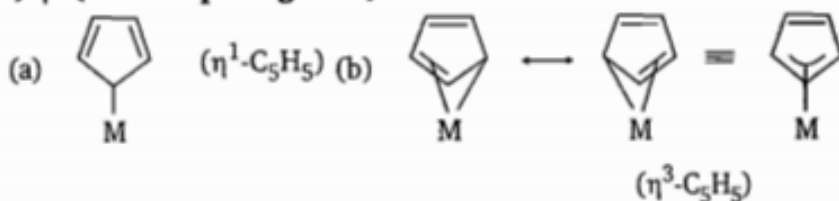
**(3)  $\eta^3$ -(Trihapto ligands) :**



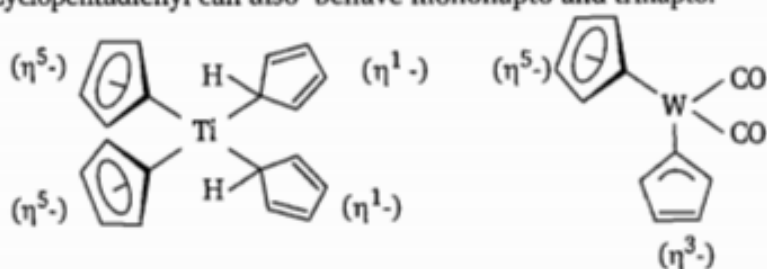
**(4)  $\eta^4$ -(Tetrahapto ligands) :**



**(5)  $\eta^5$ - (Pentahapto ligands) :**



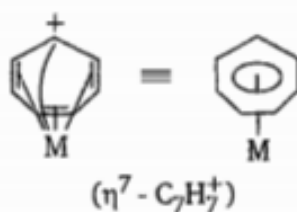
Cyclopentadienyl can also behave monohapto and trihapto.



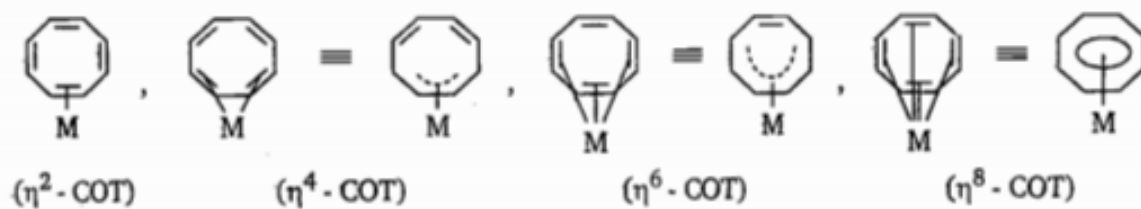
**(6)  $\eta^6$ - (Hexahapto ligands) :**



**(7)  $\eta^7$ - (Heptahapto ligands) :**



**(8)  $\eta^8$ - (Octahapto ligands) :**



where COT = cyclooctatetraene

The ligand which can change its hapticity is called a fluxional ligand.

If hapticity of a ligand is not given, then the ligand has to be assumed in its highest hapticity, e.g., Cp  $\rightarrow \eta^5$ , allyl  $\rightarrow \eta^3$ .

The IUPAC name of some compounds are given below :

