
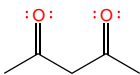




CONCEPT: LIGANDS

- A ligand represents a _____ base because it bonds to a metal cation in a complex ion by using its lone pair.
 - Since ligands use their lone pair(s) to grab onto metal cations they are referred to as _____ agents.
 - Ligands are typically either _____ (L-Ligands) or _____ charged (X-Ligands).
- The number of elements in a molecule that can donate a lone pair characterizes a ligand.
 - Ligands that possess the ability to donate _____ lone pair at a time are referred to as **Monodentate ligands**.
 - Ligands that possess the ability to donate _____ lone pairs at a time are referred to as **Bidentate ligands**.
 - Bidentate ligands give rise to _____ in the complex ion form.

	Ligand	Name	Abbreviation	Type (X or L)		Ligand	Name	Abbreviation	Type (X or L)
Monodentate Ligands	$\text{H}_2\ddot{\text{O}}:$	aqua	—		Bidentate Ligands				
	$\ddot{\text{N}}\text{H}_3$	ammine or ammino	—			$\text{H}_2\text{C}-\text{CH}_2$ $\text{H}_2\ddot{\text{N}} \quad \ddot{\text{N}}\text{H}_2$	ethylenediamine		
	$\ddot{\text{P}}\text{R}_3$	triarylphosphino trialkylphosphino	—						
	$:\text{C}\equiv\text{O}:$	carbonyl	CO						
	$\text{H}_3\text{CC}\equiv\text{N}:$	acetonitrilo	MeCN						
	$\text{H}_2\text{C}=\text{CH}_2$	ethylene	—						
		benzene	Ph			$\left[\begin{array}{c} \text{O}^- \\ \parallel \\ \text{C} \\ \parallel \\ \text{O}^- \end{array} \text{---} \begin{array}{c} \text{O}^- \\ \parallel \\ \text{C} \\ \parallel \\ \text{O}^- \end{array} \right]^{2-}$	oxalato		
	$:\ddot{\text{X}}:^-$	halo	X						
	$\text{H}:\text{H}^-$	hydrido	—						
	$:\text{C}\equiv\text{N}:^-$	cyano	CN						
	$\text{H}:\ddot{\text{O}}\text{H}^-$	hydroxido	—				acetylacetonato		
		cyclopentadienyl	Cp						
		allyl	—						

EXAMPLE: Provide the complex ion structure when a Ti^{3+} ion combines with 4 ammonia molecules and 2 chloro anions.

EXAMPLE: Provide the complex ion structure when Cu^+ combines with ethylenediamine and 2 cyanide anions.

CONCEPT: LIGANDS

PRACTICE: Provide the complex ion structure and geometry when a Ni atom combines with 2 chloro anions and 2 water molecules.

PRACTICE: Provide the complex ion structure and geometry when a Co^{3+} ion combines with 3 ethylenediamines.