T1. OMCh Problems

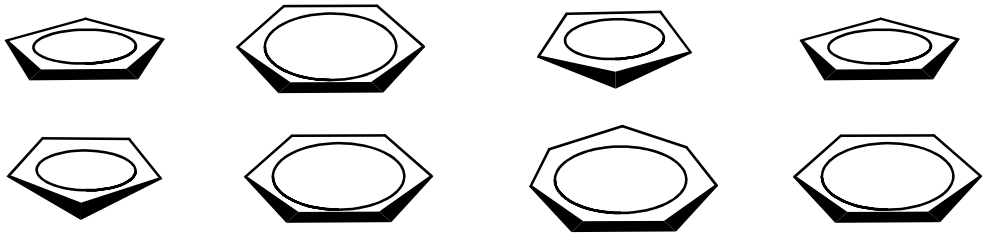
1 Name, draw and give the electron count for the following complexes: (a) $Fe(CO)_5$, (b) $Mn_2(CO)_{10}$, (c) $Nb(CO)_6$, (d) $[Fe(CO)_4]^{2-}$, (e) $La(\eta^5\text{-Cp*})_3$, (f) $Fe(\eta^3\text{-allyl})(CO)_3Cl$, (g) $Fe(CO)_4(PMe_3)$, (h) $W(CO)_3(\eta^6\text{-}C_7H_8)$, (i) $Pd(Cl)(Me)(PPh_3)$, (j) $ZrCl_2(Cp^*)_2$, (k) $[Fe(\eta^5\text{-}C_5H_5)(CO)_2]^-$, (l) $Zn_2(Cp^*)_2$. Which ones obey the 18-e rule?

2 (a) Explain why does the 16-e configuration become more stable at the end of the transition series?
(b) Why the 18-e rule applies to transition metal complexes and particularly to those in the middle of the series.
(Douglas, McDaniel, Alexander *Concepts and Models of Inorganic Chemistry,* Wiley, New York, 1994. p. 609)

3 Draw η^2 - and η^4 - metal-1,3-butadiene interactions.

4 What hapticities are possible for the interaction of each of the following ligands with iron? (a) $MeHC{=}CH_2$, (b) Cp, (c) benzene, (d) cod, (e) nbd.
cod: cyclo-octadiene; nbd: norbornadiene

5 Given the following pairs of π-donor rings, choose the proper ion from the following list to form a neutral mixed sandwich compound: V^0, Cr^0, Mn^I , Fe^{II} , Co^{III}



(a) (b) (c) (d)

Additional problems

Butler, Harrod, *Inorganic Chemistry. Principles and applications,* Benjamin Cummings, Redwood City, 1989. 22.11 – 22.12.
Crabtree, *The Organometallic Chemistry of Transition Metals, 4 ed,* Wiley, Hoboken, 2005. Chap. 2: 1, 3, 6, 10.
Douglas, McDaniel, Alexander, *Concepts and Models of Inorganic Chemistry,* Wiley, New York, 1994. 12.5; 12.10; 12.12.
Miessler, Tarr, *Inorganic Chemistry,* Prentice Hall, Englewood Cliffs, 1991. 12.7; 12.19; 12.20; 12.35.