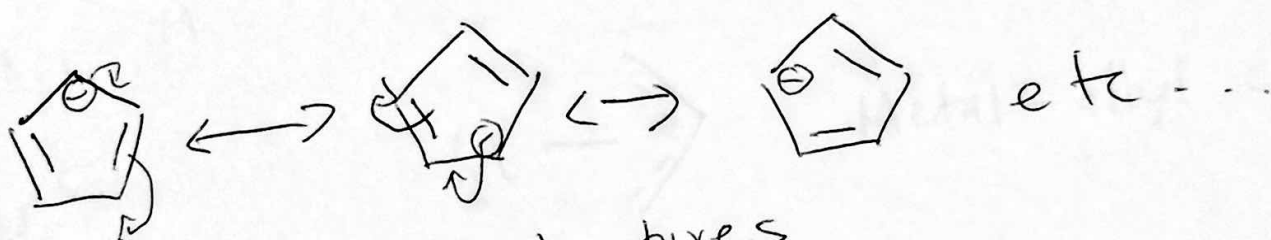
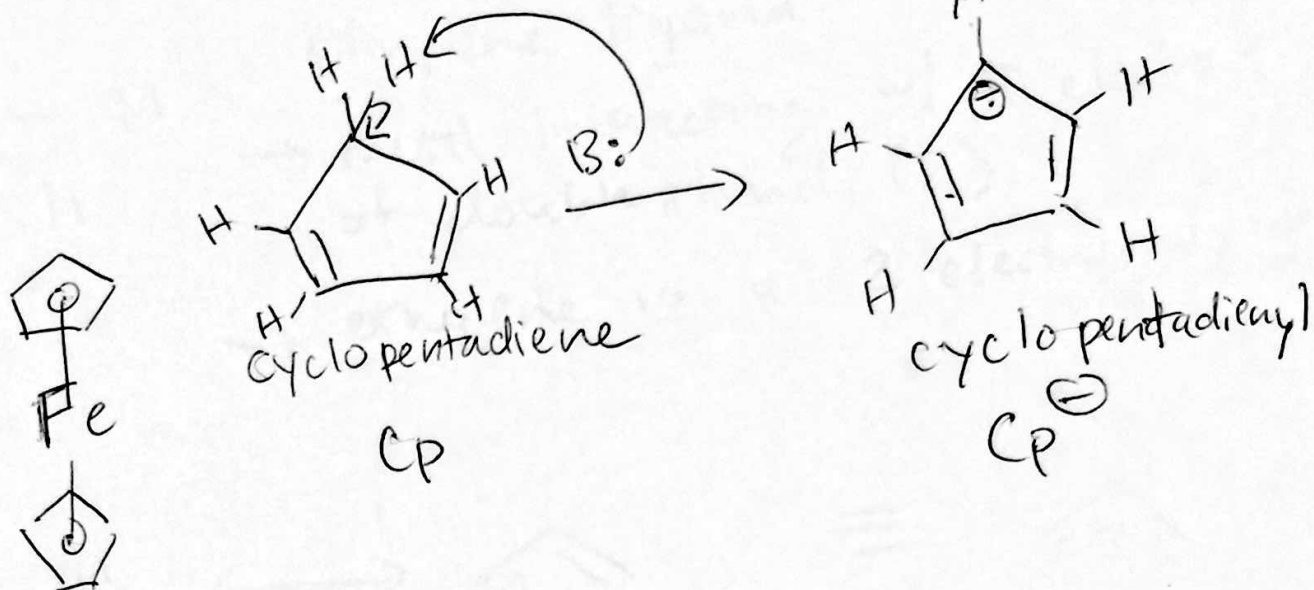


CH431

11/15/16

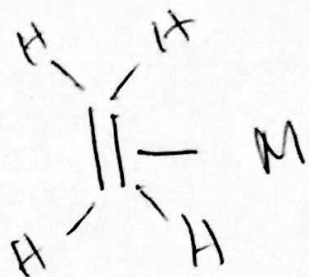


resonance structures

→ 6 π electron aromatic system

→ in FeCp_2 (ferrocene), Fe is interacting with all of the π electrons (6) in each Cp^- ligand

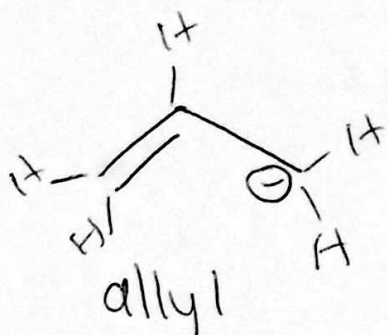
→ Cp^- is a 6 electron donor



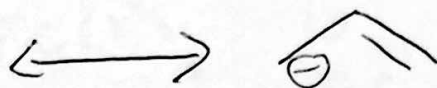
ethylene ligand

→ metal interacting w/ π electrons of double bond (2)

→ ethylene is a 2 electron donor



$C_3H_5^-$



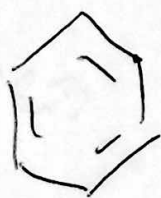
Metal-allyl complex

→ 4 electrons in π system

→ allyl is a 4 electron donor



benzene



→ benzene is a 6 electron donor

→ 6 electrons in π system

18 electron examples

①



overall charge of complex: $\boxed{0}$
 ligand charges: 2 -1 charges from Cp^-
 ligands = $\boxed{-2}$

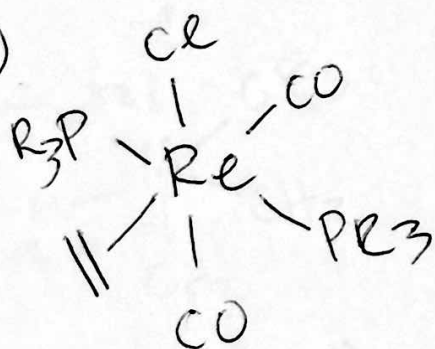
Fe charge: $\boxed{+2}$

$\text{Fe(II)} : 6$ (d electrons)
 $2\text{Cp}^- : 2 \times 6$

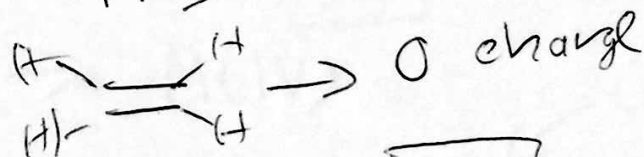
18 electrons

→ Ferrocene is an 18 electron complex

②



overall charge of complex: $\boxed{0}$
 ligands: 2 COs → 0 charge
 $\text{PR}_3 \rightarrow 0$ charge

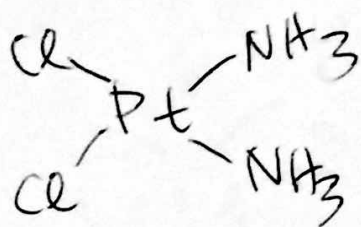


$:\text{C}^-: \rightarrow \boxed{-1}$

$\text{Re} \rightarrow \text{Re(I)}$

$\text{Re(I)} : 6$
 $2\text{CO} : 2 \times 2$
 $2\text{PR}_3 : 2 \times 2$
 $= 2$
 $\text{C}^- : 2$
18 electrons

3)



Overall charge:

0

Ligand charge:

2-

(2 Cl^-)

Pt $\rightarrow$ Pt(II)

Pt(II)

8

2 Cl^-

2 x 2

2 NH_3

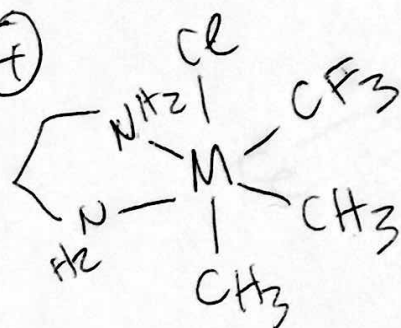
2 x 2

16 electrons

$\rightarrow$ does not follow 18 e^- rule

$\rightarrow$ Square planar complexes often have 16 e^- configurations

4)



Overall charge:

0

Ligand charge

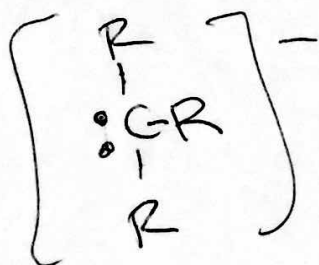
Cl^- 3 CF_3^-

4-

M $\rightarrow$ M(IV)

18 electron complex:

What is M?



Ni(IV)
Pd(IV)
Pt(IV)

M(IV)

?

H_2N NH_2

2 x 2

Cl^-

2

CF_3^-

2

2 CH_3^-

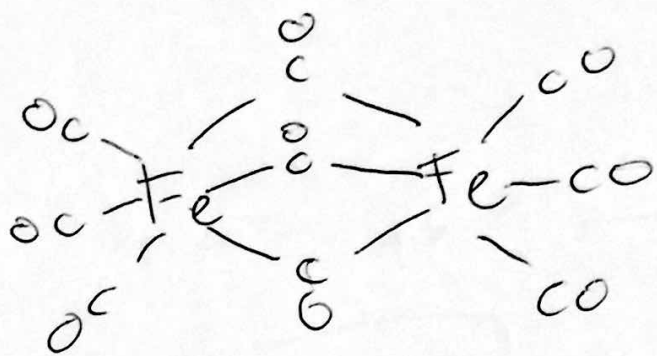
2 x 2

18

6

M(IV) has 6 d electrons

group 10 metal

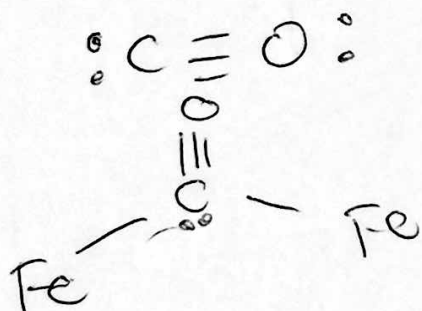


Overall charge: 0
 Ligands 0
 $\text{Fe} \rightarrow \text{Fe}(\text{CO})$

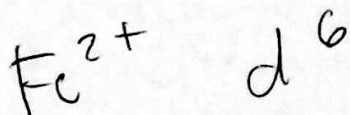


Is there a M-M bond? What is the multiplicity?
 (complex follows 18 electron rule)

$\text{Fe}(\text{CO})$	8	8
3 terminal COs	3×2	6
3 bridging COs	3×1	3
$\text{Fe}-?- \text{Fe}$	<u>?</u>	<u>? 1</u>
	18	18



→ Fe - Fe bond is a single bond in order to make this an 18 electron complex



← Ti^{2-} is more electron rich (negatively charged)

→ can donate electron density to π back bonding w/ CO (ex more than Fe^{2+})

→ weaker CO bond because more electrons are donated into π^* orbitals

→ smallest CO stretching frequency