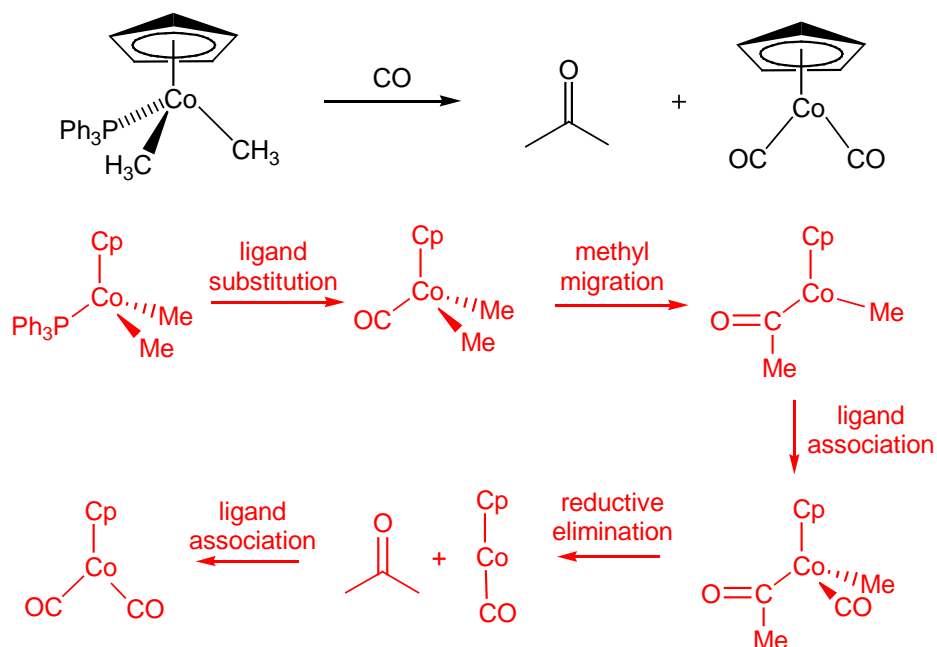


1. Suggest a plausible mechanism for the following reaction:



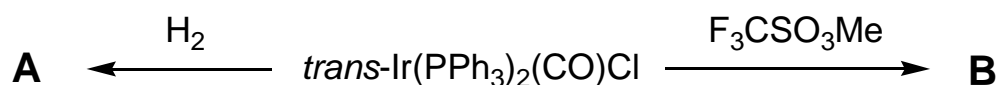
2. Why are electrophilic additions involving  $H^+$  often mechanistically complex?

Attack may occur at ligand, M-L bond, or at M (even in an 18e complex), and attack may occur at one site then transfer can occur to another.

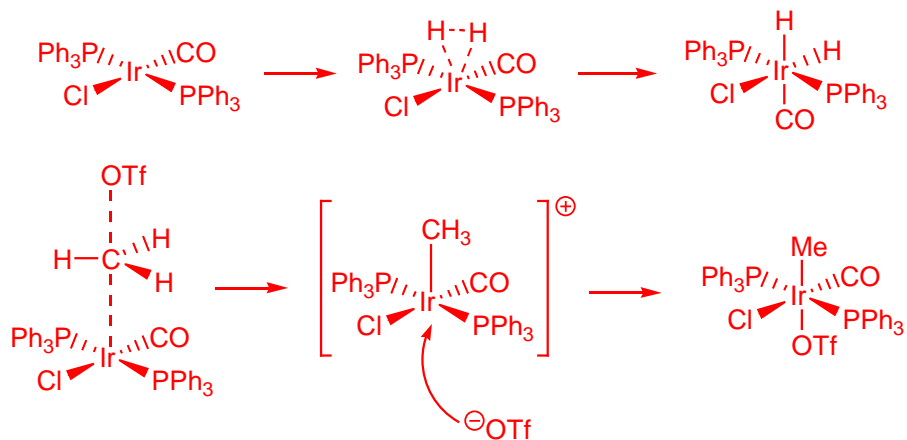
3. Addition of  $H_2$  to  $Cp_2Sc-Me$  generates  $Cp_2Sc-H$  and  $CH_4$ . What is the probable mechanism?

Sc(III) is  $d^0$ , so OA is ruled out. Sigma bond metathesis.

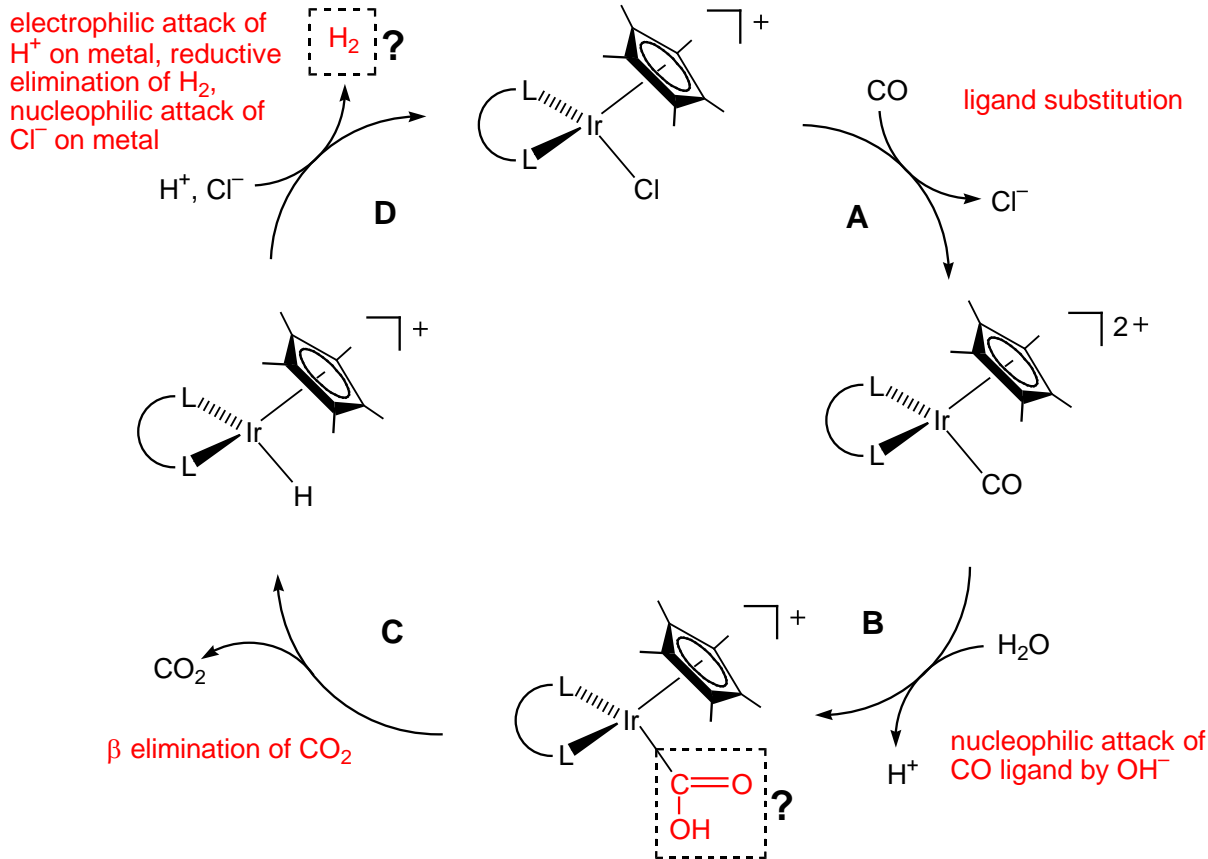
4. The following reactions have been shown to proceed via different mechanisms:



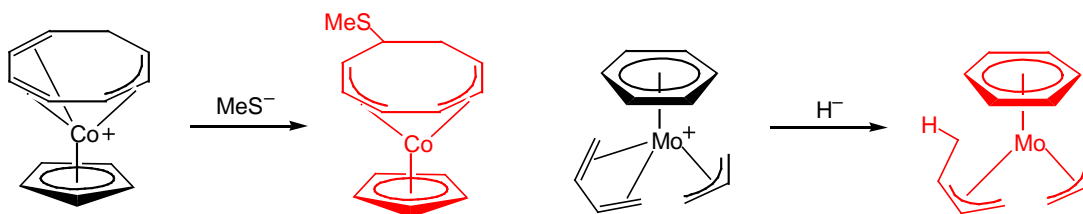
Predict products **A** and **B**, including stereochemistry, and present a reasonable mechanism for each reaction.



5. Inspect the catalytic cycle below. Fill in the two boxes (marked with “?”). What reaction is being catalysed? Describe each of the steps **A – D** in as much detail as possible.



6. Predict the outcome of the following reactions.



7. For the pairs of complexes given below, predict which one will be more reactive towards oxidative addition of  $\text{H}_2$ .

(a)  $\text{RhCl}(\text{PPh}_3)_3$  or  $\text{RhCl}(\text{CO})(\text{PPh}_3)_2$

$\text{RhCl}(\text{PPh}_3)_3$ ; it has  $\text{PPh}_3$  instead of  $\text{CO}$ , and the former is more electron-donating and hence better able to stabilize higher oxidation states.

(b)  $\text{IrCl}(\text{CO})(\text{PPh}_3)_2$  or  $[\text{PtCl}(\text{CO})(\text{PPh}_3)_2]^+$

$\text{IrCl}(\text{CO})(\text{PPh}_3)_2$ ; it is in a lower initial oxidation state, hence is easier to oxidize.