1. For Vaska's complex, $[IrCl(CO)(PPh_3)_2]$ which among the given activities will decrease the CO stretching frequency of the coordinated CO ligand from 1967 cm^{-1} to lower value(s)? Justify your answer.

(i) Replacing both PPh_3 by PMe_3

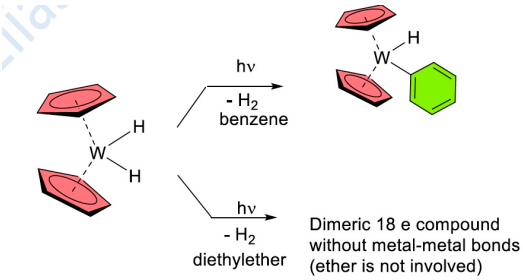
(ii) Oxidative addition by MeI

(iii) Replacing Cl^- by CH_3^-

(iv) Replacing Cl^- by CH3CN (cationic complex)

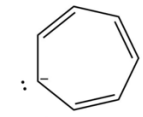
2. 18. (i) The IR spectra of the following 18-electron complexes, $[Ir(CO)_6]^{3+}$ (X), $[Ir(CO)_3]^{3-}$ (Y), and $Ir_4(CO)_{12}$ (Z), were measured and compared with free CO. Match the complexes with the correct CO stretching frequency (i) to (iv): (i) 2060 and 2020 cm^{-1}; (ii) 1642 cm^{-1}; (iii) 2143 cm^{-1};(iv) 2254 cm^{-1}.

3. UV irradiation of the given tungsten hydride in presence of benzene results in the reductive elimination of H_2 and oxidative addition of benzene leading to the formation a new compound as shown. In the presence of diethylether as solvent, a similar reaction happens resulting in the formation of a dimeric 18 e compound without metal-metal bonds. Predict the structure of this new compound.



4. Draw the structures of the 3 complexes and clearly indicate the hapticity (η) of the ring.

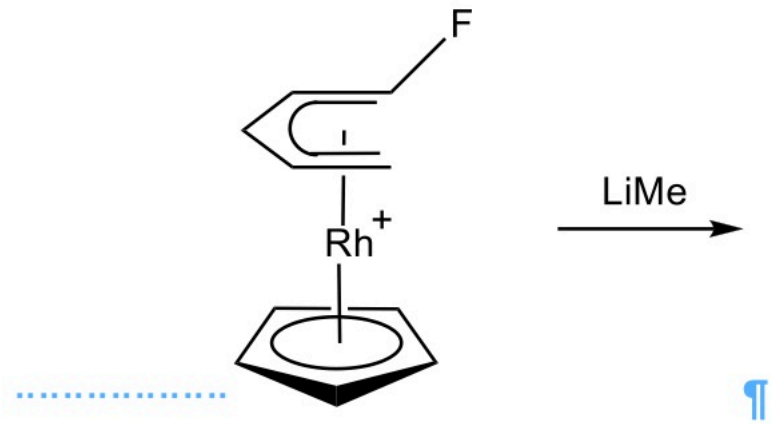
Consider the structure of the cycloheptatrienyl anion.



cycloheptatrienyl anion

$[Co(C_7H_7)(CO)_3]$ $[Co(C_7H_7)(CO)_2]$ $[Co(C_7H_7)(CO)\ ]$

5. Draw the product of the following reaction



6.For each of the following pairs of complexes, which will have the ***lowest*** average CO infrared stretching frequency? Circle your choice and clearly explain your reasoning.

a) $[Cp_2Sc(OMe)(CO)]$ or $[Cp_2Ti(CO)2]$

b) $[IrI_3(CO)_3]$ or $[CoF_3(CO)_3]$

c) $[CpRu(CO)_3]^+$ or $[CpOs(NMe_2)(CO)_2]$