1. Assign the oxidation state of each M. Assuming the 18-electron rule applies, identify the 1st row transition metal and sketch the complex:

   (a) M(CO)(CS)(PPh₃)₂Br
   (b) [M(CO)₇]⁺
   (c) [(η⁵-C₅H₅)(η⁴-C₄H₄)M(NH₃)₂]⁺
   (d) [(η²-C₅H₅)(η¹-C₅H₆)M]⁺
   (e) [(η³-C₃H₅)M(CN)₄]²⁻

2. Assign the oxidation state of each M. Identify the 2nd row transition metal and sketch the complex:

   (a) (η⁵-C₅H₅)(CO)₃M=PM(CO)₃(η⁵-C₅H₅)
   (b) (η⁴-C₈H₈)M(CO)₃
   (c) [M(CO)₅(NO)]⁻ (linear NO)
   (d) (η⁴-C₈H₈)M(CO)₃
   (e) [M(CO)₅(PMe₃)]⁻
   (f) (η⁵-C₅H₅)(η¹-C₃H₅)(η³-C₃H₅)₂M (16-electron complex)

3. What charge, z, would be necessary for the following to obey the 18-electron rule?

   (a) [Ru(CO)₄(SiMe₃)]⁺
   (b) [(η³-C₅H₅)V(CNMe)₅]⁺
   (c) [(η⁵-C₆H₇)Fe(CO)₃]⁺
   (d) [(η⁶-C₆H₆)₂Ru]⁺
   (e) [W(CO)₅(SnPh₃)]⁻

4. A complex has the empirical formula Re(CO)₃Cl. How could it attain the 18-electron configuration without requiring any additional ligands?

5. Predict the hapticity (i.e. what is n in ηⁿ) of each Cp ring in Cp₂W(CO)₂, and of each “triphos” ligand in [Pd{PPh₂CH₂CH₂)₃CPh}₂]²⁺.

6. Comment on the observation that the ν(CO) band in [Fe(CO)₆]²⁺ appears at 2203 cm⁻¹ (compare with free CO).

7. When heated at low pressure, (η⁵-C₅Me₅)Rh(CO)₂ reacts to give a gas and another product having a single peak in the ¹H NMR and a single band near 1850 cm⁻¹ in the infrared. Suggest a structure for this product.

8. Predict the distribution of products when carbon monoxide is lost from cis-Mn(COMe)(CO)₄(¹³CO) assuming the reaction proceeds by deinsertion of CO (as opposed to Me migration, i.e. it is CO that moves to the vacant coordination site, not Me).