Tutorial/Assignment -3A

1. Between complexes of $[MnBr_4]^{2-}$ and $[Mn(H_2O)_6]^{2+}$. Which one is more colorful and have higher molar extinction coefficient (ε) ?
2. Why do $[Cu\ (Phen)_2]^{+}$ complex exhibit dark orange color and $[Cu\ (MeCN)_4]^{+}$ complex become colorless ?
3. What are oxidation states of metal present in oxyhemoglobin and deoxyhemoglobin? Provide the reasons (invoking ligand field theory) that Oxyhemoglobin is of bright-red color while deoxyhemoglobin is purple blue.
4. Why does the trans complex of $[Cu(en)_2\ (H_2O)_2]^{2+}$ have lower molar extinction coefficient (ε) ?
5. How will you visually identify the solutions of $[Cu(H_2O)_6]^{2+}$ and $[Cu(NH_3)_4]^{2+}$ without recording the spectra ?
6. Explain the origin of color in Prussian blue, $Fe_4[Fe(CN)_6]_3$
7. Between complexes of $[CoCl_4]^{2-}$ (deep blue color) and $[Co(H_2O)_6]^{2-}$ (pink color) which one will have orbital contribution in their magnetic moment ?
8. Why MnO_4^- , CrO_4^- , and VO_4^{3-} have dark colors? Arrange Ligand to Metal Charge Transfer (LMCT) order in MnO_4^- , CrO_4^- , and VO_4^{3-} .
9. Magnetic moment of $[Fe(Phen)_2(NCS)_2]$ varies with temperature. Provide the reason for the observation of 4.9 BM magnetic moment at 200 K and 0 BM at 50 K.
10. $K_2[NiF_6]$ and $K_3[CoF_6]$ are diamagnetic and paramagnetic respectively. In which case μ_{eff} is greater than the $\mu_{spin\text{-}only}$ vale and why?

Tutorial/Assignment -3B

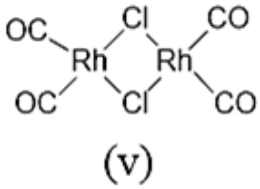
11. Calculate the outer shell electrons:

(i) $Fe(CO)_4PPh_3$

(ii) $[Mn(CO)_5]^-$

(iii) $Mn_2(CO)_{10}$

(iv) $HMn(CO)_5$



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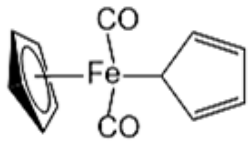
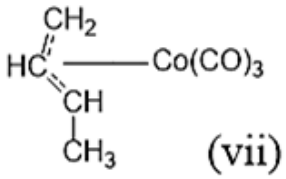




(vii)

12. Draw the structures of these compounds:

(i) $Os_4(CO)_{14}$

(ii) $Co_4(CO)_{12}$

(iii) $Ir_4(CO)_{12}$

13. Fe $(\eta^5 - C_5H_5)_2$ is more stable than Ni $(\eta^5 - C_5H_5)_2$ or Co $(\eta^5 - C_5H_5)_2$?

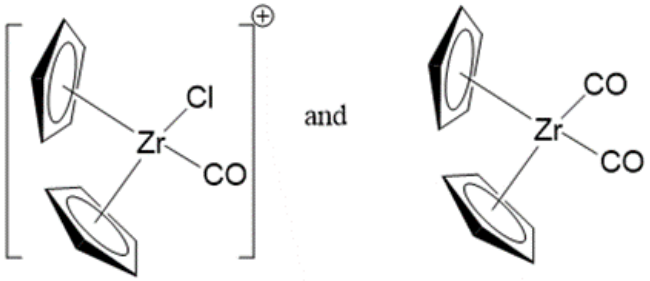
14. V-C bond distances in $V(CO)_6^-$ and $V(CO)_6$ are 1.93 and 2.0 Å. Provide the reasons for bond length difference.

15. Why does $V(CO)_6$ readily react with sodium (Na) to give $Na[V(CO)_6]$?

16. Arrange the following in the decreasing order of back-bonding

$Cr(CO)_6$, $[Ti(CO)_6]^{2-}$, $[Mn(CO)_6]^+$, $[Ir(CO)_6]^{3+}$ and $[V(CO)_6]^-$

17. Between these two complexes, which one will show a lower carbonyl (CO) stretching frequency?



18. Classify the name of reactions:

$[Ir(PPh_3)_2(CO)Cl]$, $[RhI_2(CO)_2]^{\ominus}$, $[(\eta^5\text{-}Cp)_2Ti(Me)Cl]$

19. Among the following complexes which one will not undergo oxidative addition reaction?

(i) $[RhI_3(CO)_2CH_3]^- \longrightarrow [Rh(CO)(COCH_3)]^-$

(ii) $Co_2(CO)_8 + H_2 \longrightarrow 2\,HCo(CO)_4$

(iii) $[Ir(PPh_3)_2(CO)Cl] + CF_3I \longrightarrow [Ir(I)(CF_3)(PPh_3)_2(CO)Cl]$

(iv) $TiCl_4 + 2\,Et_3N \longrightarrow TiCl_4(NEt_3)_2$

20. In hydroformylation reaction, $Co_2(CO)_8$ is the catalysts. Why does the reaction rate decrease with an increase in partial pressure of CO ?