PG – 605

IV Semester M.Sc. Examination, June 2017
(Repeaters) (NS 2010 – 11 Scheme)
CHEMISTRY
C-401-IC : Organometallic Chemistry

Time : 3 Hours Max. Marks : 80

Instruction : *Answer question* ***1*** *and* ***any five*** *from the remaining.*

1. Answer **any ten** of the following : **(10×2=20)**

a) What does the term 'metal' signify in organometallic compounds ?

b) Complete the following reactions

i) $(C_6H_5)_3CH + LiC_2H_5 \rightarrow ? + ?$

ii) $3LiR + AlCl_3 \xrightarrow{\text{heptane}} ? + ?$.

c) What are ring slippage reactions ? Give an example.

d) Write the organic fragments which are isolabal with the following :

i) C_pC_o (CO)

ii) W $(CO)_5$

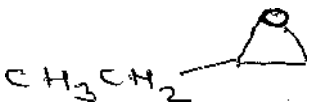
e) Predict the haptocity of the two C_p rings in $[Cp_2\ W(CO)_2]$ assuming 18-electron configuration.

f) Ensure the following conversion using IR spectroscopic technique.

$CH_2 = CH - CH_2 - Mn\ (CO)_5 \rightarrow (\eta^3 - C_3H_5)\ Mn\ (CO)_4 + CO.$

g) Hydroformylation of 1-pentene is catalysed by $CO_2(CO)_8$. It is observed that, an increase in the partial pressure of CO, above a certain threshold decreases the rate of the reaction. Account for this observation.

h) Predict the product in the following reaction

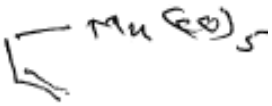


i) Complete the reaction $Zn\ Me_2 \xrightarrow{LiAlH_4}$?

j) Benzene resists nucleophilic substitution where as dibenzene chromium does not. Give reason.

k) What is a reductive-elimination reaction ? Give an example.

l) Complete the following reaction



2. a) $[M(\eta^3 - C_3H_5)(CO)_5]$ is a stable, first row transition metal complex. Predict 'M' in it.

b) Predict the products

i) $2EtI + 2Hg/Na \xrightarrow{EtOAc} ? + ?$

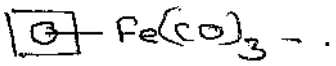
ii) $2\,Li + MgR_2 \rightarrow ? + ?$

iii) $Me_3\,sicl + LiSH \rightarrow ? + ?$

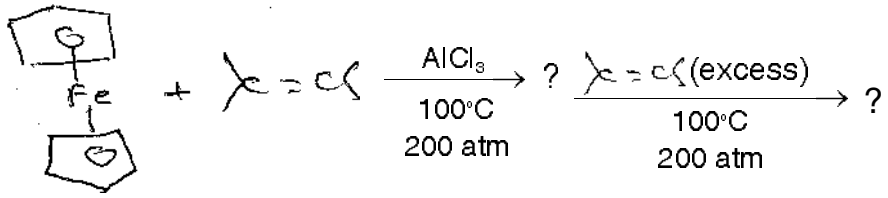
c) Electrophilic attack on transition metal olefins is relatively uncommon. Give reasons. **(3+6+3=12)**

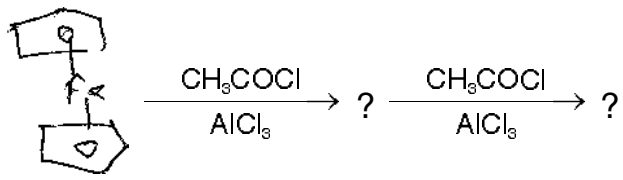
3. a) How ^{1}H-NMR helps in distinguishing $(\eta^1 - C_3H_5)\,Mn\,(CO)_5$ from $(\eta^3 - C_3H_5)\,Mn\,(CO)_4$.

b) Explain the structure and bonding in



c) Complete the following reactions and comment on the products formed

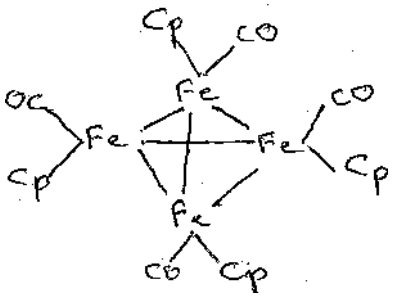
i) 

ii) 

(4+4+4=12)

4. a) Explain the structure and bonding in transition metal cyclooctatetraene complex.

   b) Derive the isolobal organic hydrocarbon fragment for the following molecules.



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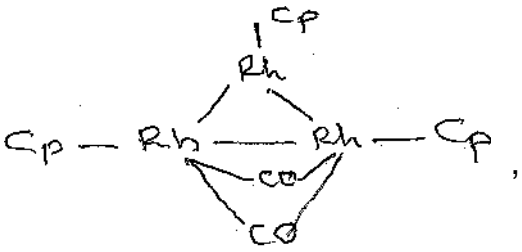

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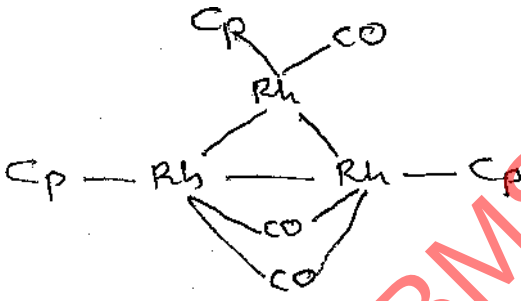


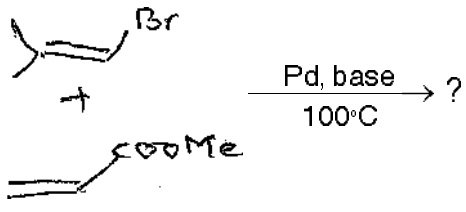
   c) What are Wade-Mingos-Lauher rules and how are they useful in predicting the structures of carbonyl clusters ? **(4+3+5=12)**

5. a) Discuss fluxionality in dienyl complexes.

   b) Discuss the activation of CF by transition metal organometallics.

   c) Complete the following reactions

i)



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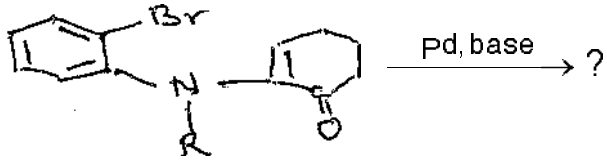
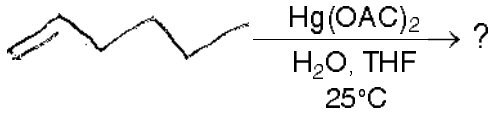


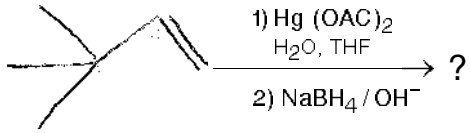
(4+4+4=12)

6. a) Explain the synthesis of aromatic compounds using chromium carbonyls citing specific examples.

   b) Write briefly on the utility of BuLi in the synthesis of organic compounds.

   c) Predict the products

i) 

ii) 

(4+4+4=12)

7. a) Write a note on photochemical cleavage of Metal-Hydrogen bonds in organotransition metal complexes.

   b) Compare the nucleophilic and electrophilic attack on coordinated ligands with that of uncoordinated ligands.

   c) What are insertion and de-insertion reactions ? Give any two examples each.

(4+4+4=12)