Register Number:
Date:

St. Joseph's College (Autonomous), Bangalore-27
M.Sc. Chemistry - III Semester
End Semester Examination: February 2022
CH 9218 – Organometallic Chemistry and Inorganic Reaction Mechanisms

Time- 2.5 hours Max Marks-70

This paper contains ***three*** printed pages and ***three*** parts

PART – A

Answer any SIX of the following: (6 X 2 = 12 Marks)

1. Define ring slippage in indenyl complexes of transition metals. Give an example.
2. Write the structures of (a) $W(CH_3)_6$ and (b) $[Re(CH_3)_8]^{2-}$.
3. Define I_a mechanism? Give an example.
4. Write the Marcus equation for a cross reaction and explain the terms therein.
5. a) CH_3Li exists as a ……. in solid state. (Hint: monomer/dimer/trimer/tetramer).
   b) Give the systematic nomenclature of H_5C_6-Hg-C_6H_5.
6. What is 18-electron rule? What is the significance of this rule?
7. Name two methods of synthesis of organometallic compounds.
8. What is asymmetric hydrogenation? Give the molecular structure of an organometallic catalyst used for asymmetric hydrogenation.

PART - B

Answer any FOUR of the following: (4 X 12 = 48 Marks)

9.(a) Give the classification of transition metal carbynes. Explain the bonding in each class.

(b) Define hapticity of a ligand. Give two chemical structures each for i) pentahapto and ii) hexahapto ligands. (6+6)

10. (a) With suitable examples, discuss the types of nucleophilic substitution reactions in transition metal complexes .

(b) Explain the inner sphere mechanism of electron transfer in transition metal complexes using suitable examples. (6+6)

11. (a) What is cyclometallation? Explain the most common type of cyclometallation with an example.

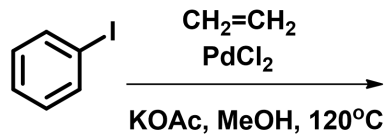
(b) What is kinetic lability? Explain the classification of metal ions based on their lability. (4+8)

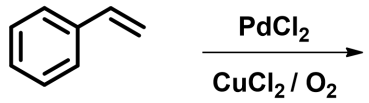
12. a) Outline the catalytic cycle of Wacker process.

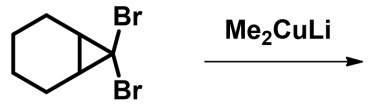
b) Despite being thermodynamically unstable, $Pb(CH_3)_4$ can be isolated. Comment on the thermodynamic and kinetic stabilities of $Pb(CH_3)_4$.

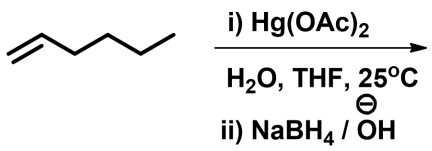
c) Arrive at the total valence electron count of $(PPh_3)_3RhCl$ using ionic or covalent model of electron counting. (Hint: Rh: $[Kr]4d^85s^1$). (6+4+2)

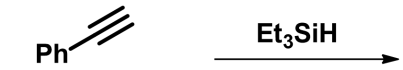
13. a) Predict the products of the following reactions:

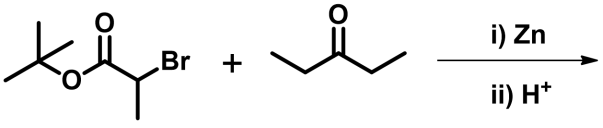
i) 

ii) 

iii) 

iv) 

v) 

vi) 

b) Discuss the structure of Grignard reagents by Schlenk equilibrium. Give any two evidences in favor of this interpretation. (6+6)

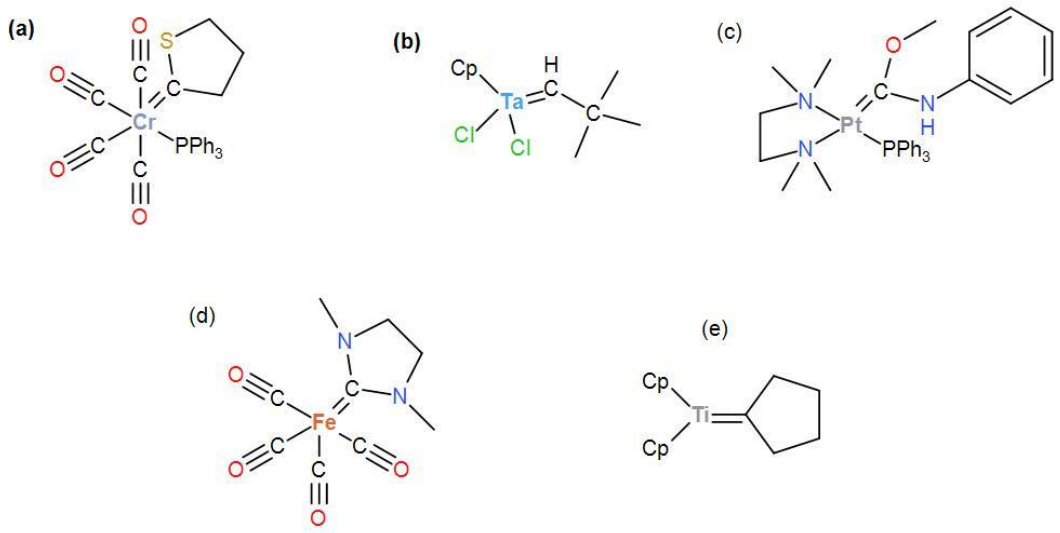
14. a) Outline the catalytic cycle of hydroformylation of an alkene.

b) Discuss the structure and bonding in $(CH_3)_3Al$. (6+6)

PART - C

Answer any TWO of the following: **(2 X 5 = 10 Marks)**

15. Identify the Fischer-carbene and Schrock-carbene complexes in the following compounds: (5)



16. a) Predict the products **A, B, C** and **D** in the following reactions:

$[PtCl_3NH_3]^-$ + NO_2^- ------> **A** + NO_2^- ------> **B**

$[PtCl(NH_3)_3]^+$ + NO_2^- ------> **C** + NO_2^- ------> **D**

(Hints: The trans effects are in the order NO_2^- > Cl^- > NH_3. Cl^- is the best leaving group among the three).

b) Give any two applications of organoselenium compounds in organic synthesis. (Chemical reactions required) (3+2)

17. A heap of plastic bags (LDPE) was degraded thermally at t ºC. The resulting product was subjected to a reaction with $TiCl_4$/ Et_3Al at a moderate temperature. The resulting product was now stronger and did not get affected at t ºC. Explain the chemical transformations involved with mechanism. (5)

----------End of questions----------

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