



St. Joseph's College (Autonomous), Bengaluru – 27

End Semester Examination, November, 2020

III Semester M.Sc. Chemistry

CH 9218 – Organometallic Chemistry and Inorganic Reaction Mechanisms

Time: 2½ hours

Max. Marks: 70

Note: This question paper has 3 pages and 3 sections

PART A

Answer any SIX of the following:

6 X 2 = 12

1. Name any two methods of synthesis of organometallic compounds with one example each.
2. i) What is the hybridization of Be in $(\text{BeMe}_2)_n$?
ii) The catalyst used in Monsanto acetic acid process is
3. What is 18-electron rule? What is the significance of this rule?
4. Me_3Al hydrolyses easily whereas Me_3B is stable to hydrolysis. Why?
5. Depict any one twist mechanism for racemization in octahedral tris chelate complexes.
6. Which of the following is more labile: $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ or $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$? Explain.
7. The complex $[\text{Cr}(\text{H}_2\text{O})_5\text{Et}]^{2+}$ does not undergo β - elimination easily. Why?
8. Depict the two modes of binding of butadiene to transition metals.

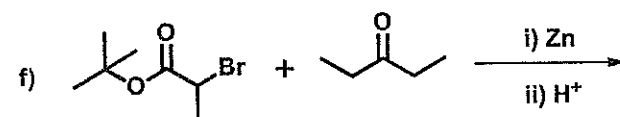
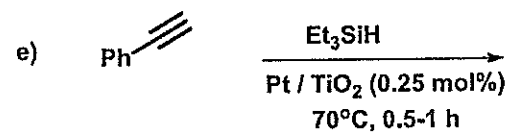
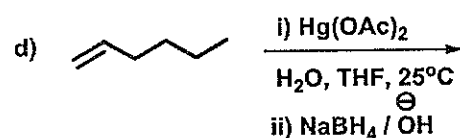
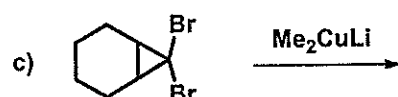
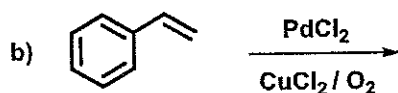
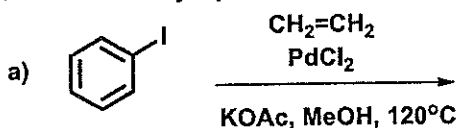
PART B

Answer any FOUR of the following:

4 X 12 = 48

9. a) Discuss the mechanism of base hydrolysis of $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$. Write and explain the rate law of this reaction.
b) Discuss three different mechanisms of oxidative addition. (6+6)
10. a) Discuss the important steps of outer sphere mechanism. Explain why the bond length adjustments of reactant complexes is an important prerequisite for outer sphere mechanism.
b) List out the important characteristics of Schrock carbenes. Based on the bonding present in them explain these characteristics. (6+6)

11. a) What are the criteria for two molecular fragments to be isolobal? With suitable MO diagrams illustrate how CH_3 is isolobal with $\text{Mn}(\text{CO})_5$.
 b) Discuss the differences between two extreme types of binding of an alkene to a transition metal. (6+6)
12. a) Discuss the structure of Grignard reagents by Schlenk equilibrium. Give any two evidences in favor of this interpretation.
 b) Outline the catalytic cycle of Wacker oxidation. (6+6)
13. a) Discuss the structure and bonding in CH_3Li solid.
 b) Outline the catalytic cycle of hydroformylation process. (6+6)
14. Predict the major products of the following reactions: (12)

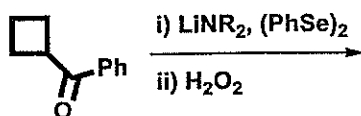


PART C

Answer any TWO of the following:

2 X 5 = 10

15. a) Predict the product:



b) Cobaltocene has a stable cation. Explain based on its bonding orbital occupation pattern in the MO diagram. (2+3)

16. Arrive at the most plausible structure of $(\mu\text{-CO})_2\text{-}[\eta^5\text{CpRh}]_3(\text{CO})$, provided it follows the 18-electron rule. (5)

17. When two isomers of $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ react with thiourea, (tu) one product is $[\text{Pt}(\text{tu})_4]^{2+}$ and the other one is $[\text{Pt}(\text{NH}_3)_2(\text{tu})_2]^{2+}$. Identify the initial isomers and explain the results. (5)

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

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