Registration Number:

Date & session:

ST. JOSEPH'S UNIVERSITY, BENGALURU -27
M.Sc. CHEMISTRY – III SEMESTER
SEMESTER EXAMINATION: OCTOBER 2023
(Examination conducted in November/December 2023)
CH 9223: ORGANOMETALLIC CHEMISTRY AND INORGANIC REACTION MECHANISMS
(For current batch students only)

Time: 2 Hours **Max Marks: 50**

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

PART-A

Answer any **EIGHT** of the following questions. **(8 x 2 = 16)**

1. Give the systematic nomenclature of
   (a) $H_3C\text{-}Zn\text{-}C_2H_5$
   (b) $(C_2H_5)_3As$
2. Write the structures of
   (a) $[AlFMe_2]_4$
   (b) $[HAlMe_2]_3$
3. Depict the two important types of binding of an allyl group to transition metals.
4. Write the structures of
   (a) $Ti(CH_3)_4$
   (b) $Ta(CH_3)_5$
5. What is Heck reaction? Give an example.
6. Mention the catalyst used in the following processes
   (a) Wacker process
   (b) Zeigler-Natta polymerization
7. Write the Marcus equation for a cross reaction and explain the terms therein.
8. What is migratory insertion? Give an example.
9. Discuss any two applications of organolithium compounds in organic synthesis.
10. Give any two differences between kinetic lability and inertness of metal complexes.

PART-B

Answer any **TWO** of the following questions. **(2 x 12 = 24)**

11. (a) Give the classification of transition metal carbenes. Draw the bonding in each class.
    (b) Discuss the ring slippage reactions with an example.
    (c) Arrive at the total valence electron count of $Co_2(CO)_8$ using ionic and covalent models of electron counting. (Hint: Co: $[Ar]3d^74s^2$). (4+4+4)

12. (a) Outline the catalytic cycle of Monsanto acetic acid process.
    (b) Give any two applications of the following organometallic reagents in organic synthesis (chemical reactions needed):
    (i) Organoselenium compounds
    (ii) Trialkylsilyl derivatives
    (iii) Organomercury compounds (6+6)

13. (a) What are outer sphere electron transfer reactions? With the help of an example, outline the steps involved in the outer sphere mechanism.
    (b) Discuss the types of nucleophilic substitution reactions with an example each.
    (c) Explain template reactions with an example. (6+3+3)

PART-C

Answer any **TWO** of the following questions. **(2 x 5 = 10)**

14. Predict the structures of the products **A, B, C, D** and **E** in the following reactions:

$$[PtCl_3(NH_3)]^- + NO_2^- \rightarrow \mathbf{A} + NO_2^- \rightarrow \mathbf{B}$$

$$[PtCl(NH_3)_3]^+ + NO_2^- \rightarrow \mathbf{C} + NO_2^- \rightarrow \mathbf{D}$$

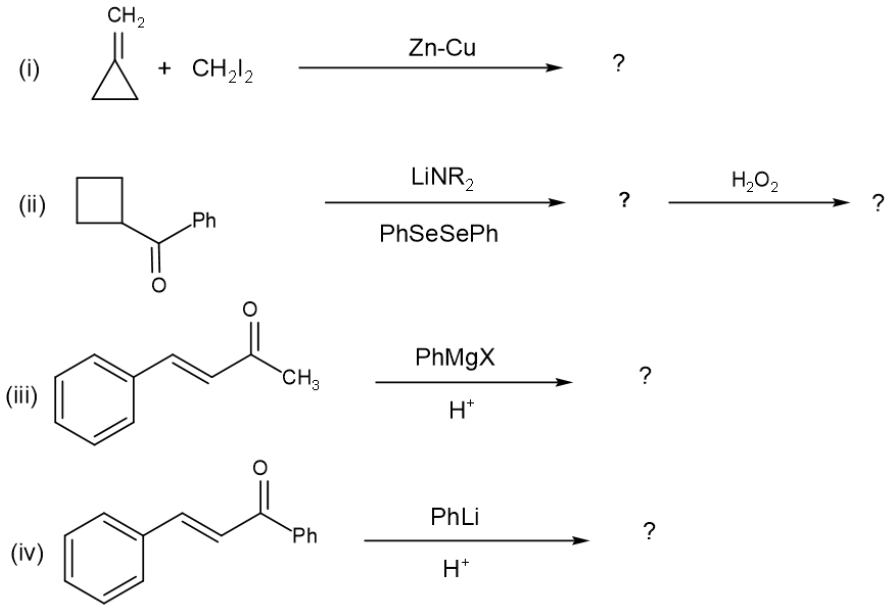
$$[PtCl_3(CO)]^- + NH_3 \rightarrow \mathbf{E}$$

15. (a) Identify the polymeric solid in the given molecules. Write its IUPAC nomenclature.

$Be(CH_3)_2$ or $Be(C(CH_3)_3)_2$

    (b) A main group organometallic compound, **XY** adopts a distorted cubane-type cluster both in solution and in solid state, with **X** and **Y** atoms at alternate corners. **Y** is bonded to three hydrogen atoms and three **X** atoms. Predict **X** and **Y** and draw the tetrameric structure of the compound. (2+3)

16. Predict the major product/s of the following reactions.



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