

G-3/313/21

Roll No.....

M.Sc. III Semester Examination, April-2021**CHEMISTRY****Paper I**

(Organo-transition metal Chemistry)

Time : 3 Hours]

[Maximum Marks : 80

Note : All questions are compulsory. Question Paper comprises of 3 sections. **Section A** is objective type/Multiple Choice questions with no internal choice. **Section B** is short answer type with internal choice. **Section C** is long answer type with internal choice.

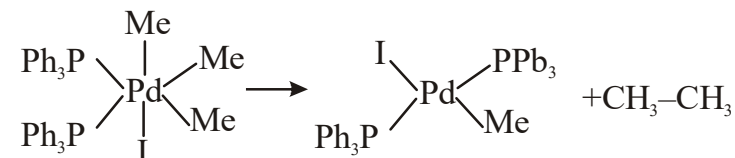
SECTION 'A'**1×8=8**

(Objective Type Questions)

Give the correct answer :

- No. of electron present in singlet carbene is.....and triplet carbene is.....with hybridisation.
- Complete the reaction :
 $\text{CH}_3\text{I} + \text{CuI} \rightarrow \dots\dots\dots \& \dots\dots\dots$
- Give one example each of 3 electron donor and 4 electron donor ligand.

- Name of the reaction :



- Structure of Wilkinson catalyst.
- No. of HNMR signal in $\eta^3-\text{C}_3\text{H}_5$ ligand.
- No of electron present in both Cr atom in $[(\text{Co})_5 \text{Cr}-\text{H} \rightarrow \text{Cr}(\text{CO})_5]$ organometallic compound.
- Transition metal linked with carbon by double bond is called.....

SECTION 'B'**4×6=24**

(Short Answer Type Questions)

Note : Answer the following questions in 250 words.

- Why singlet dichloro carbene is more stable than triplet dichloro carbene ?

Or

Give reason why some transition metal alkyls cannot undergo β -elimination reaction.

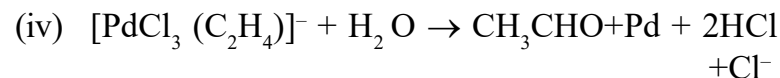
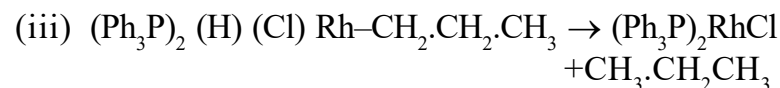
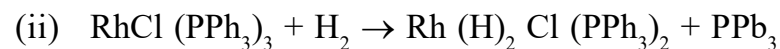
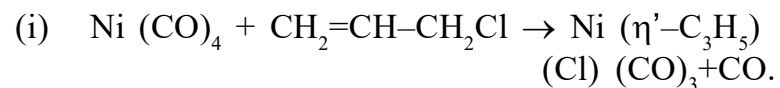
- 1,3 butadiene behaves as η^4 and 4 electron donor ligand. Justify the statement.

[3]

Or

Which will undergo electrophillic substitution reaction more easily $[\text{Cr} (\eta^6 - \text{C}_6\text{H}_6\text{I}_2)]$ or $[\text{Cr} (\eta^6 - \text{C}_6\text{H}_6) (\text{CO})_3]$ and why ?

3. Categorize the following reactions as formal oxidative – addition and/or reductive elimination reaction :



Or

Write a mechanism for the catalytic hydroformylation of $\text{CH}_3\text{CH}=\text{CH}_2$.

4. What is stereochemical non-rigidity ? How does non rigid behaviour of molecule can be detected by NMR spectroscopy ?

Or

- (a) Explain pyramidal inversion.

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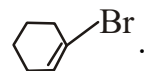
[4]

- (b) Discuss the reason for the catalytic efficiency of transition metal.

SECTION 'C' **12×4=48**

(Long Answer Type Questions)

Note : Answer the following questions in 500 words.

1. (a) What are different methods of preparations of transition metal allays ? Give name with one example of each reaction.
- (b) Complete the following reaction :
- (i) Organocuprate with aldehydes,
- (ii) Lithium organocuprate with R-X.
- (iii) Lithium organocuprate with .

Or

What are various types of carbyne ligands ? Describe structure and bonding pattern of carbyne complex.

2. Starting from ferrocene, how will you prepare its :
- (a) (i) Monocarboxylic derivative.
- (ii) Nitroderivative,
- (iii) Diacetyl derivative.
- (b) Free cyclobutadiene is antiaromatic, while cyclobutadiene coordinated to metal atom is aromatic. Explain clearly with suitable example.

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[5]

Or

- (a) Bonding between Pt^{++} ion and C_2H_4 molecule in the anion of zeise's salt.
- (b) Comment on the statement : "The allyl group is a ligand of versatile character".
3. Propose a mechanism for the polymerisation of propene to polypropene by a Zeigler-Natta catalyst.

Or

- (a) Write the mechanism of aerial oxidation of propene in the presence of PdCl_2 and CuCl_2 .
- (b) Why alkanes are chemically very less reactive ? What is C-H activation, Give some method for C-H activation.
4. (a) Cyclopentadienyl ligand is monohapto (η^1) trihapto (η^3) and penta hapto (η^5) ligand. Justify the statement.
- (b) Discuss the NMR spectrum of the following fluxional molecule :
- (i) $\text{Fe}(\text{CO})_5$
- (ii) η_3 - allyl complex.

Or

- (a) Distinguish between dihydrogen and dihydride complexes.

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- (b) Which one of $\text{HCO}(\text{CO})_4$ and $\text{HCO}(\text{CO})_3(\text{PPh}_3)$ is more acidic and why ?

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