Chemistry (P.G.)

[CBCS]

M.Sc. Third Semester End Examination-2024

(Regular & Supplementary Paper)

PAPER-CEM-302

[Inorganic Special]

Full Marks: 40 ***Time: 02 Hrs.***

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

Group A

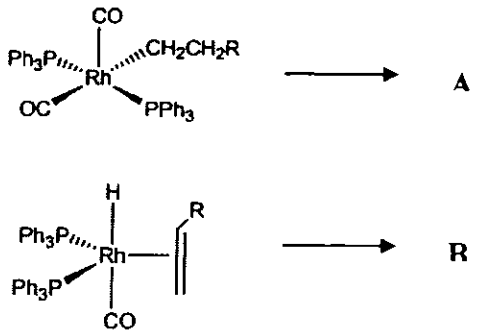
Answer any four questions of the following: **4x2= 8**

(i) Differentiate between heterogeneous and homogeneous catalysts.

(ii) What is meant by Turnover number (TON) and turnover frequency (TOF).

(iii) Explain water gas shift reaction and mention its application.

(iv) Identify '**A**' & '**B**'.



(v) What is exclusion principle?

(vi)Reduce the representation into irreducible representation.

C2v	E	C2z	σxz	σyz
Reducible Representation(Γ_{red})	12	-2	2	4

Group B

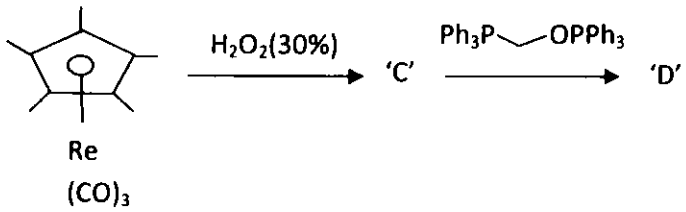
Answer any four questions of the following: 4x8= 32

2. (i) Discuss the MO diagram of ferrocene .

(ii) Write two important synthesis of cyclopentadiene metal carbonyl complexes. (4+4)

3. (i) Discuss the π interactions of bis arene metal complexes.

(ii) (a)



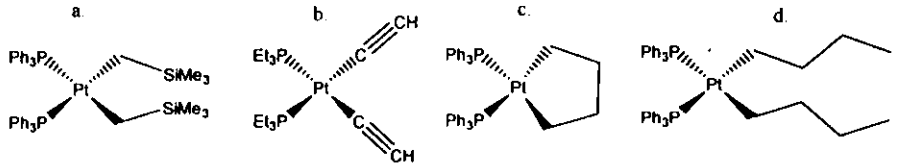
(b) $[C_5H_5Fe(CO)_2]_2$ —Na / Hg→ 'E' —CH_3I→ 'F' + NaI

Identify C, D, E and F

(iii) Which catalysts are used for the hydrogenation of alkenes? (3+4+1)

4. (i) Terminal alkenes are hydrogenated more rapidly than terminal alkynes – explain.

(ii) Write down the general mechanism involved in the β-hydride elimination reaction. Write the important characteristics of this reaction.



(iii) Which of the above mentioned most stable platinum complex can undergo β – hydride elementation reaction and why? (2+3+3)

5. (i) For $[CoCl_4]^{2-}$, pure d-d transition is allowed or not? Explain.

(ii) In $[CoCl_4]^{2-}$ ion the electronic transition form $A_2 \rightarrow T_1$ is around 10 times more intense than $A_2 \rightarrow T_2$ transition. – Explain. (4+4)

6. (i) Construct the π-MO diagram of NO_2^- ion on the basis of group theory.

   (ii) Cyclobutadiene is unstable but $(C_4H_4)Fe(CO)_3$ is stable- why? (4+4)

7. (i) For water molecule, verify whether the electronic transition from GS to ES is possible or not?

   (ii) Discuss the mechanism of Monsanto process. Which technique can be used to confirm the product formation and how? (5+3)

   Point Group of water:

C2v	E	C2z	σxz	σyz
A1	1	1	1	1
A2	1	1	-1	-1
B1	1	-1	1	-1
B2	1	-1	-1	1
