2023

Time - 3 hours

Full Marks - 60

*Answer **all groups** as per instructions.*
Figures in the right hand margin indicate marks.
Candidates are required to answer
in their own words as far as practicable.

GROUP – A

1. Answer all questions and fill in blanks as required. [1 × 8

(a) In the carbonyl compound $Cr(CO)_6$ the number of electrons present around Cr to give stability to the compound is _____.

(b) $Fe(CO)_5$ is magnetically _____ by the nature.

(c) The group reagent of the third group cations of qualitative analysis to precipitate is _____.

(d) _____ is a sandwich compound.

(e) Greater the value of equilibrium constant _____ will be the Metal-ligand bond.

(f) The co-ordination number of carbon in Methyl Lithium is _____.

(g) The ionisation of H_2S in second group of qualitative analysis of cations suppressed due to _____.

(h) $Ni(CO)_4$ has _____ structure.

GROUP – B

2. Answer any eight of the following questions within two to three sentences each. [1½ × 8

(a) What is Thumb's rule ?

(b) What is trans effect ?

(c) Complete the reaction, $2Mn(CO)_5 \xrightarrow[\text{light}]{UV}$ _____ ?

(d) What do you mean by water gas ?

(e) Write the structure of Grignard's reagent.

(f) What is Wilkinson's catalyst ?

(g) Why substitution rate of Mn^{2+} is greater than Fe^{2+} ?

(h) How carbonyl groups are linked in the polynuclear $Fe_3(CO)_{12}$ compounds ? Also show the structural representation.

(i) How the nucleophilic substitution reaction proceed in square planar complexes ?

(j) What do you mean by aquation in octahedral complexes ?

(k) Write the decreasing order of trans effect of the ligands Cl^-, NH_3 and NO_2^-.

GROUP – C

3. Answer any eight of the following questions within 75 words each. [2 × 8

(a) Differentiate between Inert and Labile complexes.

(b) What is Ziegler Natta Catalyst ? Write its application.

(c) How can you prepare Grignard's reagent in laboratory ?

(d) What is Fischer-Tropsch process ?

(e) Why metal carbonyls are called π-acid complexes ?

(f) Describe the structure of Ferrocene ?

(g) Explain synergic effect ?

(h) Describe the π-acceptor behaviour of CO.

(i) What is 18-electron rule ? Give one example.

(j) What is hapticity ?

GROUP – D

4. Answer any four of the following questions within 500 words each.

(a) State and explain EAN rule and 18-electron rule with suitable example. Calculate the EAN of $Fe(\pi - C_5H_5)(\sigma-C_5H_5)(CO)_2$. [6

(b) How is Ferrocene prepared in the laboratory ? Also describe Mannich condensation. [6

(c) Discuss the multicentre bonding in Methyl lithium (tetramer) and trialkyl aluminium (dimer). [6

(d) What is Wacker process ? Write the mechanism for the reaction. [6

(e) What are organometallic compounds and mixed organometallic compounds ? Distinguish and give one example of each. [6

(f) Write the differences between Associative and Dissociative mechanisms. [6

(g) Explain Kinetics of Octahedral substitution reaction. [6