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B.Sc/6th Sem (H)/CHEM/23(CBCS)

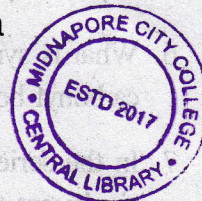
2023

6th Semester Examination  
CHEMISTRY (Honours)

Paper : C 13-T

[Inorganic Chemistry-V]

[CBCS]



Full Marks : 40

Time : Two Hours

*The figures in the margin indicate full marks.*

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

**Group - A**

Answer any **five** questions :  $2 \times 5 = 10$

1. Using 18-electron rule, find the value of 'n' in  $(\eta^5 - C_p)Co(CO)_n$ .
2. What is the formal oxidation state of iron in  $Na_2[Fe(CN)_5NO]$ ?
3. Show that substitution in square planar complexes is an associative process.
4. Acetylation of ferrocene produces only one major product. Explain why.

P.T.O.



5. Between  $Rh(PEt_3)Cl$  and  $Rh(PPh_3)_3Cl$  which one is suitable for Wilkinson's type catalyst for hydrogenation of olefins? Explain.
6. What is synergic effect and how does it relate to metal-carbonyl bonding?
7. In the series  $Ni(II)$ ,  $Pd(II)$  and  $Pt(II)$ , only  $Pt(II)$  shows significant trans effect. Justify.
8. What is Fischer-Tropsch process?

**Group - B**

Answer any *four* questions :  $5 \times 4 = 20$

9. What is *trans* effect? How would you proceed to prepare *cis*- and *trans*- $[Pt(NH_3)(NO_2)Cl_2]$  from  $[PtCl_4]^{2-}$  in two steps using  $NH_3$  and  $NO_2^-$ ?  $1+2+2$
10. (a) Discuss the structure and bonding of the Zeise's salt.
- (b) On the basis of 18e rule, find 'z' and 'M' in the following :
- (i)  $[Ni(NO)_3(SiMe_3)]^z$
- (ii)  $[(\eta^3-C_3H_3)(\eta^5-C_5H_5)M(CH_3)(NO)]$
- NO has linear coordination in both cases.  $3+2$
11. (a) Show the catalytic cycle for the polymerisation of propene using an organometallic catalyst.

- (b) Why does  $Pb^{2+}$  appear both in Gr. I and Gr. IIA during qualitative analysis of inorganic salts?  $3+2$
12. (a) Draw *Bailar* twist and *Ray-Dutt* twist for the interconversion of enantiomers  $\Lambda$  and  $\Delta$  of  $M(L-L)_3$ .
- (b) What is Bohr effect? Explain.  $2+2+1$
13. (a) Draw the active site structure of Myoglobin and Hemerythrin and comment on the oxygen binding modes for each.

- (b) In the IR spectrum of free  $MeCH=CH_2$ ,  $\nu_{C=C}$  comes at  $1652 \text{ cm}^{-1}$ , but in the complex  $K[PtCl_3(\eta^2-MeCH=CH_2)]$ , the corresponding absorption is at  $1504 \text{ cm}^{-1}$ . Comment on the observation.  $3+2$

14. (a) Discuss, with examples, the differences between inner- and outer-sphere mechanisms, and state what is meant by a self-exchange reaction.
- (b) Write the advantages of using Rh-catalyst in place of Co-catalyst in hydroformylation reaction.  $3+2$

**Group - C**

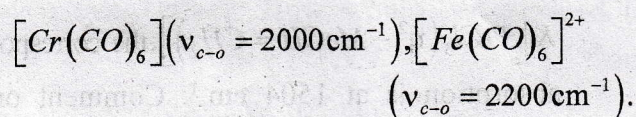
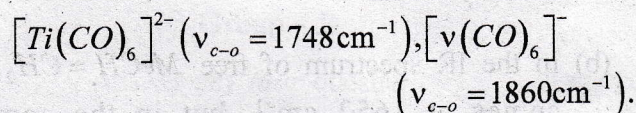
Answer any *one* question :  $10 \times 1 = 10$

15. (a) Explain the metal ion transport across bio-membranes with reference to the function of  $Na^+$  /  $K^+$  pump.

P.T.O.



- (b) Show by examples oxidative addition and insertion reactions in organometallic complexes.
- (c) Write and explain the light and dark phase reactions related to photosynthesis.
- (d) Draw the structure of  $4Fe-4s$  ferredoxin and mention its biological function. 3+2+4+1
16. (a) The  $\nu_{C-O}$  of isoelectronic hexacarbonyls is given below. Explain their trends. ( $\nu_{C-O} = 2143 \text{ cm}^{-1}$  in free CO).



- (b) Draw the microenvironment of the active site of Hemocyanin.
- (c) Illustrate by an example using its qualitative molecular orbital diagram the reason for the stability of  $18e^-$  organometallic complexes.
- (d) How is ferrocene converted to  $(\eta^5-C_5H_5)Fe(\eta^5-C_5H_4NH_2)$ ?
- (e) Applying 18-electron rule deduce the structure of  $Fe_3(CO)_{12}$ . Show the different modes of bonding of CO in this structure. 3+2+2+1+2