

B.Sc./6th Sem/CEM/26(NEP)

2026

6th Semester Examination (CCFUP : NEP)

CHEMISTRY

Paper : MJ 11-T

(Single Core Major)

(Inorganic Chemistry-IV)

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. What are metalloproteins and metalloenzymes?
2. Name two clinically approved drugs of platinum (II) for the treatment of cancer.
3. Why does Wilkinson's catalyst act in a selective manner?
4. How will you chemically differentiate between *cis* and *trans* isomers of $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$.
5. Determine ground state term symbols for Sm^{3+} and Eu^{3+} .

P.T.O.

6. What is the major function of Ziegler-Natta catalyst? Write the active species in Ziegler-Natta catalyst.
7. What is hapticity? Give an example of mono-hapto cyclopentadienyl complex.
8. What is chelation therapy? How As-toxicity can be treated using chelation therapy?

Group - B

Answer any *four* questions : 5×4=20

9. (a) Draw the active site structure of Myoglobin and Hemerythrin and comment on the oxygen binding modes for each.
- (b) Compare the Coordination sphere of cytochrome *a* with that of cytochrome *c*. 3+2
10. (a) Explain the trends of C – O stretching frequencies of the given metal carbonyls :

$$\text{V(CO)}_6^-, [\text{Cr(CO)}_6], \text{Mn(CO)}_6^+$$

$$\nu_{\text{CO}}(\text{cm}^{-1}) : \quad 1860, \quad 2000, \quad 2090$$
- (b) What will be the change in C – C bond distance when hydrogen atoms in ethylene are substituted by fluorine atoms in Zeise's salt? — Justify your answer. 3+2
11. (a) What is Wilkinson's catalyst? Mention the example of oxidative addition and reductive elimination with reference to the hydrogenation of alkene with Wilkinson's catalyst.

- (b) Explain, why ferrocene is unreactive toward iodine while cobaltocene rapidly decolorizes the colour of the iodine solution. 3+2
12. (a) Arrange the ligands H_2O , NH_3 , NO_2^- , and Cl^- in order of increasing *trans* effect and hence design two-step synthesis of the *cis*- and *trans*-isomers of $[\text{Pt}(\text{NH}_3)_2(\text{NO}_2)_2]$ starting from $\text{K}_2[\text{PtCl}_4]$.
- (b) Explain why lanthanide coordination compounds exhibit sharp electronic absorption bands in their spectra. 2+3
13. (a) What is lanthanide contraction? The third ionization energy for Eu and Yb are comparatively higher than other lanthanides. — Explain.
- (b) On the basis of 18e rule, find 'z' and 'M' in the following :
- (i) $[\text{Ni}(\text{NO})_3(\text{SiMe}_3)]^z$
- (ii) $\left[(\eta^3 - \text{C}_3\text{H}_3) (\eta^5 - \text{C}_5\text{H}_5) \text{M}(\text{CH}_3)(\text{NO}) \right]$
- (NO has linear coordination in both complexes) 3+2
14. (a) State the function of Nitrogenase enzyme and describe the active site structure of the enzyme.

P.T.O.

(4)

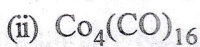
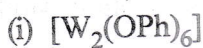
- (b) A 'stable complex' does not mean it is always inert
— Explain the statement with proper example.

3+2

Group - C

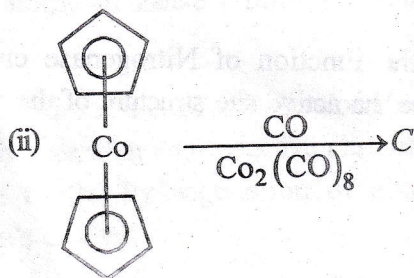
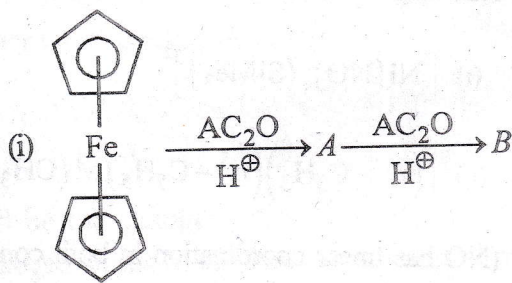
Answer any *one* question : $10 \times 1 = 10$

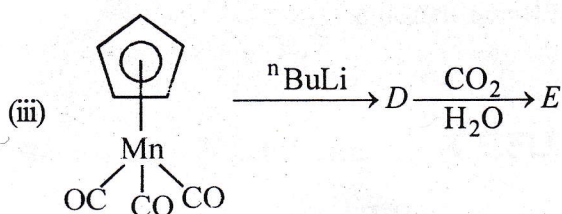
15. (a) Calculate the number of M – M bond and predict the structures of the following complexes :



- (b) Briefly describe the function of Carbonic Anhydrase.

- (c) Complete the following reactions :





- (d) How do you synthesize the following species from nickelocene?



2+2+3+3

16. (a) What are PS I and PS II? Explain their roles in the process of photosynthesis.
- (b) Explain the terms 'Cooperative effect' and 'Bohr effect' in connection with oxygen transport in human body.
- (c) Comment on the statement : 'Nb' and 'Ta' are difficult to separate from the mixture of their ores.
- (d) Using *trans* effect phenomenon prepare all possible stereoisomers of $\text{PtCl}(\text{NH}_3)(\text{Py})\text{Br}$ starting from PtCl_4^{2-} .
- (e) Give an example of reaction that follows inner sphere mechanism. 2+2+2+2+2