



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

**M.Sc. DEGREE EXAMINATION – CHEMISTRY**

THIRD SEMESTER – NOVEMBER 2017

**CH 3813 /CH3809- COORDINATION CHEMISTRY**

Date: 04-11-2017  
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

**Part-A**

*Answer ALL questions.*

**(10 × 2= 20)**

1. What is spectrochemical series?
2. Calculate CFSE for  $d^4$ , tetrahedral complex.
3. Differentiate Curie and Neel temperatures.
4. How are terminal and bridging carbonyl groups differentiated in metal complexes?
5. Mention any two types of substitution reactions of metal complexes with an example.
6. What is hydroformylation reaction? Cite an example of any one metal complex acting as a catalyst for this reaction.
7.  $MnO_4^-$  is dark pink in colour. Why?
8. What is template synthesis? Cite an example.
9. Mention the name of any one copper protein and its specific role.
10. Highlight the biological role of any two trace elements.

**Part-B**

*Answer any EIGHT questions.*

**(8 × 5= 40)**

11. How does crystal field theory explain the formation of low and high spin, octahedral complexes?
12. Explain why metal ion with  $d^8$  configuration prefers to form square planar complexes, whereas  $d^3$  configuration prefers to form octahedral complexes.
13. Predict whether the octahedral, low and high spin,  $d^4$  metal complexes possess only spin magnetic moment or spin and orbital magnetic moment.
14. Explain the variations in the stretching frequency of the isoelectronic species,  $[Cr(CO)_6]$ ,  $[V(CO)_6]^-$  and  $[Mn(CO)_6]^+$ .
15. How is trans effect useful in the stereospecific synthesis of square planar and octahedral complexes?
16. Derive the ground terms for  $d^3$  and  $d^5$  configurations.
17. Discuss the bonding in ferrocene using molecular orbital theory.
18. Explain the splitting diagram of d-orbitals to explain the type of Jahn-Teller distortion in high spin and low spin octahedral complexes.
19. Write a brief note on the types of charge transfer transitions in metal complexes with suitable examples.

20. What are photoaquation and photoisomerisation reactions? Give examples.
21. Explain the role of metal complexes in photosystem I and II.
22. Discuss the essential structure of haemoglobin and myoglobin in oxygen transport mechanism.

### Part-C

Answer any *FOUR* questions.

(4 × 10= 40)

23. Compute OSSE to predict whether the following oxides are spinel or inverse spinel.  
a)  $Mn_3O_4$       b)  $CuFe_2O_4$
24. How does MOT explain the formation of low and high spin, octahedral metal complexes with  $\pi$ -bond forming ligands?
25. Construct Orgel diagram for  $[VCl_4]^-$  complex and predict the number of expected peaks in the electronic spectrum.
26. a) Discuss in detail the mechanisms of outer sphere electron transfer in metal complexes.  
b) Why is the electron transfer in the system  $[Co(NH_3)_6]^{2+} - [Co(NH_3)_6]^{3+}$  slower than that in  $[Fe(CN)_6]^{4-} - [Fe(CN)_6]^{3-}$ ?
27. Explain with mechanism the use of coordination compounds as industrial catalysts in the following reactions. a) Hydroformylation b) hydrogenation of alkenes
28. Write a brief note on the specific functions of the enzymes, carboxy peptidase and carbonic anhydrase.

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