



# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

## B.Sc. DEGREE EXAMINATION – CHEMISTRY

FIFTH SEMESTER – APRIL 2019

### 16UCH5MC01– COORDINATION CHEMISTRY

Date: 15-04-2019  
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

#### PART A

ANSWER ALL QUESTIONS

(10x 2 = 20 Marks)

1. Classify the following as mono or bi or tri or tetra or polydentate ligands. i) aqua ii) oxalato iii) glycinato iv) en.
2. Mention the geometry and hybridisation of  $[\text{Pt}(\text{Cl})_4]^{2-}$  complex based on VB theory.
3. Explain the nature of transition in  $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$  and  $\text{KMnO}_4$ .
4. Calculate the CFSE of  $\text{Fe}^{2+}$  ion in strong field.
5. What is meant by atom transfer reaction and provide a suitable example.
6. Predict the product  $[\text{PtCl}_4]^{2-} + \text{NH}_3 \longrightarrow ? + \text{NH}_3? \longrightarrow \_$
7. Draw the possible structure of  $\text{Co}_2(\text{CO})_8$ .
8. Show that  $\text{Mn}_2(\text{CO})_{10}$  is very stable.
9. Mention the oxidation state of iron in hemoglobin and deoxyhemoglobin.
10. List out any two important enzymes containing Zinc.

#### PART B

ANSWER ANY EIGHT QUESTIONS

(8 x 5 = 40 Marks)

11. Explain the concept of optical isomerism in  $\text{Mabcd}$  and  $\text{Ma}_3\text{b}_3$  complexes, where M is the central metal atom and a, b, c and d are monodentate ligands.
12. Using VBT, arrive at the geometry, hybridisation and magnetic nature of  $\text{CoF}_6^{3-}$ .
13. Explain the concept of crystal field effects for low spin octahedral complexes of  $d^n$  ions.
14. a) Write the IUPAC name of  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$  and  $\text{K}_4[\text{Fe}(\text{CN})_6]$ .  
b) Mention the coordination number and oxidation state of the central metal atom in  $[\text{Ni}(\text{CO})_4]$  and  $[\text{Ni}(\text{Cl})_4]^{2-}$
15. What is Jahn-Teller distortion? Sketch the d orbital splitting when  $d_z$  orbitals are along the path of the incoming ligand.
16. Explain the concept of associative and dissociative mechanism of substitution of  $\text{Co}(\text{III})$ , octahedral complex.
17. Explain the concept of template effect in synthesis of macrocyclic ligands.
18. What is Kurnakov test? Mention its application for any  $\text{Pt}(\text{II})$  complex of square planar geometry.

19. What is meant by homogeneous catalysis? What are the advantages of Wilkinson catalyst over other homogeneous catalyst?
20. Explain the bonding in ferrocene and indicate the metal orbitals and ligands orbitals involved in bonding with a neat sketch.
21. Discuss the structure of myoglobin and its significance.
22. Mention the criteria of metals used for diagnosis and chemotherapy.

### PART C

**ANSWER ANY FOUR QUESTIONS**

**(4 x 10 = 40 Marks)**

23. a) Explain the structural isomerism and coordination position isomerism in coordination complexes with suitable examples. b) Give the name and formula of the following ligands i) py ii) acac iii) phen iv) trien v) en vi) EDTA. **(7+3)**
24. i) Calculate the EAN ii) mention the coordination number iii) charge on the central metal atom iv) IUPAC name of the following complex  $[\text{Co}(\text{NH}_3)_6]^{3+}$ . **(5)**  
 b) Explain the following terms. i) Nephelauxetic effect. ii) Racah parameter. **(5)**
25. a) What are the factors influencing the rate of substitution in square planar complexes  
 b) Distinguish Trans effect from cis effect. **(6 +4)**
26. Explain the concept of electron transfer in octahedral complexes by inner sphere and outer sphere mechanism using suitable example.
27. a) Draw the structures of the following metal carbonyls  $\text{Fe}_2(\text{CO})_9$ ,  $\text{Fe}_3(\text{CO})_{12}$ , and  $\text{Mn}_2(\text{CO})_{10}$ .  
 b) How will you prepare stereo regulated polypropylene by Zeigler-Natta catalyst? **(5+5)**
28. a) Explain the importance of MRI in biological applications for mankind. **(6)**  
 b) Mention the active site in carboxy peptidase? Mention the role and function of the carboxypeptidase. **(4)**

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