



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

FOURTH SEMESTER – APRIL 2016

CH 4956 - ADVANCED COORDINATION CHEMISTRY

Date: 21-04-2016
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

Part-A

Answer ALL questions.

(10 x 2= 20)

1. Why does the g-value of most of the compound remain a constant and almost same as that for a free electron?
2. What are the factors causing tetragonal distortion in transition metal complexes?
3. Which of the following radicals are NMR active? Cite reasons: ^{12}C , ^{13}C , ^{14}C , ^{14}N , ^{16}O , ^{19}F , ^{27}Al .
4. What are optically transparent electrodes? Mention their applications.
5. What is the use of metal complexes in solar cell? Cite an example.
6. What is a molecular device? Cite an example.
7. Mention the role of bridging ligand in an electron transfer reaction with an example.
8. What is the structure of ferredoxin? Mention any two important functions.
9. Give the structure of porphyrin and its importance in photosynthesis.
10. What are pendant arm macrocyclic ligands? Give an example.

Part-B

Answer any EIGHT questions.

(8 x 5= 40)

11. Draw and explain the esr spectrum of $[\text{Cu}(\text{NH}_3)_4]^{2+}$, $I_{\text{Cu}} = 3/2$, $I_{\text{N}} = 1$. Assume that the spin of hydrogen atoms do not couple with spin of electron.
12. Account for the shoulder observed in the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$.
13. Write a brief note on scalar and psuedocontact effect in the NMR spectrum of transition metal complexes.
14. ^{19}F -NMR spectrum of a compound with formula $[\text{MF}_6]$ showed only one singlet. Comment on its structure and spin of the central metal atom/ion.
15. How does polarographic analysis help in understanding the chemistry of complexes?
16. What are dendrimers? Explain the types of metallodendrimers.
17. What is template synthesis? Mention its role on the synthesis of Schiff base macrocyclic ligands.
18. How is $^{99\text{m}}\text{Tc}$ generated? Mention any four applications of metal complexes in radiotherapy.

19. Discuss the host-guest chemical relationship in forming supramolecular assemblies.
20. Describe the antenna effect and tunneling of electronic energy in supramolecular assemblies.
21. Write a note on non-linear optical materials.
22. What are photosensitizers? Discuss the role of metal complexes as photosensitizers.

Part-C

Answer any FOUR questions.

(4 x 10= 40)

23. Discuss the principles involved in differentiating the following compounds by Massbauer spectroscopy: i) $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ ii) FeCl_3 iii) $\text{K}_4[\text{Fe}(\text{CN})_6]$ iv) $\text{K}_3[\text{Fe}(\text{CN})_6]$.
24. Compute the ground state term symbol for a d^7 metal ion and draw qualitative Orgel diagram. Predict its electronic spectrum and also explain the changes expected in the spectrum due to tetragonal distortion.
25. Explain the divergent and convergent methods in the synthesis of dendrimers with an example.
26. Discuss the role of Ru(II) and Os(II) polypyridyl complexes employed in light harvesting devices and photosplitting of water molecule.
27. Describe the principles involved in using metal complexes as contrast enhancing agents in MRI.
- 28 a. Discuss anyone method of appending pendant arm functionalities onto macrocyclic framework.
b. Write a brief note on the different kind of supramolecular assemblies constructed by coordinate and hydrogen bonding.

(5+5)
