



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

THIRD SEMESTER – APRIL 2018

CH3813/CH 3809- COORDINATION CHEMISTRY

Date: 19-04-2018
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

Part-A

Answer ALL questions.

(10 × 2 = 20)

1. Differentiate tetragonal distortion and Jahn-Teller distortion.
2. What is spectrochemical series?
3. Predict whether the metal ion with d^4 , high spin octahedral complex possesses, spin only magnetic moment or both spin and orbital magnetic moment.
4. How are nitro and nitrito ligands differentiated by IR spectroscopy?
5. What is anation reaction? Give an example.
6. What is meant by fluxional isomerism? Explain with an example.
7. What is Fischer-Tropsch synthesis?
8. Why is $KMnO_4$ dark pink in colour?
9. Mention the specific functions of the enzyme, superoxide dismutase.
10. Highlight the significance of the structure of chlorophyll in photosynthesis.

Part-B

Answer any EIGHT questions.

(8 × 5 = 40)

11. State Jahn-Teller theorem and explain the types of Jahn-Teller distortion in octahedral, high spin, d^{1-10} metal complexes.
12. Compute OSSE to predict whether the following oxides are spinel or inverse spinel.
a) Mn_3O_4 b) $ZnFe_2O_4$
13. Explain the variations in the stretching frequency of the isoelectronic species, $[Cr(CO)_6]$, $[V(CO)_6]^-$ and $[Mn(CO)_6]^+$.
14. Derive the ground term of d^4 and d^7 configuration of metal ion.
15. Explain the mechanistic pathway of coordination compounds as industrial catalysts in
a) hydroformylation reaction b) alkene hydrogenation reactions.
16. How is absolute configuration of chiral complexes determined by ORD method?
17. Explain 'trans effect' in explaining the substitution reactions of square planar complexes.
18. Discuss the types of photosubstitution reaction with suitable example.

19. Discuss the 18-electron rule. Apply this rule to calculate effective atomic number of the metal in each of the following complexes.
(i) $[(C_2H_4) Fe (CO)_3]$ (ii) $(\eta^5-C_5H_5)_2 Fe$
20. Describe the associative mechanism of substitution reaction.
21. How does Bohr effect explain the factors affecting the oxygen binding capacity of haemoglobin?
22. Discuss the role of metal complexes in photo system I and II.

Part-C

Answer any FOUR questions.

(4 × 10= 40)

23. How does MOT explain the formation of low and high spin, octahedral metal complexes with σ and π -bond forming ligands?
24. Construct Orgel diagram for the electronic configuration of d^{1-10} metal complexes and predict the number of expected peaks in the electronic spectrum.
- 25a Discuss in detail the mechanisms of inner and 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 of $[Fe(CN)_6]^{4-}$ - $[Fe(CN)_6]^{3-}$?
- 26a. Discuss in detail the properties of ferrocene.
- b. Discuss the bonding in ferrocene on the basis of MO theory. (4+6)
- 27a Write a brief note on the types of charge transfer transition in metal complexes with suitable examples.
- b. Explain photoaquation and photoisomerisation reactions with examples.
28. Write a brief note on the specific functions of the enzymes, carboxypeptidase and carbonic anhydrase.

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