C 63028 (Pages : 2) Name..................................

Reg. No.............................

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2019

(CUCSS)

Chemistry

CH 2C 06—CO-ORDINATION CHEMISTRY

(2015 Admissions)

Time : Three Hours

Maximum : 36 Weightage

Section A

Answer **all** *questions.*
Each question carries 1 weightage.

1. K_3 value is found to be greater than K_2 value for Fe(II) complexes of 1, 10-phenanthroline. Why ?

2. A tris-diaminoethane complex will generally be more stable than the-corresponding monodendate ligand. Why ?

3. Nickel and Platinum are in the same family of Periodic Table but $[NiCl_4]^{2-}$ and $[PtCl_4]^{2-}$ differ considerably in their geOmetries. Why ?

4. Interionic repulsion is found to be weaker in complexes than in free ions. Why ?

5. Deduce the spectroscopic ground term ofpldifl and $Co^{3}+$.

6. State Curie law and Curie-Weiss law.

7. Arrange the following in the order of increasing CO stretch frequencies and explain your answer $[Mn(CO)_6]+$, $[Ti(CO)_6]^{2-}$, $[Cr(CO)_6]$, $[V(CO)_6]$.

8. Define Doppler broadening of Mossbauer spectroscopy.

9. Steric crowding favours dissociative mechanism of substitution in metal complexes. Justify the statement with suitable examples.

10. Write down the Fuoss-Eigen equation and explain the terms.

11. Complexes containing Ci^-, NCS N3 and CN^- ions as ligands favour inner sphere electron transfer reactions. Why ?

12. What is photorecimization ? illustrate,

(12 x 1 = 12 weightage)

Turn over

Section B

Answer any **eight** *questions.*
Each question carries **2** *weightage.*

13. Write down the stepwise and overall formation constants for the reaction
$Cu^{2+} + 4NH_3 \rightleftharpoons Cu(NH_3)4^+$. Also calculate P_4 value for the reaction if $\log k_1 = 4$, $\log k_2 = 3.2$, $\log k_3 = 2.7$ and $\log k_4 = 2$.

14. Describe the spectrophotometric method for determining Binary formation constant.

15. Name and draw the structures of the following complexes :
    (a) $[Ni(CO)_4]$; (b) $[Ni(CN)_4]^{2-}$; (c) $[CoCl_4]^{2-}$; (d) $[Ni(NH_3)_6]^{2+}$.

16. Explain how does a Pi donor ligand influences the magnitude of the splitting parameter in a pi bonded octahedral complex.

17. What do you mean by spin only magnetic moment ? Calculate the spin only magnetic moment for (a) $[Fe(CN)_6]^{4-}$; (b) $[Ru(NH_3)_6]^{3+}$; (c) $[Cr(NH_3)_6]^{2+}$.

18. Write down the favourable conditions for LMCt and MLCT.

19. Explain hyperfine structure of EPR spectrum taking Cu(II) complex as example.

20. Sketch the Mossbauer spectra for the complexes $K_4[Fe(CN)_6]^{1-}$ and $K_3[Fe(CN)_6]^{4-}$. Explain the features of the spectra.

21. What is trans effect ? How is 'cis' and trans $[Pt(NH_3)_4]^{2+}$ synthesized by the application of trans effect ?

22. Give a brief note on SN^1CB mechanism.

23. Distinguish between outer sphere and inner sphere reactions with examples.

24. Discuss the reducing and oxidizing character of $[Ru(bipy)_3]^{2+}$.

(8 x 2 = 16 weightage)

Section C

Answer any **two** *questions.*
Each question carries 4 *weightage.*

25. Discuss the merits of MOT over CFT and sketch the MO diagram for $[CoF_6]^{3-}$ and predict its magnetic behaviour.

26. What are Orgel diagrams ? Draw the Orgel diagrams for $[Cr(H_2O)_6]^{3+}$ and $[Co(H_9O)_6]^{2+}$ and explain how does their electronic spectra differ each other ?

27. With suitable examples, discuss the applications of **IR** spectroscopy in structural studies of metal complexes.

28. Give an account of photochemical reactions of metal complexes.

(2 x 4 = 8 weightage)