

17P216

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Name:.....

Reg. No.....

**SECOND SEMESTER MSc DEGREE EXAMINATION, MAY 2018**

(Regular/Supplementary/Improvement)

(CUCSS-PG)

**CC15P CH2 C06 - COORDINATION CHEMISTRY**

(Chemistry)

(2015 Admission onwards)

Time: 3 Hours

Maximum: 36 weightage

**Section A**

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

1. Differentiate macrocyclic ligands and ambidentate ligands. Give two examples for each type.
2. Give two examples for the stabilisation of unusual oxidation states.
3. What are Racah parameters? Mention their significance in the case of transition metal complexes.
4. What is spectrochemical series? Arrange the position of the ligands CO, OH<sup>-</sup>, H<sub>2</sub>O and F<sup>-</sup> in the increasing order of CFSC. Justify your answer.
5. The complex [Ni(H<sub>2</sub>O)<sub>6</sub>]<sup>2+</sup> exhibits electronic spectral bands at 8600cm<sup>-1</sup>, 13,500cm<sup>-1</sup> and 25,300<sup>-1</sup>. Assign the bands.
6. Explain Curie law and Curie-Weiss law.
7. Explain the changes that occur in the IR spectra of 'nitrate' group upon complexation to metal ions.
8. What are the requirements for a compound to be ESR active?
9. Calculate the spin only magnetic moment of potassium ferrocyanide and potassium ferricyanide.
10. Explain *cis effect* with a suitable example.
11. Differentiate prompt and delayed reactions. Give one example for each type.
12. Explain *photo isomerisation* with an example.

(12 x 1 = 12 Weightage)

**Section B**

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

13. Explain spectrophotometric method for the determination of binary formation constants of coordination compounds.
14. Compare the crystal field splitting patterns of d-orbitals in octahedral, tetrahedral and square planar fields of ligands.

15. Copper (II) generally forms square planar complexes. Explain on the basis of Jahn-Teller effect.
16. Explain the two selection rules for electronic spectra of complexes.
17. Explain *temperature independent para magnetism* (TIP).
18. Between Tetrahedral and Octahedral Co(II) Complexes, in which do you expect to have orbital contribution to magnetic moment? Explain.
19. Write a note on Mossbauer spectra of Iron complexes.
20. Give four differences between *Tanabe-Sugano* and *Orgel* diagrams.
21. Explain the following
  - a) Eigen - Wilkins mechanism
  - b) Fuoss - Eigen equations
22. Differentiate A, D and I mechanisms. Give examples for these mechanisms.
23. Explain the photochemistry of  $[\text{Ru}(\text{bipy})_3]^{2+}$ . Explain its reducing character and oxidizing character in the excited state.
24. Explain Adamson's rule for the prediction of substitution lability.

**(8 x 2 = 16 Weightage)**

### Section C

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

25. Construct MO diagrams of Octahedral complexes with and without pi bonding and explain the theory behind it.
26. a) How do magnetic susceptibility vary with temperature for different types of magnetic materials.  
b) Explain the Marcus theory of outer sphere electron transfer reactions.
27. a) Explain the NMR spectral studies of diamagnetic metal complexes from chemical shift and spin-spin coupling.  
b) Explain the antiferromagnetism in co-ordination compounds.
28. a) What is 'trans effect'. Explain the various theories proposed to explain it.  
b) Explain the principle of determination of magnetic susceptibility of a complex by Gouy method.

**(2 x 4 = 8 Weightage)**

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