

16P211

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Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, MAY-2017

(Regular/Supplementary/Improvement)

(CUCSS - PG)

CC 15P CH2 C06 – CO ORDINATION CHEMISTRY

(Chemistry)

(2015 Admission Onwards)

Time: Three Hours

Maximum: 36 Weightage

Section A

(Answer *all* questions. Each question carries **one** weightage)

1. Sketch the possible geometries of complexes with coordination number 5 and 7. Give one example for each.
2. Define overall stability constant and stepwise stability constant of a complex. How are they related?
3. Give three limitation of valence bond theory of coordination compounds.
4. Order the following ligands in spectro chemical series and nephelauxetic series. H_2O , F^- , OH^- , Py , CO , CN^- .
5. What is meant by spin orbit coupling?
6. What is temperature independent paramagnetism?
7. How IR spectroscopy can be used to identify monodentate and bidentate (chelating) nature of NO_3 groups.
8. Calculate ESR frequency in a magnetic field of 25,000 Gauss, if $h = 6.626 \times 10^{-34} \text{Js}$, $g = 2$, $\beta = 9.27 \times 10^{-24} \text{JT}^{-1}$.
9. What is *Cis effect*? Give examples.
10. Explain the term labile and inert metal complexes with an example for each.
11. Explain photoaquation reactions in metal complexes giving suitable examples.
12. What are prompt and delayed reactions?

Section – B

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

13. Explain *macro cyclic effect* and *template effect* with examples.
14. Explain the major factors which affect the crystal field splitting.
15. What are Racah parameters? Mention their significance.
16. Explain *Jahn Teller effect*. What are its spectral consequences?
17. Based on charge transfer transitions, explain the origin of colour of KMnO_4 .
18. From the free ion term, obtain the *orgel diagram* for an octahedral complex of a d^4 ion. How is this diagram related to the *orgel diagrams* of octahedral d^6 and tetrahedral d^4 ions?

19. How do *Tanabe – Sugano* and *Orgel diagrams* differ? Explain.
20. Explain the changes that occur in the IR spectra of carbonate group upon coordination to metal ions.
21. Distinguish between D, A and I mechanisms.
22. Explain Eigen – Wilkins mechanism of substitution in octahedral complexes.
23. Explain *Marcus theory* of outer sphere electron transfer reactions.
24. How will you distinguish outer sphere reactions from inner sphere reactions?

Section – C

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

25. a) Sketch the molecular orbital diagram of $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ taking water molecule as a σ donor ligand. Explain the important features of the diagram.
- b) Explain the determination of binary stability constant by spectro photometric methods.
26. a) Explain the selection rules pertaining to electronic transition in complexes. How break down of selection rules occur in $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ to give a pale pink colour.
- b) Explain Orbital contribution to magnetic moment for octahedral complexes.
27. a) What is *trans effect*? Explain the theory involved in transeffect.
- b) Explain the applications of *trans effect* in the synthesis of transition metal complexes.
28. a) Discuss the principle involved in Mossbauer Spectroscopy and its application to iron complexes.
- b) Give a brief account of the photochemical reactions of Rhuthenium complexes.
