

G 18001606



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Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, JUNE 2018

Second Semester

Faculty of Science

Branch : Chemistry

AN2C05/AP2C05/CH2C05/PH2C05/POH2C05—CO-ORDINATION CHEMISTRY

(2012 Admission onwards)

[Common to all branches of chemistry]

Time : Three Hours

Maximum Weight : 30

Section A

*Answer any **ten** questions.*

Each question carries weight 1.

1. Explain 'Macro cyclic effect' using a suitable example ?
2. What is Jahn Teller theorem ? Explain using a suitable example.
3. Explain the terms λ (lambda) and Δ (delta) used to designate chiral complexes.
4. Arrange the following ligands in the increasing order in the spectro chemical series. I^- , Br^- , Cl^- , F^- , S^{2-} , NO_3^- , OH^- , H_2O , NH_3 , NO_2^- , PPh_3 , CN^- and CO .
5. What is EAN rule ? Name two complexes, one which obeys the rule and another which violates.
6. Arrange the following in the decreasing order of nephelauxetic effect. $Mn(II)$, $Ni(II)$, $Co(II)$, $Mo(II)$, $Fe(III)$, $Mn(IV)$
7. Give one example of a lanthanide complex used as shift reagent in NMR measurements and explain how it is helpful in simplifying complex spectra.
8. What are hard and soft ligands ? Give examples.
9. Explain briefly the type of bonding of NO ligand in complexes
10. The Irving -William order of stability of some ions are given below. Explain the reasons for such an order. $Mn(II) < Fe(II) < Co(II) < Ni(II) < Cu(II) < Zn(II)$.
11. What are the differences between ligand to metal charge transfer complex (LMCT) and metal to ligand charge transfer complex (MLCT) ? How they are distinguished ?

Turn over





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12. What are metal carbonyl cluster ? Give two examples. What are 'Chini clusters' ? Give an example.
13. Nickelocene, $\text{Ni}(\text{C}_5\text{H}_5)_2$ has a structure analogous to that of Ferrocene, but the Ni-C distance is about 0.16\AA longer than the Fe-C distance. Rationalize the bonding in Nickelocene with the 18-electron rule.

(10 × 1 = 10)

Section B

Answer any five questions.

Each question carries weight 2.

14. (a) The $\text{Mn}(\text{OH})_6^{2+}$ ion has an extremely pale pink color, attributable to transitions which are formally forbidden. Explain why there are no completely allowed d-d transitions ?
- (b) Two d-d bands can be seen at $17,000$ and $26,000\text{ cm}^{-1}$ in the absorption spectra of $\text{V}(\text{H}_2\text{O})_6^{3+}$. Assign the bands.
15. Explain briefly the Gouy method to determine the magnetic moment of complexes.
16. Give brief description of outer sphere mechanism as given by Marcus theory.
17. What is linkage isomerism ? Explain the electronic and steric factors affecting the isomerism.
18. Give the MO energy level diagram for a tetrahedral complex using a suitable example.
19. Explain ligand field theory ? What are its shortcomings ?
20. Explain an experimental method which could be used for measuring back bonding in transition metal carbonyl.
21. What is meant by stability of a complex ? Explain the factors determining the stability of complexes ?

(5 × 2 = 10)

Section C

Answer any two questions.

Each question carries weight 5.

22. Write briefly on the co-ordination chemistry of Iron and Cobalt with special reference to electronic spectra and magnetic properties.
23. Explain the use of the following in interpreting the electronic spectra of complexes :
- (1) Orgel diagrams. (2) Tanabe-Sugano diagrams.





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24. Write briefly on the following using octahedral complexes as example :
- (1) Geometrical and optical isomerism.
 - (2) The kinetics and mechanisms of solvolytic reactions
25. (a) State and explain the selection rules for the electronic spectra of transition metal complexes.
- (b) Explain the use of the following methods in elucidating the structure of complexes :
- (1) Electronic spectra.
 - (2) Magnetic measurements.

(2 × 5 = 10)

