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Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, JULY 2017

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. Give Curie's law. What are its limitations?
2. What is Jahn Teller theorem? Explain using a suitable example.
3. Predict and explain the possible electronic transitions in $[\text{Co}(\text{NH}_3)_6]^{2+}$.
4. Give a molecular orbital energy level diagram for octahedral complex.
5. State and explain the selection rules for the electronic spectra of complex compounds.
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. Predict which pair have higher stability
 - (a) $[\text{Cu}(\text{NH}_3)_4]^{2+}$ and $[\text{Cu}(\text{en})_2]^{2+}$.
 - (b) $[\text{Cu}(\text{acac})_2]^{2+}$ and $[\text{Cu}(\text{en})_2]^{2+}$.
9. Explain briefly the type of bonding of NO ligand in complexes.
10. The Irving-Williams order of stability of some ions are given below. Explain the reasons for such an order. $\text{Mn (II)} < \text{Fe (II)} < \text{Co (II)} < \text{Ni (II)} < \text{Cu (II)} < \text{Zn (II)}$.
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. Which is having greater magnetic moment CoCl_4^{2-} or CoI_4^{2-} ? Why ?
 13. Explain the term synergic bonding using a suitable example

(10 × 1 = 10)

Section-B

*Answer any five questions.**Each question carries weight 2.*

14. Explain briefly the splitting of d orbitals in : (a) Square pyramidal field ; (b) Trigonal bipyramidal field.
 15. What is Trans effect ? Give two applications.
 16. There are two isomers of $\text{Pt}(\text{NH}_3)_2\text{Cl}_2$ A and B. When A is treated with thiourea $\text{Pt}(\text{tu})_4^{2+}$ is formed. When B is treated with thiourea $\text{Pt}(\text{NH}_3)_2(\text{tu})_2^{2+}$ is formed.
 Identify the isomers and explain the data (Thiourea = tu)
 17. Explain the use of ORD and CD in determining the configuration of optically active complexes.
 18. Give the MO energy level diagram for an tetrahedral complex using a suitable example.
 19. Explain crystal field theory ? What are its shortcomings ?
 20. Calculate the difference in ligand field stabilization energy (in units of Δ_0) between octahedral and tetrahedral coordination of high spin configuration from d^1 to d^9 . Assume that $\Delta_t = 4/9 \Delta_0$.
 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 kinetics and mechanism of nucleophilic substitution reactions in square planar complexes
 23. Explain the use of the following in interpreting the electronic spectra of complexes :
 (a) Orgel diagrams.
 (b) Tanabe-Sugano diagrams.





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24. Write briefly on the following using octahedral complexes as example

- (a) Geometrical and optical isomerism.
- (b) The kinetics and mechanisms of water exchange reactions.

25. Write briefly on :

- (a) Temperature independent paramagnetism (TIP).
- (b) Trans effect.
- (c) Asymmetric synthesis catalyzed by co-ordination compounds.

(2 × 5 = 10)

