

K21P 0968

Reg. No. :

Name :

III Semester M.Sc. Degree (CBSS – Reg./Suppl./Imp.)

Examination, October 2021

(2018 Admission Onwards)

CHEMISTRY

CHE 3C. 08 : Inorganic Chemistry – II

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **all** questions in **one** word or **one** sentence. **Each** question carries **one** mark.

1. Which of the following complex possess dsp^2 hybridization ?
 $[Ni(CN)_4]^{2-}$, $[Ni(CO)_4]$, $[NiCl_4]^{2-}$, $[Ni(PF_3)_4]^{2+}$
2. The spin-only magnetic moment for $[Fe(CN)_6]^{4-}$ and $[FeF_6]^{3-}$ are _____ and _____ respectively.
3. Derive the term symbol for Ni^{2+} .
4. For p^2 electronic configuration, the number of microstates are _____
5. What is the product formed when $[Pt(NH_3)_4]^{2+}$ is treated with Cl^- ?
6. The base hydrolysis of $[CoCl(NH_3)_5]^{2+}$ proceeds through _____ mechanism.
7. The metal present in Wilkinson's catalyst is _____
8. The active catalyst for hydroformylation is _____ **(8×1=8)**

SECTION – B

Answer **any eight** questions. Answer may be in **two** or **three** sentences. **Each** question carries **two** marks.

9. Which ligand has got high nephelauxetic effect; CN^- or NH_3 ? Give reasons for your answer.

P.T.O.



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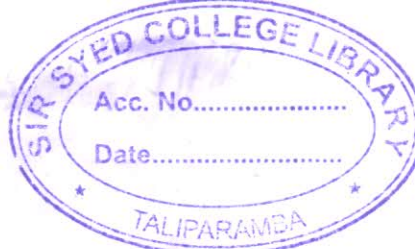


10. Arrange the following complex species in the increasing order of Δ_o value. $[\text{Cr}(\text{CN})_6]^{3-}$, $[\text{CrCl}_6]^{3-}$, $[\text{Cr}(\text{NH}_3)_5]^{3+}$. Substantiate your answer.
11. In a crystal of CuF_2 , all Cu-F bond distances are not equal, why ?
12. How do ferromagnetism and antiferromagnetism vary with temperature ?
13. Differentiate between Orgel diagrams and Tanabe-Sugano diagrams ?
14. What evidence from the absorption spectra show that $[\text{Co}(\text{EDTA})]^-$ has lower symmetry than $[\text{Co}(\text{en})_3]^{3+}$?
15. Give two examples for photochemical reactions of metal complexes.
16. Chelate effect is an entropy effect. Justify this statement.
17. Stepwise formation constants of $[\text{CdBr}_4]^{2-}$ from aqueous Cd^{2+} ions follow the trend $K_1 > K_2 > K_3 < K_4$. Explain the unusual increase in the value of K_4 .
18. What is transmetallation ? How this reaction is useful for the synthesis of organometallics ?
19. How is methyllithium prepared ? Comment on its structure.
20. State and explain 18-electron rule as applied to metal carbonyls. (8×2=16)

SECTION – C

Short paragraph questions. Answer **any four** questions. **Each** question carries **three** marks.

21. Draw the d orbital splitting diagrams for octahedral and square planar metal complexes. Give reasons for such type of splitting patterns.
22. Construct the Orgel diagram for $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ and assign the possible electronic transitions.
23. Write a note on spin crossover systems.
24. Discuss the principle involved in Gouy method.
25. Substitution reactions of $[\text{Cr}(\text{CO})_6]$ are very slow, consistent with low-spin d^6 complex, but the isoelectronic complex $[\text{V}(\text{CO})_6(\text{NO})]$ is very reactive; why ?



26. Describe the spectrophotometric method for determining the stability of a metal complex.
27. Give an account of the synthesis and structure of Zeise's salt.
28. Discuss the mechanism of the reactions involved in hydroformylation reaction. (4×3=12)

SECTION – D

Essay type questions. Answer **any four** questions. **Each** question carries **six** marks.

29. A) Critically evaluate valence bond theory and molecular orbital theory as applied to transition metal complexes.

OR

- B) What are the factors that affect LFSE ? Discuss the ligand field effect on ionic radii and lattice energy of bivalent 3d metal ions.

30. A) What is meant by spin-orbit coupling ? What are the factors that affect spin-orbit coupling constant ? Which among the following octahedral complexes, do you expect spin-orbit coupling ? d^4 (low and high spin), d^8 high spin and d^9 .

OR

- B) How magnetic moment measurements are useful for the structural investigation of transition metal complexes ? Illustrate with suitable examples.

31. A) Differentiate between thermodynamic stability and kinetic stability of metal complexes. Discuss the factors that affect the stability of metal complexes.

OR

- B) Give an account of the ligand substitution reactions on square planar complexes.

32. A) Give an account of the synthesis, structure and reactivity of ferrocene.

OR

- B) Discuss the mechanisms involved in oxidative addition and reductive elimination reactions of organometallic compounds giving suitable examples. (4×6=24)