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 nephalauxetic effect; CN^- or NH_3 ? Give reasons for your answer.

P.T.O.

10. Arrange the following complex species in the increasing order of Δ_0 value. $[Cr(CN)_6]^{3-}$, $[CrCl_6]^{3-}$, $[Cr(NH_3)_5]^{3+}$. 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 $[Co(EDTA)]^-$ has lower symmetry than $[Co(en)_3]^{3+}$?

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 $[CdBr_4]^{2-}$ 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 $[Ni(H_2O)_6]^{2+}$ 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 $[Cr(CO)_6]$ are very slow, consistent with low-spin d^6 complex, but the isoelectronic complex $[V(CO)_6(NO)]$ 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)**
