



K20P 1079

Reg. No. :

Name :

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

Examination, October 2020

(2014 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. Give one example for a metal complex with coordination number 5.
2. The structure of $K_2[Ni(CN)_4]$ is _____
3. The term symbol for Mn^{3+} is _____
4. Name two calibrants used in Gouy balance.
5. When an yellow complex $[Ni(en)_2]Br_2$ is dissolved in pyridine a blue solution is formed; why ?
6. Why chelate effect is considered as an entropy effect ?
7. What are 'naked clusters' ?
8. Give one example for transmetallation reaction. (8×1=8)

SECTION – B

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

9. Do you find any difference in the geometries of $[Mn(H_2O)_6]^{2+}$ and $[Mn(H_2O)_6]^{3+}$?
Substantiate your answer.

P.T.O.



10. What is meant by nephelauxetic series ? Explain.
11. Calculate the LFSE for an octahedral cobalt (II) complex for which $\Delta_0 = 275 \text{ kJmol}^{-1}$ and the electron pairing energy $P = 250 \text{ kJmol}^{-1}$.
12. What is meant by spin crossover ? Explain with an example.
13. Calculate the number of microstates for d^4 configuration.
14. Account for the intense yellow colour of ceric ammonium sulphate solution.
15. State and explain Irving-William order of stability.
16. The rate of substitution reaction of $\text{Cr}(\text{CO})_6$ is very low, consistent with a low spin d^6 complex; but the isoelectronic complex $[\text{V}(\text{CO})_6\text{NO}]$ is very reactive, why ?
17. Differentiate between electron exchange and electron transfer reactions.
18. What is meant by oxidative carbonylation reaction ? Explain with an example.
19. What hapticities are possible for 1,3-butadiene ? Sketch the interactions.
20. Give any two synthetic applications of Grignard's reagent. (8×2=16)

SECTION – C

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

21. Comment on the spectral consequences of Jahn-Teller distortion in copper (II) complexes.
22. Ionic radii of M^{2+} ions are expected to decrease smoothly from Sc^{2+} to Zn^{2+} . But the change is not regular. Why ?
23. Assign the electronic transition in $[\text{V}(\text{H}_2\text{O})_6]^{3+}$ with the help of Orgel diagram.
24. What is meant by spin-orbit coupling ? Explain.
25. Write a note on photochemical reactions of transition metal complexes.
26. Derive the relationship between stepwise and overall formation constants of a metal complex.



27. Give an account of the synthesis and structure of Zeise's salt.

28. Discuss the factors that favour the formation of metal clusters.

(4×3=12)

SECTION – D

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

29. A) What are the important assumptions of V.B. theory ? How this theory is useful in the structural study of transition metal complexes ? What are its limitations ?

OR

B) Sketch the MO diagram for cobalt (II) low-spin octahedral complex with σ -bonding only and discuss its salient features. What is the effect of π -bonding on the stability of metal complexes ?

30. A) Describe the Gouy method for determining the magnetic moment value of solid metal complexes. Bring out the significance of Pascal's constant in this study.

OR

B) Calculate 10 Dq and β value for the complex species $[\text{Ni}(\text{MeNH}_2)_6]^{2+}$ from the following spectral data.

$\nu_1 = 10,000 \text{ cm}^{-1}$, $\nu_2 = 16,780 \text{ cm}^{-1}$, $\nu_3 = 27,320 \text{ cm}^{-1}$ and $\beta = 1030 \text{ cm}^{-1}$ for free Ni^{2+} ion.

31. A) Discuss the A, D and I mechanisms of substitution reactions in octahedral metal complexes.

OR

B) What is trans effect ? Discuss the synthetic applications of trans effect with suitable examples.

32. A) Draw the catalytic cycle and discuss the reactions and mechanisms involved in Monsanto acetic acid process.

OR

B) How is ferrocene synthesised ? Give an account of its reactions and structure.

(4×6=24)