



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

THIRD SEMESTER – NOVEMBER 2018

16/17PCH3ES02 – PHYSICAL CONCEPTS IN INORGANIC CHEMISTRY

Date: 31-10-2018

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

Part-A

Answer ALL questions.

(10 × 2 = 20)

1. Account for the pale pink colour of the complex $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$.
2. Obtain the spin multiplicity for a two electron system under the condition $\Delta E > P$.
3. Predict the number of bending and stretching vibrational modes for $[\text{MnF}_6]^{4-}$.
4. What are fluxional molecules? Give an example.
5. What is isomer shift?
6. Write the factors affecting diffusion current in polarographic technique.
7. What are optically transparent thin layer electrodes? Cite its application.
8. Show that photoracemisation of chromium complexes follows an intramolecular mechanism.
9. Mention the role of acridinium ion in photoaquation reactions.
10. Write the advantages of chromophore-quencher assemblies in photoelectron transfer reactions.

Part-B

Answer any EIGHT questions.

(8 × 5 = 40)

11. Discuss the Orgel diagram of the complex $[\text{CoF}_6]^{4-}$ and explain the various transitions involved in it.
12. Explain the hole formalism with an example.
13. The cis isomer of the complex $[\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2]^+$ gives more IR bands than the trans isomer. Explain.
14. How does the $^1\text{H-NMR}$ pattern of trihapto allyl complex vary with temperature?
15. How are rhombohedral and tetragonal symmetries identified using EPR spectroscopy?
16. Discuss the influence of Jahn Teller distortion in the electric field gradient of a nucleus with an example.
17. Illustrate how polarographic technique is applied to study the formation of metal complexes.
18. Write the principle of AC polarography and mention its advantages.
19. Explain the functions of three different electrodes used in voltammetric techniques.
20. With the help of Jablonski diagram explain A-ET-E process for energy transfer in lanthanide complexes.
21. Discuss any one mechanism for photon up conversion.
22. Explain the Marcus theory of electron transfer reactions.

Part-C

Answer any FOUR questions.

(4 × 10= 40)

23. What are the various allowed terms possible for a d^8 ion? Discuss its energy level diagram in an octahedral field.
24. How are unidentate and bidentate nitrito groups identified through vibrational spectroscopy?
- 25a. What are chemical shift reagents? Explain their uses with an example. (5+5)
- b. Discuss the use of EPR spectroscopy in differentiating ionic crystals from free radicals.
- 26a. Discuss how light energy is converted to chemical energy using lamellar solids and thin films.
- b. Write the significance of Heyrovsky-Ilkovic equation. (6+4)
27. Illustrate the role and mechanistic pathway of manganese complexes in photosplitting of water.
- 28a. Discuss MLCT-ET scheme for type-1 and type-2 metal organic dyads.
- b. Write the expression for free energy change of photoinduced back electron transfer reaction and mention the terms involved in it. (8+2)
