LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **CHEMISTRY**

THIRD SEMESTER – **APRIL 2019**

16/17PCH3ES02– PHYSICAL CONCEPTS IN INORGANIC CHEMISTRY

Date: 22-04-2019 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

Part-A

Answer ALL questions. **(10 × 2= 20)**

1. Why does the *cis* isomer of a complex give a large number of bands in IR?
2. How is 'g' value used to identify spin orbit coupling in a molecule?
3. How many lines are possible in the proton NMR of monohaptobis(cyclopentadienly)mercury?
4. Predict the number of bending vibrational modes in $[PtCl_4]^{2-}$ complex.
5. What are fluxional molecules?
6. What is the need for the supporting electrolytes in voltammetric techniques?
7. Write Heyrovsky-Ilkovic equation and mention the terms in it.
8. Distinguish between photovoltaic and photogalvanic cells.
9. Mention the role of biacetyl in photoaquation reactions.
10. What are chromophore-quencher assemblies? Cite their advantages.

Part-B

Answer any EIGHT questions. **(8 × 5= 40)**

11. How will you explain the coordinating tendency of CO_3^{2-}?
12. Discuss the spectral consequences of Jahn-Teller effect with an example.
13. Explain hole formalism with an example.
14. Discuss the electronic transition observed in d^2 octahedral complex.
15. Explain contact and pseudo contact shifts with examples.
16. How is the second order ^{1}H-NMR spectrum of 1-hexanol simplified?
17. Explain the working of dye sensitised solar cells.
18. What is the principle of cyclic voltammetry? Explain the cyclic voltammogramof $[Fe(CN)_6]^{3-}$.
19. Explain the construction of Honda cell for the photoelectrolysis of water.
20. Discuss A-ET-E process for energy transfer in lanthanide complexes with the help of Jablonski diagram.
21. Describe the mechanism for the photosynthetic evolution of oxygen by manganese complexes.
22. Explain Adamson's rule for photosubstitution reactions.

Part-C

Answer any FOUR questions. **(4 × 10= 40)**

23. What are *fac* and *mer* isomers of a complex? How are they identified using IR spectroscopy?

24 a. Define quadrupole coupling constant. Discuss the quadrupole splitting in the Mössbauer spectra of $[Fe(CN)_6]^{4-}$complex.

b. Explain Laporte selection rule. (6+4)

25 a. How are cubic and rhomboheral geometries identified using EPR spectroscopy?

b. What is the effect of tetragonal distortion on the electronic spectrum of a complex?

26a. What are diffusion and limiting currents?

b. Illustrate how polarographic technique is applied to study the formation of metal complexes.(4+6)

27. Discuss any two mechanisms for photon up conversion.

28 a. What are metal-organic dyads?

b. Discuss MLCT-ET scheme for type-1 and type-2 metal organic dyads. (2+8)

****