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Reg. No. :

Name :

Third Semester M.Sc. Degree Examination, January 2023

Chemistry/Polymer Chemistry/Analytical Chemistry

CH/CL/PC 231 : INORGANIC CHEMISTRY – III

(2020 Admission onwards)

Time : 3 Hours

Max. Marks : 75

SECTION – A

Answer any two among (a), (b) and (c) from each. Each sub question carries 2 marks.

- Explain with reason : CO is a π -acceptor ligand.
 - Give an example each for a tetrahapto and a hexahapto ligand.
 - Show that whether $[Fe(CO)_4(pph_3)]$ obeys 18-electron rule or not.
- Write the overall stability constant " β " in the following reaction.
$$Ag^+ + 2 NH_3 \rightleftharpoons [Ag(NH_3)_2]^+$$
 - What is meant by trans effect?
 - Show that SN_2 mechanism involves a 7-coordinated intermediate.
- What is Gibbs-Donnan equilibrium?
 - What is Bohr effect?
 - Draw the active site structure of 2Fe-2s proteins.

P.T.O.



4. (a) IR- frequency of $Fe(CO)_5$ is 2002 cm^{-1} and 1979 cm^{-1} predict the geometry and structure of the above carbonyl.
- (b) What is Doppler broadening?
- (c) Predict the MB spectrum of low-spin $k_3[Fe(CN)_6]$.
5. (a) Define Radioactive constant (λ).
- (b) Complete the following nuclear reaction
- $${}_{13}^{27}Al + {}_2^4He \longrightarrow \underline{\quad ? \quad} + \underline{\quad ? \quad}$$
- (c) What is stellar energy? Indicate the elements involved in the stellar energy nuclear reactions.

(10 × 2 = 20 Marks)

SECTION – B

Answer either (a) or (b) from each question. Each sub question carries 5 marks.

6. (a) Represent the structure of Zeise's salt. Emphasis the important features on which metal-alkene bonding is based.
- (b) Utilizing IR spectroscopy discuss the structure with two types of modes of binding of CO in the following metal-carbonyls.
- (i) $Fe_2(CO)_9$
- (ii) $Co_4(CO)_{12}$
7. (a) Describe briefly the Eigen-Wilkins mechanism with suitable example.
- (b) Write note on:
- (i) Photo-isomerisation
- (ii) Photo-aquation reactions



8. (a) Explain the role of calcium in biological systems.
(b) Account on: Cytochrome $P - 450$.
9. (a) Discuss with suitable example the application of ORD spectra in metal complexes.
(b) Explain the utility of mossbauer spectroscopy in the study on Tin complexes.
10. (a) Give a brief note on Radioactive decay of Transient equilibrium.
(b) Discuss the important postulates of nuclear shell model.

(5 × 5 = 25 Marks)

SECTION – C

Answer any three questions. Each question carries 10 marks.

11. Construct the MO energy level diagram of Ferrocene and explain the structure and bonding using MOT.
12. What is trans effect? Explain the mechanism of trans effect using polarization and π -bonding theories.
13. Discuss in detail the function of PS-I and PS-II in photosynthetic activity.
14. Utilizing ESR spectra, explain the application of inorganic free radicals, such as PH_4 , F_2^- and $[BH_3]^-$.
15. Discuss the principles of following counting techniques
- (a) G.M. Counter
- (b) Ionization and Scintillation counters.

(3 × 10 = 30 Marks)

