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P-6080

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.

1. (a) Explain with reason : CO is a π -acceptor ligand.
(b) Give an example each for a tetrahapto and a hexahapto ligand.
(c) Show that whether $[Fe(CO)_4(pph_3)]$ obeys 18-electron rule or not.
2. (a) Write the overall stability constant " β " in the following reaction.
$$Ag^+ + 2NH_3 \rightleftharpoons [Ag(NH_3)_2]^+$$

(b) What is meant by trans effect?
(c) Show that SN_2 mechanism involves a 7-coordinated intermediate.
3. (a) What is Gibbs-Donnan equilibrium?
(b) What is Bohr effect?
(c) Draw the active site structure of 2Fe-2s proteins.

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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)

