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Reg. No. :

Name :

Third Semester M.Sc. Degree Examination, January 2023

**Chemistry/Analytical Chemistry/Applied Chemistry/
Polymer Chemistry/Medicinal Chemistry**

CH/CL/CA/PC/CM 231 : INORGANIC CHEMISTRY III

**(Chemistry/Analytical Chemistry/Applied Chemistry/ Medicinal Chemistry
(2016-2019 Admission) and Polymer Chemistry (2018-2019 Admission))**

Time : 3 Hours

Max. Marks : 75

SECTION - A

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

1. (a) CO stretching frequency in IR spectra drops as the metal becomes more electron rich. Justify the statement.
(b) Formulate neutral, 18 electron complexes of chromium which contain only
(i) cyclopentadienyl and nitrosyl ligands
(ii) cyclopentadienyl, carbonyl and nitrosyl ligands.
(c) Why $\text{Cr}(\text{CO})_6$ is stable than $\text{V}(\text{CO})_6$ Explain.
2. (a) The aquation reaction of $[\text{Co}(\text{NH}_3)_5\text{Cl}_2]^+$ is faster than that of $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$. Why?
(b) The rate of outer sphere electron transfer from $[\text{Fe}(\text{CN})_4]^{4-}$ to $[\text{Fe}(\text{CN})_4]^{3-}$ is much faster than that from $[\text{Co}(\text{NH}_3)_6]^{2+}$ to $[\text{Co}(\text{NH}_3)_6]^{3+}$. Why?
(c) With a suitable example, explain the stepwise and overall formation constants.

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3. (a) What are nitrogenases? Give the functions of nitrogenases.
(b) Oxy form of hemocyanin is blue while the deoxy form is colorless.
(c) What is the role of Mn in photosynthesis?
4. (a) What are the limitations of Mössbauer spectroscopy?
(b) What is CD? What is its application in metal complexes?
(c) How coordinated and uncoordinated nitrate ion can be distinguished by IR Spectroscopy?
5. (a) ^{18}F undergoes 10% radioactive decay in 16.5 minutes. Calculate its half life.
(b) Describe the working of G.M. counter.
(c) What is a Breeder reactor?

(10 × 2 = 20 Marks)

SECTION – B

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

6. (a) How is Ziese's salt synthesized? Write its structure and bonding.
(b) Discuss the fluxional behavior exhibited by two organometallic compounds.
7. (a) What is macrocyclic effect?
(b) Write down Marcus equation and illustrate its important applications.
8. (a) What stops simple iron-porphyrins from functioning as oxygen carriers? Discuss the role of globin and heme part in cooperatively and reversible uptake of oxygen by hemoglobin.
(b) What are cytochromes? Give the active site structure of P-450.



9. (a) Discuss the applications of NMR for the study of diamagnetic complexes.
(b) What is the principle of Mössbauer spectroscopy?
10. (a) Explain the nuclear fusion reactions.
(b) What are magic numbers of the nucleus? Explain the uses of magic numbers.

(5 × 5 = 25 Marks)

SECTION – C

Answer any **three** questions, and each question carries **10** marks.

11. Explain polymerization of olefins using Wilkinson catalyst
12. Account for the photoreactive excited states of Cr (III) complexes. Giving suitable examples discuss the photoaquation reactions of Cr (III) complexes.
13. Describe structure, classification and function of biological iron-sulfur proteins.
14. Write an account of EPR spectroscopy of Cu (II) complexes.
15. Explain the nuclear fission process. How it can be used as a source of energy?

(3 × 10 = 30 Marks)

