



WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2021

CEMACOR13T-CHEMISTRY (CC13)

INORGANIC CHEMISTRY-V

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

Answer any three questions taking one from each unit

Unit-I

1. (a) What are trace elements? Write the analytical techniques that are used to determine these. How chelation therapy may be applied to remove Pd-toxicity from body? 1+2+2
- (b) Show the mechanism of the catalytic hydration of CO₂ by carbonic anhydrase. 3
- (c) Draw the structure of 4Fe-4S ferredoxin and describe its e-transport. 3
- (d) Explain the metal ion transport across bio-membranes with reference to the function of Na⁺/K⁺ pump (mention the inside/outside concentration of Na⁺ and K⁺ in a typical cell and its necessity). 3
- (e) State the name and structural form of two gold drugs. 2
2. (a) What are the effects of As-toxicity in human body? Discuss a method of its removal by chelation therapy. 3
- (b) Give the active site structure of O₂-transport Heme protein Hemoglobin. What is Bohr effect? Explain. 3+2
- (c) What is the function of cytochrome-C? 1
- (d) Write and explain the light and dark phase reactions related to photosynthesis. 4
- (e) Discuss the biological role of Ca²⁺ and Mg²⁺. 3

Unit-II

3. (a) Using 18-electron rule, find the value of 'n' in (η⁵ - C₅H₅)Co(CO)_n. 2
- (b) Explain why the reactivity of bent and linear nitrosyls is different. 2
- (c) What happens when propylene is treated with Co₂(CO)₈ and H₂? Give mechanism. 3
- (d) Why ferrocene cannot undergo nitration reaction similar to that of benzene? How is nitro ferrocene prepared? 3
- (e) Applying 18-electron rule deduce the structure of Fe₃(CO)₁₂. Show the different modes of bonding of CO in this structure. How would you distinguish them experimentally? 4

- (f) What is Fischer-Tropsch process? 2
4. (a) How will you prepare Zeise's salt from K_2PtCl_6 ? Discuss the structure and bonding in Zeise's salt. 2+3
- (b) What products do you expect if $\text{H}_2\text{C}=\text{CH}_2$ and $\text{CH}_3\text{-HC}=\text{CH}_2$ are separately treated with Ziegler-Natta Catalysts? 2
- (c) Write the advantages of using Rh-catalyst in place of Co-catalyst in hydroformylation reaction. 2
- (d) The $\nu_{\text{C-O}}$ of isoelectronic hexacarbonyls is given below. Explain their trends. ($\nu_{\text{C-O}}=2143\text{ cm}^{-1}$ in free CO). 3
- $[\text{Ti}(\text{CO})_6]^{2-}$ ($\nu_{\text{C-O}}=1748\text{ cm}^{-1}$), $[\text{V}(\text{CO})_6]^-$ ($\nu_{\text{C-O}}=1860\text{ cm}^{-1}$).
- $[\text{Cr}(\text{CO})_6]$ ($\nu_{\text{C-O}}=2000\text{ cm}^{-1}$), $[\text{Fe}(\text{CO})_6]^{2+}$ ($\nu_{\text{C-O}}=2200\text{ cm}^{-1}$).
- (e) Between $\text{Rh}(\text{PET}_3)_3\text{Cl}$ and $\text{Rh}(\text{PPh}_3)_3\text{Cl}$ which one is suitable for Wilkinson's type catalyst for hydrogenation of olefins? Explain. 2
- (f) Acetylation of ferrocene produces only one major product. Explain why. 2

Unit-III

5. (a) What is trans effect? How can you synthesize any two isomers of $[\text{Pt}(\text{Br})(\text{Cl})(\text{NH}_3)(\text{Py})]$ from PtCl_4^{2-} ? 2+3
- (b) What is a labile complex? For what value of 'n' of d^n configuration do we obtain labile complexes and why? 3
6. (a) How would you proceed to prepare *cis*- and *trans*- $[\text{Pt}(\text{NH}_3)(\text{NO}_2)\text{Cl}_2]^-$ from $[\text{PtCl}_4]^{2-}$ in two step — using NH_3 and NO_2^- ? 2+2
- (b) In the series Ni(II), Pd(II) and Pt(II), only Pt(II) shows significant trans effect. Justify. 2
- (c) What do you mean by Thermodynamic and Kinetic stability? Explain. 2

N.B. : Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.

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