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 CO_2 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 O_2-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 Ca^{2+} and Mg^{2+}. 3

Unit-II

3. (a) Using 18-electron rule, find the value of '*n*' in $(\eta^5 - C_p)Co(CO)_n$. 2

   (b) Explain why the reactivity of bent and linear nitrosyls is different. 2

   (c) What happens when propylene is treated with $Co_2(CO)_8$ and H_2? 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 $Fe_3(CO)_{12}$. 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 $H_2C{=}CH_2$ and $CH_3{-}HC{=}CH_2$ are separately treated with Ziegler-Natta Catalysis? 2

(c) Write the advantages of using Rh-catalyst in place of Co-catalyst in hydroformylation reaction. 2

(d) The ν_{C-O} of isoelectronic hexacarbonyls is given below. Explain their trends. (ν_{C-O}=2143 cm^{-1} in free CO). 3

$[Ti(CO)_6]^{2-}$ (ν_{C-O}=1748 cm^{-1}), $[V(CO)_6]^{-}$ (ν_{C-O}=1860 cm^{-1}).

$[Cr(CO)_6]$ (ν_{C-O}=2000 cm^{-1}), $[Fe(CO)_6]^{2+}$ (ν_{C-O}=2200 cm^{-1}).

(e) Between $Rh(PEt_3)_3Cl$ and $Rh(PPh_3)_3Cl$ 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 $[Pt(Br)(Cl)(NH_3)(Py)]$ 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*-$[Pt(NH_3)(NO_2)Cl_2]^{-}$ from $[PtCl_4]^{2-}$ 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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