WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

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) Name one zinc containing metallo-enzyme and explain its biological function. 1+3

   (b) What is biological nitrogen fixation? Explain. 3

   (c) What are the biological functions of the following? 3

   (i) Myoglobin and

   (ii) Ferridoxin.

   (d) Indicate the oxidation state of copper ions in deoxy- and oxy-hemocyanin. What is the oxidation state of O_2 ligand in oxyhemocyanin? 1+1+1

   (e) How can you differentiate oxygen carrier and oxygen transport proteins? Explain with examples. 3

2. (a) What difference is noted in the binding of oxygen to hemoglobin and hemerythrin? 4

   (b) Discuss the role of PS-I and PS-II in photosynthesis. Name an electron transport protein involved in the process. 4+1

   (c) Name two toxic elements and describe their toxic effects. 4

   (d) What is *cis*-Platin? State its medicinal use. Why is *trans*-isomer not active as a medicine? 3

Unit-II

3. (a) What do you mean by hapticity? Cite examples of mono-, tri- and penta hapto cyclopentadienyl complexes. 1+3

   (b) Giving examples explain the different coordination modes of NO. 3

   (c) Discuss the mechanistic steps in Wacker process of oxidation of olefins. 3

(d) Identify A and B with explanation: 3

$$Fe(CO)_5 \xrightarrow[\text{(ii) Metallic Na Reflux}]{\text{(i) Dry THF}} A \xrightarrow{CH_3Br} B$$

(e) Define with example, oxidative addition reaction. What type of compounds generally undergo this type of reaction? 1+2

4. (a) Illustrate with example that isocyanide stabilize higher oxidation state. 2

(b) Using 18-electron rule, establish the structure of $Os_3(CO)_{12}$ and $Co_4(CO)_{12}$. 4

(c) Write a method of preparation of ferrocene and give the product of the reaction: 4

Ferrocene + $(CH_3CO)_2O/H_3PO_4 \rightarrow$.

(d) What is meant by 'hydroformylation' reaction? 2

(e) Name and describe the catalyst in homogenous hydrogenation of alkene. How is it different from Zieglar-Natta catalyst? 4

Unit-III

5. (a) State two factors affecting rate of substitution reaction. 2

(b) Elucidate the mechanism of the following substitution reaction: 2+2

$$[Co(NH_3)_4(Cl_2)]^+ + H_2O \rightarrow [Co(NH_3)_4(H_2O)Cl]^{2+} + Cl^-$$

Explain the effect of charge on the complex.

(c) Differentiate between labile and inert complex. 2

6. (a) Write down the products (with reaction steps) when the *cis*- and *trans*-isomers of $[Pt(NH_3)_2Cl_2]$ react with excess thiourea (tu). Explain the reaction with the help of *trans*-effect. 4

(b) Explain the *trans*-effect phenomenon by polarization theory with example. 2

(c) Explain the term CFAE and its importance. 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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