CBCS/B.Sc./Hons./6th Sem./CEMACOR13T/2024





WEST BENGAL STATE UNIVERSITY B.Sc. Honours 6th Semester Examination, 2024

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)	Explain the role of PS-I and PS-II in the process of photosynthesis mentioning the chemical reactions involved in it.	4
	(b)	Describe the structure and electron-transport process of 2Fe-2S Ferredoxin.	3
	(c)	Discuss the role of Zn(II) in carbonic anhydrase.	2
	(d)	Define Bohr effect in connection to oxygenation of Hb and Mb with proper plot.	3
	(e)	State the medicinal use of <i>cis</i> -platin.	2
	(f)	Briefly discuss the biofunction of Cys-C.	2
2.	(a)	Explain the function of nitrogenase enzyme in biological nitrogen fixation.	3
	(b)	Briefly describe the cooperative effect in connection with oxygen transport by Haemoglobin. Comment on the pH dependence of oxygenation of Hb.	2+2
	(c)	Give the name of two gold drugs. Which diseases may be treated with such drugs?	2
	(d)	Mention the role of manganese cluster in photosynthesis.	2
	(e)	Name one non-heme oxygen uptake protein and discuss its structural features.	1+2
	(f)	How As-toxicity can be removed by Chelation therapy?	2

Unit-II

3.	(a)	What are the different modes of bonding of CO found in polynuclear metal carbonyls? How these are differentiated experimentally?	3
	(b)	Using the 18-electron rule as a guideline determine the value of x in the following complexes	2
		compiences.	

- (i) $Cr(\eta^5 C_5H_5)(CO)_x(CH_3)$
- (ii) $\operatorname{Ru}_3(\operatorname{CO})_x$.

CBCS/B.Sc./Hons./6th Sem./CEMACOR13T/2024

	(c)	Ferrocene undergoes electrophilic substitution at a faster rate compared to benzene. — Explain.	2
	(d)	Discuss the mechanistic steps for the hydroformylation of propene by cobalt organometallics as a catalyst.	4
10	(e)	Arrange the following according to their increasing σ -donor and π -acceptor properties:	3
		CN^{-} , NO^{+} , CO	
		With proper reasoning.	
	(f)	Give definition and one example of fluxionality.	2
4.	(a)	How Zeise's salt is prepared? What happens when the salt is warmed with water?	2
	(b)	Using 18 electron rule explain the real structure of $Fe_3(CO)_{12}$ and $Co_4(CO)_{12}$.	4
	(c)	Discuss the role of two metal / metal ions used in Wacker process for oxidation of olefins.	3
	(d)	The V–C bond lengths in $[V(CO)_6]^-$ and $V(CO)_6$ are 193 pm and 200 pm respectively. — Comment.	2
	(e)	Give an example of each: Reductive elimination and oxidative addition reactions. $1\frac{1}{2}+1$	$\frac{1}{2}$
	(f)	Draw the structure of $[Mn(CO)_4 NO]$ and comment on position of ligands.	2

Unit-III

5.	(a)	Explain the mechanism of nucleophilic substitution reactions in octahedral complexes.	4
	(b)	Why $[Ni(CN)_4]^2$ undergoes rapid exchange with $*CN^-$ than that of $[Mn(CN)_6]^4$?	2
	(c)	How could you prepare <i>cis</i> - and <i>trans</i> -isomers of $[Pt(C_2H_4)Cl_2(NH_3)]$ from	2
		K_2 PtCl ₄ by using <i>trans</i> effect phenomenon?	

(b) "The kinetically inert complexes are not necessarily thermodynamically stable and conversely the kinetically labile complexes are not necessarily thermodynamically

unstable." — Explain it with suitable example.(c) Arrange ions according to their increasing exchange rate:

6. (a) Explain *Trans*-effect on the basis of polarization theory.

2

3

3

 $\left[Sr(H_2O)_6\right]^{2+} \ , \ \left[Mg(H_2O)_6\right]^{2+} \ , \ and \ \left[Ca(H_2O)_6\right]^{2+}$