

B.Sc. 6th Semester (Honours) Examination, 2023 (CBCS)**Subject : Chemistry****Course : CC-XIII****Time: 2 Hours****Full Marks: 40***The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words
as far as practicable.***1. Answer any five questions:** $2 \times 5 = 10$

- (a) Categorize the following elements as trace and ultra trace biological elements: V, Cu, Zn, Se.
- (b) Mention the important buffers present in the blood.
- (c) Define organometallic compound. Give one example of organometallic compound having no metal-carbon bond(s).
- (d) Write the oxidation states of Fe and NO in $[\text{Fe}(\text{CN})_5\text{NO}]^{2-}$ ion.
- (e) Discuss the mode of bonding in $\text{Re}_2\text{Cl}_8^{2-}$ ion.
- (f) Give one example of metal nitrosyl compound containing only metal and NO ligands which is isoelectronic with $\text{Ni}(\text{CO})_4$. Show electron counts.
- (g) Sketch the reaction profile for associative or 'A' mechanism for substitution reaction.
- (h) What is the difference between ΔG° and ΔG^\ddagger of a chemical reaction?

2. Answer any two questions: $5 \times 2 = 10$

- (a) Write in brief the significance of $\text{Na}^+ - \text{K}^+$ ion pump in biological reaction.
- (b) Distinguish oxidative addition and reductive elimination with suitable examples.
- (c) What is Ziegler-Natta Catalyst? Show the schematic representation of polymerisation of ethylene using this catalyst. Mention the special significance of the usefulness of this catalyst.
- (d) Cite one example of organometallic compound which follows 16-electron rule and show its molecular-orbital energy diagram.

3. Answer any two questions: $10 \times 2 = 20$

- (a) (i) Write the brief outline to obtain acetaldehyde from ethylene using Wacker Process.
 (ii) Ethylene cannot be hydrogenated using Wilkinson's catalyst. Explain.
 (iii) Write the evidence(s) of dissociative mechanism.
 (iv) What is spectator ligand?

 $4+2+3+1$

- (b) (i) Fe^{3+} ion in water shows yellow colour but on acidification with dil. H_2SO_4 its colour fades— write the reaction involved.
- (ii) Predict which of the complexes $[\text{V}(\text{CO})_6]^-$ and $[\text{Mn}(\text{CO})_6]^+$ has the shortest C — O bond.
- (iii) Name the metal which is antagonistic to copper.
- (iv) Give one example of electron transfer protein. Mention the metal ion present in it.
- (v) Write two important biological function of calcium. 2+3+1+2+2
- (c) (i) State the structure and reactivity of carboxypeptidase A.
- (ii) In between Cr (III) and Cr (VI) which one is more poisonous?
- (iii) What is Wilson's disease?
- (iv) Give one example of a pi-bonded organometallic compound.
- (v) What is the difference between thermodynamic chelate effect and kinetic chelate effect? 5+1+1+1+2
- (d) (i) Give a short account on linear free energy relationship (LFER).
- (ii) How is ferrocene obtained? Give a comparative account of the reactivity of ferrocene and benzene with respect to Friedel-Crafts acylation and Mannich condensation. 5+5
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