

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: 2×5=10
- Categorize the following elements as trace and ultra trace biological elements: V, Cu, Zn, Se.
 - Mention the important buffers present in the blood.
 - Define organometallic compound. Give one example of organometallic compound having no metal-carbon bond(s).
 - Write the oxidation states of Fe and NO in $[\text{Fe}(\text{CN})_5\text{NO}]^{2-}$ ion.
 - Discuss the mode of bonding in $\text{Re}_2\text{Cl}_8^{2-}$ ion.
 - 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.
 - Sketch the reaction profile for associative or 'A' mechanism for substitution reaction.
 - What is the difference between ΔG° and ΔG^\ddagger of a chemical reaction?
2. Answer any two questions: 5×2=10
- Write in brief the significance of $\text{Na}^+ - \text{K}^+$ ion pump in biological reaction.
 - Distinguish oxidative addition and reductive elimination with suitable examples.
 - 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.
 - Cite one example of organometallic compound which follows 16-electron rule and show its molecular-orbital energy diagram.
3. Answer any two questions: 10×2=20
- Write the brief outline to obtain acetaldehyde from ethylene using Wacker Process.
 - Ethylene cannot be hydrogenated using Wilkinson's catalyst. Explain.
 - Write the evidence(s) of dissociative mechanism.
 - 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