

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.

M.Sc. Chemistry - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - IV

22PCHCT4010 - Advanced Inorganic Chemistry

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

Section B

Answer any **SIX** questions ($6 \times 5 = 30$ Marks)

1. Explain the structure and bonding in metal carbonyls with reference to the synergic bonding concept.
2. Illustrate the hydrogenation of olefins using Wilkinson's catalyst with a suitable reaction mechanism.
3. Differentiate the hydroformylation of olefins using cobalt and rhodium catalysts in terms of efficiency, reaction conditions, and product selectivity.
4. Demonstrate how the $\text{Na}^+ - \text{K}^+$ pump functions and illustrate its role in maintaining concentration gradients in cells.
5. Describe the role of siderophores in iron transport.
6. Distinguish the electronic and spatial structures of hemoglobin and myoglobin.
7. Illustrate the function of cytochromes in the electron transport chain and show how they contribute to cellular energy production.
8. Assess the working principle of a Scintillation counter and justify its applications in radiation detection.

Section C

I - Answer any **TWO** questions ($2 \times 10 = 20$ Marks)

9. Illustrate the synthesis and structure of ferrocene. How do its bonding characteristics influence chemical reactivity in electrophilic and nucleophilic substitution reactions?
10. Analyze the Ziegler-Natta polymerization of olefins by examining the role of catalysts, polymerization mechanism, and its applications.
11. Examine the structure and function of biological membranes, analyzing the mechanisms of ion transport across them.

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12. Design a conceptual model illustrating the roles of Photosystem I and II in photosynthesis, and formulate a comparative analysis of their mechanistic differences.

II - Compulsory question ($1 \times 10 = 10$ Marks)

13. Account the principles of neutron activation analysis and isotope dilution analysis, and appraise their applications in scientific research.
