

M.Sc. DEGREE END SEMESTER EXAMINATION : NOVEMBER 2023**SEMESTER 1 : CHEMISTRY / PHARMACEUTICAL CHEMISTRY****COURSE : 21P1CHET01 / 21P1CPHT01 : INORGANIC CHEMISTRY - I***(For Regular - 2023 Admission and Improvement/Supplementary -2022/2021 Admissions)*

Duration : Three Hours

Max. Weights: 30

PART A**Answer any 8 questions****Weight: 1**

1. What are ionophores? (U, CO 3)
2. $(\text{H}_3\text{Si}-\text{CH}_2)_4\text{Cr}$ is more stable than $(\text{H}_3\text{C}-\text{CH}_2)_4\text{Ti}$, why? (A)
3. Discuss about the Q-value of a nuclear reaction. (U, CO 4)
4. Free alkenes are unreactive towards nucleophiles, but on co – ordination to metal center, alkenes react with nucleophiles. Why? (A)
5. Ethylene is commonly chosen to explain homogeneous hydrogenation with Wilkinson's catalyst, but the process is very slow. Explain why? (A)
6. In Monsanto acetic acid process, one of the step is the oxidative addition of CH_3I to $[\text{Rh}(\text{CO})_2\text{I}_2]^-$ but CH_3I is not a initial reactant in this process. How this is generated in the reaction? (A)
7. Comment on the stability of $(\text{carbene})(\eta^5\text{-cyclopentadienyl})\text{methyltantalum(III)}$ complex. (An)
8. What do you mean by prompt and delayed neutrons? (An, CO 4)
9. Strong N-N stretching bands appear at 2105 cm^{-1} for $[\text{Ru}(\text{NH}_3)_5(\text{N}_2)]\text{Cl}_2$ and at 1995 and 1890 cm^{-1} for $\text{trans-Mo}(\text{N}_2)_2\text{Me}_8[16]\text{ane S}_4$. Give reason. (An)
10. What are MRI contrast agents? (A, CO 3)

(1 x 8 = 8)**PART B****Answer any 6 questions****Weights: 2**

11. Explain the mechanism of benzannulation reaction of the chromium carbene complex with alkynes. (U, CO 2)
12. Discuss the bonding in dinitrogen organometallics. (An)
13. Write down the synthesis of transuranic elements berkelium and einsteinium. (R, CO 4)
14. Discuss the mechanism of action of cis-platin as anti-cancer drug. (A, CO 3)
15. Draw the possible structures of the product obtained by the reaction of NiBr_2 with allyl magnesium bromide. Discuss the bonding present in allyl organometallics. (An)
16. What are Tollman catalytic loops? Sketch the loop for the cobalt catalyzed conversion of propylene to butyraldehyde using carbon monoxide and hydrogen. (A)
17. Briefly explain the mode of transport and storage of iron in living organism. (U, CO 3)
18. Write a note on substitution reactions in organometallic complexes. Differentiate between associative and dissociative substitution reactions. (U)

(2 x 6 = 12)

PART C**Answer any 2 questions****Weights: 5**

19. Briefly discuss the important functions and mechanism of action of
a. Carboxypeptidase, b. Cytochrome P450, c. Carbonic anhydrase. (A, CO 3)
20. Give an account on C-H activation and functionalization
reactions of alkanes using organometallic catalysts. (An, CO 2)
21. a) Suggest suitable mechanisms for the following reactions. Give
explanation and justification for your answer.
i) $(\text{CO})_5\text{MnCH}_3 + \text{CO} \rightarrow (\text{CO})_5\text{Mn}(\text{COCH}_3)$ (A, CO 2, CO
ii) $\text{Ir}(\text{CO})\text{Cl}(\text{PPh}_3)_2 + \text{CH}_3\text{I} \rightarrow \text{Ir}(\text{CO})\text{Cl}(\text{CH}_3)\text{I}(\text{PPh}_3)_2$ 4)
b) Explain the analytical techniques of neutron activation analysis and
radioanalysis based on radioactivity.
22. Using molecular orbital theory as a guideline, illustrate the bonding
present in dibenzene chromium. (An, CO 1)
- (5 x 2 = 10)**

OBE: Questions to Course Outcome Mapping

CO	Course Outcome Description	CL	Questions	Total Wt.
CO 1	Describe the key concepts of inorganic and organometallic chemistry including those related to synthesis, reaction chemistry, and structure and bonding	A	22	5
CO 2	Explain stability of organometallic compounds and clusters, and their application as industrial catalysts.	U	11, 20, 21	12
CO 3	Categorize the interaction of different metal ions with biological ligands	An	1, 10, 14, 17, 19	11
CO 4	Demonstrate a systematic understanding of the key aspects of nuclear chemistry and their analytical applications	A	3, 8, 13, 21	9

Cognitive Level (CL): Cr - CREATE; E - EVALUATE; An - ANALYZE; A - APPLY; U - UNDERSTAND; R - REMEMBER;