

Your Roll No.....

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School of Chemical & Life Sciences
M.Sc. Chemistry, Semester-II Examinations-2024
Paper Title: Inorganic Chemistry-II
Paper Code: MCHCC – 203

Time 2.5 Hours

Maximum Marks 60

Note: This paper has 3 sections A, B, and C, Attempt all the three sections

Section A: Answer all the questions; Section B: Answer any 2 out of 4; Section C: Answer all the questions, each question has an internal choice.

Abbreviations Used:

CLO- Course Outcome, **PLO-** Program Outcome, **BTL-** Bloom Taxonomy Level: **BT level 1-Remember; BT level 2-Understand; BT level 3-Apply; BT level 4-Analyse; BT level 5-Evaluate, BT level 6-Create**

SECTION A

Very short answer type questions (Attempt all)

(10x1.5 = 15 Marks)

Q. No.	Question	BTL	CLO	PLO
1.	$[\text{Fe}(\text{CO})_4]^x$ complex follows the 18-electron rule. Calculate the value of x.	1-3	2	3
2	Find out the geometry of $[\text{Co}_6(\text{CO})_{16}]$ using Wade's rule.	1-3	2	3
3	Find out the number of improper axes of rotation in S_5 .	4	3	4
4	Calculate the effective atomic number and oxidation state of metal in $[(\text{CH}_3)\text{Mn}(\text{CO})_5]$.	1-2	2	2
5	Draw the structure of Schwartz's reagent.	1	1	1/2
6	What is the selection rule for ESR transitions?	1	1	1/2
7	Calculate the fundamental vibrations in the H_2O molecule.	2-6	6	5
8	Write the selection rule of Mossbauer allowed transition.	1	1	1/2
9.	Draw the ^{31}P NMR spectrum of HPF_2 if $J_{\text{P-F}} > J_{\text{P-H}}$.	2-6	4	5
10.	Calculate the effective atomic number and oxidation state of metal in $[\text{Fe}(\text{H})(\text{Cp})(\text{CO})(\text{Cl})]$.	2-4	3	4

SECTION B

Long answer type questions (Attempt any two out of four)

(2x10 = 20 Marks)

Q. No.	Question	BTL	CLO	PLO
1	Describe the polymerization using the Ziegler-Natta catalyst and discuss the various polymers formed by polymerization.	2-6	3/4	4/5
2	Define the silicates and discuss the different types of silicates.	2-4	3/4	3/4
3	Describe the hydrogenation of alkene using Wilkinson's catalyst and arrange the different alkenes in decreasing order of hydrogenation.	2-6	4-6	5/6
4	Describe the classical and quantum theory of the Raman effect.	1-3	3	1-3

SECTION C

Short answer type questions. (Attempt all the questions)

(5x5 = 25 Marks)

Q. No.	Question	BTL	CLO	PLO
1	Draw the MO diagram and discuss the bonding modes of CO. OR Draw the structure and discuss the structural properties of Zeise's salt.	2-6	3-5	4/5
2	Find out the point group of PCl_5 , BF_3 , H_2O , NH_3 and pyridine. OR Derive Bragg's equation and discuss the application of Bragg's law. Find out the distance between the adjacent Miller planes when first-order X-rays of $2.20 \text{ \AA}$ is incident at 30° on a crystal. ($\sin 30^\circ = 0.5$)	2-5	3-4	2-4
3	Discuss the synthesis and describe the bonding of hexachlorocyclotriphosphazene. OR Describe the β -H elimination with suitable examples.	1-4	2-4	3/4
4	Explain the Mossbauer spectrum of $[\text{Fe}(\text{CN})_6]^{3-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$. OR Draw the hyperfine spectrum of deuterium radical.	1-4	2-4	2/3
5.	Explain the diamagnetic and paramagnetic effect on NMR signals. OR Discuss Kramer's degeneracy and explain the zero-field splitting.	1-3	1-3	2/3