

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BSc
BRANCH: Chemistry

SEMESTER : V
SESSION : MO/2025

SUBJECT: CH333 INORGANIC CHEMISTRY-I

TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

		CO	BL
Q.1(a) Predict the correct structure of $(\mu\text{-CO})_2\text{-}[(\eta^5\text{-C}_5\text{H}_5)\text{Co}]_3(\text{CO})$ based on 18 electron rules.	[1]	1	3
Q.1(b) Determine the number of metal-metal bonds in the following complexes which obeys 18 electron rule: a) $(\text{CO})_2\text{Rh}(\mu\text{-Cl})_2\text{Rh}(\text{CO})_2$ b) $((\eta^5\text{-C}_5\text{H}_5)(\text{CO})\text{Ru}(\mu\text{-CO})_2\text{Ru}(\text{CO})(\eta^5\text{-C}_5\text{H}_5))$	[2]	1	3
Q.1(c) What are the different possible bridging modes of carbon monoxide (CO) to the metal center in metal complexes?	[2]	1	1
Q.2(a) Why alkenes bound to metal are prone to nucleophilic attack rather than electrophilic attack?	[1]	1	2
Q.2(b) Select the best choice in each of the following and briefly justify the reason for your choice. [2] i. Complex with shortest C-O bond: $\text{Ni}(\text{CO})_4$; $[\text{Co}(\text{CO})_4]^+$ ii. Complex with largest M-C bond: $[\text{Fe}(\text{CO})_4]^{2-}$; $[\text{Co}(\text{CO})_4]^+$	[2]	2	3
Q.2(b) Draw the molecular orbital diagram of CO and discuss metal-carbonyl bonding based on Molecular orbital theory and discuss synergistic effect.	[2]	2	2
Q.3(a) Explain the structure of $\text{Co}_2(\text{CO})_8$ and $\text{Mn}_2(\text{CO})_{10}$ based on the Valence bond theory.	[2]	2	1
Q.3(b) Discuss the reaction mechanism of olefin-polymerization using Ziegler-Natta Catalyst.	[3]	2	2
Q.4(a) Define pole strength and lines of force.	[2]	3	1
Q.4(b) Explain Faraday's method of determination of magnetic susceptibility.	[3]	3	2
Q.5(a) Discuss the effect of temperature on ferromagnetic and antiferromagnetic substances.	[2]	3	2
Q.5(b) What is the utility of Pascal constant? Evaluate the diamagnetic correction for Pyridine. [X_{dia} for C is -6.00, H is -2.93, N(ring) is -4.61, C(ring) is -0.24, all the values are in 10^{-6} cgs units/gram atom]	[3]	3	3

:::::19/09/2025:::::E