

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION MO/SP20\*\*)

CLASS: IMSc  
BRANCH: CHEMISTRY

SEMESTER : VI  
SESSION : SP/23

SUBJECT: CH313R1 INORGANIC CHEMISTRY-IV; ORGANOMETALLIC CHEMISTRY

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
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		CO	BL
Q.1(a)	Choose the organometallic complexes from the list: Dichloro, ethylene diammine Pt(II) carbonate, Ferrocene, Ethylene diammine tetra acetato Co(III) ion, bis-(cyclopentadienyl) Ti(III) chloride	[1] 1	1
Q.1(b)	Give example of the following: Ionic organometallic compounds; Organometallic complexes with bridging bonds.	[1] 1	1
Q.1(c)	Discuss the lability of the main group organometallic compounds. In this context explain the higher stability of tetraethyl lead over tetra methyl lead.	[3] 1	2
Q.2(a)	Show the Schlenk equilibrium for grignard reagent.	[2] 1	1
Q.2(b)	With proper diagram, explain the tetrameric cluster of methyl lithium. Also provide valid reason for such aggregation	[3] 2	2
Q.3(a)	Consider the 18-electron rule as a guide and determine the unknown quantity in the following complexes. i) $[\text{Cp}]\text{W}(\text{CO})_x$ (has a W-W single bond) determine x. ii) $\text{MnBr}(\text{CO})_n$ determine n. iii) $[\text{Cp}]\text{Mn}(\text{CO})_x$ (has a Mn=Mn double bond) determine x.	[3] 2	2
Q.3(b)	Select the best choice in each of the following and briefly justify the reason for your choice. 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] 3	2
Q.4(a)	Discuss metal-carbonyl bonding based on Molecular orbital theory and discuss synergistic effect.	[3] 1	
Q.4(b)	Explain the structure of $\text{Mn}_2(\text{CO})_{10}$ and $\text{Fe}(\text{CO})_5$ based on the Valence bond theory.	[2] 2	
Q.5(a)	What is stepwise stability constant and how is it different from overall formation constant.	[2] 1	
Q.5(b)	Define and Distinguish between thermodynamic stability and kinetic stability, giving suitable examples	[3] 1	

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