

Roll No.

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Department of Chemistry
School of Chemical & Life Sciences
BSc. Hons. Chemistry (FYUP)/Semester-V
Paper Title: Organometallic and Bioinorganic Chemistry
Paper Code: BCH DSC502 TH

Time 2.5 Hours

Maximum Marks 60

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

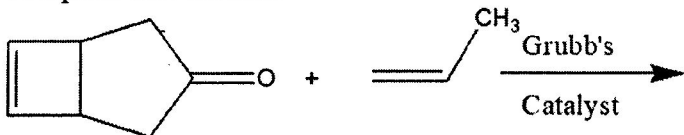
Section A: Answer all the questions; Section B: Answer any 2 out of 4; Section C: Answer all the questions, each question has an internal choice.

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

Concise answer type questions (Attempt all)

(10X2 = 20 Marks)

Q. No.	Question	BTL	CLO	PLO
A1	Calculate the effective atomic number and oxidation state of metal in $[(\eta^3\text{-C}_5\text{H}_5)\text{V}(\text{CO})_3(\text{C}_2\text{H}_4)_2]$.	1-3	1-2	1-2
A2	Complex follows the 18-electron rule. Calculate the value of x in $[(\text{CO})_3\text{Ni} - \text{Co}(\text{CO})_3]^x$.	1-3	1-2	1-2
A3	Using the 18-electron rule, calculate the total number of metal-metal bonds and per metal bonds in $[(\eta^2\text{-C}_2\text{H}_4)_2\text{Rh}(\mu\text{-Cl})]_2$.	1-4	1-3	1-3
A4	Which substrates and catalysts do you use in Hiyama coupling and write the product?	1-2	1-2	1-2
A5	Complete the reaction: 			
A6	Discuss in brief the hydrolase enzyme.	1-2	1-2	1-2
A7	Define the terms cofactor, apoenzyme and holoenzyme.	1-2	1-2	1-2
A8	Discuss in brief the magnetic behaviour of deoxy and oxy myoglobin.	1-3	1-2	1-2
A9	Draw the structure of oxyhemoglobin.	1-2	1-2	1-2
A10	What do you understand by oxidative addition and reductive elimination terms?	1-2	1-2	1-2

SECTION B

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

(2X10 = 20 Marks)

B1	Describe the preparation of ferrocene. Discuss the structural features and stability differences of staggered and eclipsed conformations of ferrocene. Discuss the acetylation and alkylation reaction of ferrocene.	1-5	4-6	4-6
B2	Describe the hydrogenation of alkene using Wilkinson's catalysis loop and write the salient features of Wilkinson's catalyst.	1-5	2-4	2-4
B3	Derive the Lineweaver-Burk equation and explain the plots of it and Michaelis-Menten equation.	1-6	4-6	4-6

B4	What is the role of Ferredoxins? Classify and discuss the properties of ferredoxins.	1-5	2-4	2-4
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SECTION C

Short answer type questions (Attempt all)

(5X4 = 20 Marks)

C1	What do you understand by the hapticity? Using cyclopentadiene explain the concept of hapticity OR What is Zeise's salt? Discuss the preparation bonding and synergistic effect.	1-4	2-4	2-4
C2	Using Valence Bond Theory (VBT), draw the hybridization and the structures of the dimeric carbonyls of $\text{Co}_2(\text{CO})_8$. (hint: carbonyl in both μ^1 and μ^2 forms) OR What is the significance of the 18-electron rule, especially concerning metal carbonyl complexes? Discuss the stability and reactivity of $\text{V}(\text{CO})_6$ is a compound.	1-4	3-6	3-6
C3	What do you mean by Mizoroki-Heck reaction? Write down the catalytic cycle. OR Write the product and draw the catalytic cycle of Stille coupling.	3-6	3-6	3-6
C4	How does temperature and pH affect the rate of enzyme action? OR Discuss enzyme specificity using 'Lock and key' model and the induced fit model.	1-4	1-5	1-5
C5	What do you understand by hematin? How does it form instead of haemoglobin? OR Draw the active site of hemocyanin and discuss its role.	1-4	3-5	3-5
