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BSc-MSc Chemistry, III Semester (FYUP)
End term Examination 2024

Paper Name: Hydrocarbon

Paper Code: BCH-DSC-302

Time: 2.5 hours

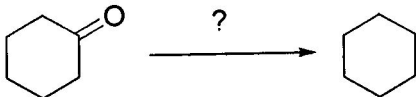
Maximum Marks: 60

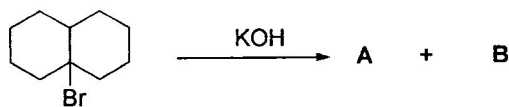
Note: This paper has 3 sections A, B, and C, Attempt all three sections

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 Learning Outcome, PLO- Program learning 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

		BTL	CLO	PLO
PART A				
	<i>Very Short Answer type Question (Attempt <u>ALL</u>)</i>	<i>(10 x $\frac{1}{2}$ = 15 marks)</i>		
1	HVZ reaction cannot be given by a) Butyric Acid; b) Acetic Acid; c) Benzoic Acid; d) phenylacetic acid	2	2-3	3
2	Arrange the following in order of increasing stability a) Cyclopropane; b) cyclobutene; c) cyclohexane and d) cyclopentane b) 1-butene, <i>cis</i> -but2-ene and <i>trans</i> -but-2-ene	3	2-3	3
3	Using Newmann projection, draw the most stable conformer of a) 3-methyl pentane (considering rotation about the C2-C3 bond); b) 3,3-dimethylhexane (considering rotation about the C3-C4 bond)	3-4	3-4	3
4	Which one of the following alkenes when treated with HCl yields majorly an anti-markownikoff product a) <chem>ClC=CC</chem> b) <chem>H2NC=CC</chem> c) <chem>MeOC=CC</chem> d) <chem>F3C=CC</chem>	4	3-5	5
5	Give reagent required for the following conversion: 	4	3-5	5
6	Complete the reaction below where A and B are major and minor products respectively. Write the structure of A and B.	3	3-4	4



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|---|--|---|-----|-----|
| 7 | Draw the ball and stick model of <i>cis</i> and <i>trans</i> decalin | 2 | 1-3 | 1-2 |
| 8 | Complete the reaction given below: | 3 | 3-4 | 4 |



- | | | | | |
|----|--|---|-----|-----|
| 9 | Define Flagpole interaction. | 2 | 1-3 | 1-2 |
| 10 | a) Mercuration-demercuration follows Markovnikov's rule.
(True/False) | 2 | 1-3 | 2 |
| | b) Dichlorocarbene (:CCl ₂) is the electrophile in the Reimer-Tiemann reaction. (True/False) | | | |

PART B

Long Answer type Question (Attempt Any 2)

(2 x 10 = 20 marks)

- | | | | | |
|---|--|-----|-----|-----|
| 1 | a) Explain the Bayer strain theory and describe how it accounts for the stability of cycloalkanes
b) Cyclopropane has reactivity very similar to olefin. Justify | 3 | 4-5 | 3-5 |
| 2 | a) Define Aromaticity.
b) Classify the following compounds as <i>aromatic</i> , <i>anti-aromatic</i> and <i>non-aromatic</i>
i) Cyclopentadiene; ii) Cyclooctatetraene
iii) iv) v)
c) Discuss the aromaticity of Azulene | 2-5 | 2-6 | 2-6 |
| 3 | Write Short note on
a) Clemmensen reduction
b) Wolff Kishner reduction
c) Reimer-Tiemann reaction
d) Diels Alder reaction | 2-5 | 2-5 | 3-6 |
| 4 | When 2-bromo-2-methyl butane is treated with alcoholic KOH under heat, two products are observed:
1. Major product A: A less substituted alkene.
2. Minor product B: A more substituted alkene.
(a) Identify the two products and explain the mechanism that forms each product.
(b) Explain why the less substituted alkene is the major product, referring to Hofmann elimination. | 2-5 | 2-6 | 2-6 |

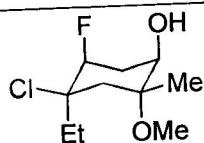
(c) If a strong base like t-BuOK is used, how does the product distribution change, and why?

PART C

Short Answer type Question (attempt All questions)

(6 x 5 = 30 marks)

1



a) Denote cis and trans arrangement of groups

i) Et & Me; ii) OMe & Et; iii) Cl & F; iv) OH & Cl; and v) OMe & F

b) Arrange the following in increasing order of their stability and justify with suitable explanation

i) cis-1,2-cyclohexane-diol; ii) trans-1,2-cyclohexane-diol; iii) cis-1,3-cyclohexane-diol; iv) trans-1,3-cyclohexane-diol

Or

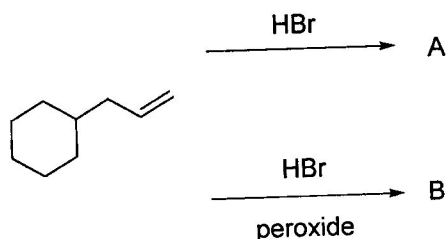
Hydroboration-oxidation is used to synthesize alcohols. What type of alcohol is formed when hydroboration-oxidation is performed on:

a) 1-butene?

b) 2-methyl-1-propene?

2

Complete the following reaction and briefly explain the mechanism involved.

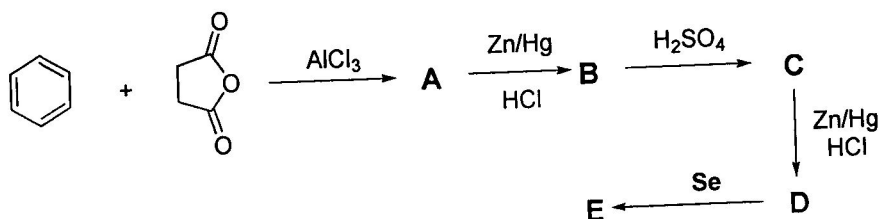


Or

Write the name reaction and reaction condition for the conversion of benzaldehyde to styrene

3

Complete the following reaction and denote the name reactions involved in the following reaction cascade



Or

2-5

5

4

Write the mechanism for the reaction of 1-methylcyclopentene with $\text{Hg}(\text{OAc})_2$ in methanol, followed by NaBH_4 .

4	Discuss the conformation analysis of cyclohexane	2-4	3-5	3-4
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Or

In 1,2-dimethylcyclohexane:

- | | | | | |
|----|---|-----|-----|-----|
| a) | Determine the most stable conformation for <i>cis</i> and <i>trans</i> isomers. | 2-5 | 3-5 | 2-5 |
| b) | Explain how the steric interactions between the substituents influence stability. | | | |

5	Write two methods for the synthesis of anthracene or phenanthrene	3-5	4-6	3-5
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Or

Write two methods for the generation of benzyne

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