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M. Sc. Chemistry, Semester I
End-term Examinations 2023

Paper Name: Organic Chemistry-I

Paper Code: MCHCC-102

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 3* out of 5; **Section C:** Answer *all* the questions, each question has an *internal choice*.

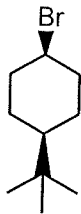
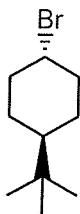
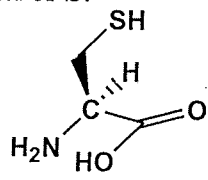
Abbreviations Used

CLO-Course 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.

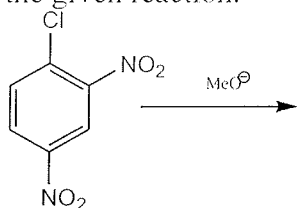
SECTION A

Attempt *all* questions

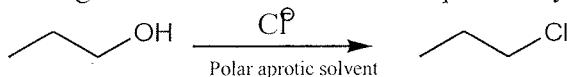
(10x1.5 = 15 marks)

Q. No.	Question	BTL	CLO	PLO
A1	Which reacts faster by S_N1 mechanism, Compound A or B? Why?	4	3	3
	 A  B			
A2	Are these molecules are Enantiomers , Diastereomers or the Same ? (4E,2R)-Hex-4-ene-2-ol and (4Z,2S)-Hex-4-ene-2-ol	2	3	2
A3	Assign the configuration to the stereogenic carbon in the given compound as R or S .	3	2	1
				
A4	Describe how resonance affects the acidity of carboxylic acids, particularly comparing the effects of electron-withdrawing and electron-donating substituents on the aromatic ring of benzoic acid derivatives.	4	1	2
A5	Draw an energy diagram for a two-step reaction with overall negative ΔG , where the intermediate has higher energy than reactant and its first transition state have the higher energy than second transition state.	4	3	3

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| A6 | What are carbenes, discuss the types and shape of carbenes. | 2 | 2 | 1 |
| A7 | Complete the given reaction. | 2 | 3 | 2 |

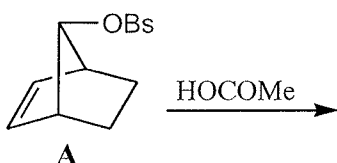


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| A8 | The following reaction does not occur. Explain why? | 3 | 3 | 3 |
|----|---|---|---|---|



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|----|--|---|---|---|
| A9 | What is primary kinetic isotopic effect in organic reaction mechanism explain. | 4 | 3 | 2 |
|----|--|---|---|---|

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|-----|--|---|---|---|
| A10 | The rate constant for acetolysis of given compound A is greater than expected rate constant Explain. | 5 | 4 | 1 |
|-----|--|---|---|---|



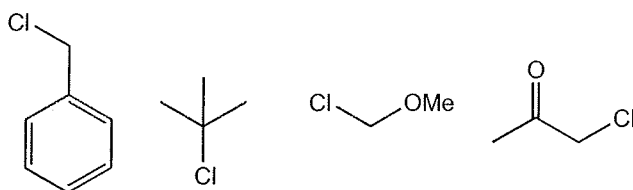
SECTION B

Attempt *any two* out of four

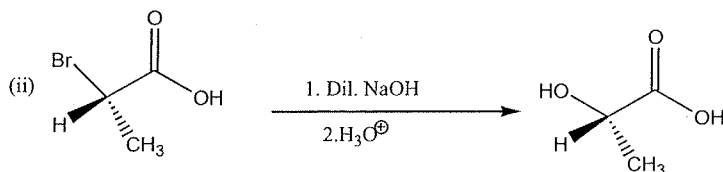
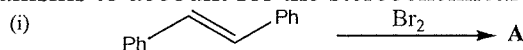
(2x10=20 marks)

Q. No.	Question	BTL	CLO	PLO
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|----|---|---|---|---|
| B1 | Discuss the factors which influence the stability of the carbocations generated from the following four compounds after loss of chloride. | 4 | 2 | 3 |
|----|---|---|---|---|



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|----|--|---|---|---|
| B2 | For each of the following reactions, give the structures of any unknown products (where relevant) and provide detailed mechanisms to account for the stereochemical outcome. | 6 | 4 | 2 |
|----|--|---|---|---|



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|----|--|---|---|---|
| B3 | What are enantiotopic and diastereotopic atoms. Describe how enantiotopic and diastereotopic atoms can be differentiated in a chiral environment, using the example of lactic acid methyl ester. | 4 | 4 | 3 |
|----|--|---|---|---|

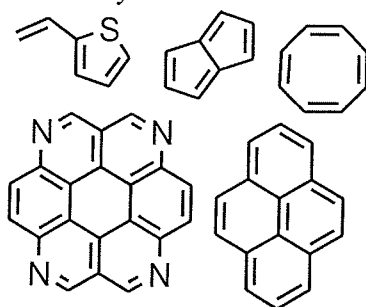
- B4 Detail the step-by-step mechanism of acid catalysed and base catalysed ester hydrolysis, and explain how the reaction kinetics differ between these two processes? 5 5 3

SECTION C

Attempt *all* questions, each question has an *Internal choice*

(5*5=25 Marks)

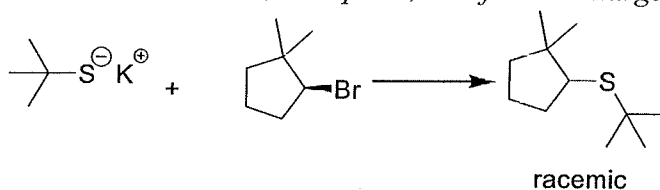
Q. No.	Question	BTL	CLO	PLO
C1	Class each of the following as non-aromatic or being/containing aromatic or anti-aromatic systems.	3	2	2



OR

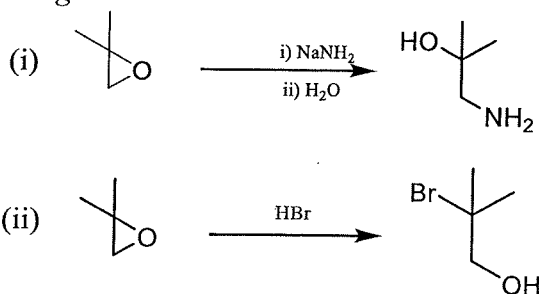
Discuss the role of resonance and hyperconjugation in determining the bond length and bond strength in conjugated dienes and enones. 1-3 1-3 1-3

- C2 Propose a reasonable mechanism for the reaction. *Show all necessary intermediates, curved arrows, lone pairs, and formal charges.* 6 4 3



OR

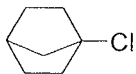
Propose mechanisms for the following reactions. *Show all necessary intermediates, curved arrows, lone pairs, and formal charges.* 6 5-6 5-6



- C3 Distinguish between classical and non-classical carbocations. Discuss the non-classical carbocations with suitable examples. 5 4 3

OR

Explain the observation that following bicyclo[2,2,1]heptan-1-yl chloride is exceedingly unreactive towards nucleophilic and solvolytic conditions.



bicyclo[2,2,1]heptan-1-yl chloride

- C4 How do resonance and field effects influence the rate of electrophilic aromatic substitution, and how can this be quantitatively assessed using the Hammett equation? 4 3 2

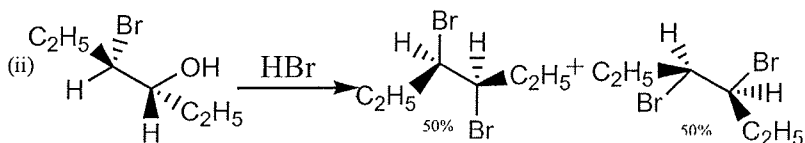
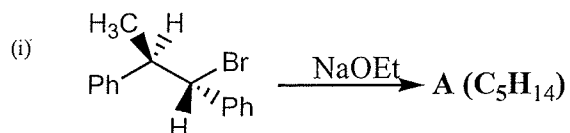
OR

What are the limitations in the scope of the Smiles rearrangement, particularly in the context of synthesizing heterocyclic compounds?

- C5 Explain the concept of axial chirality in biphenyls, focusing on the conditions under which a biphenyl compound can exhibit chirality, and the factors influencing its atropisomerism. 5 3 1

OR

For each of the following reactions, give the structures of any unknown products (where relevant) and provide detailed mechanisms to account for the stereochemical outcome.



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