

Total number of printed pages-8

3 (Sem-3/CBCS) CHE HC 2

2021

(Held in 2022)

**CHEMISTRY**

(Honours)

Paper : CHE-HC-3026

**(Organic Chemistry-II)**

Full Marks : 60

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

1. Answer the following questions :  $1 \times 7 = 7$

(a) Write the name of a thiol compound that can be used as an antidote for mercury poisoning.

(b) Arrange the following compounds in order of reactivity toward  $S_N2$  reaction :

1-Bromobutane,

1-Bromo-2,2-Dimethylpropane

1-Bromo-2-Methylbutane

1-Bromo-3-Methylbutane

Contd.

- (c) With increasing temperature, elimination is favoured over substitution. Why?
- (d) What is meant by cine-substitution?
- (e) Name a reagent used to convert cyclohexylmethanol to cyclohexanecarboxaldehyde.
- (f) Give two ways in which you can convert the poor leaving group in ROH to a good leaving group.
- (g) What happens when diethylsulfide reacts with hydrogen peroxide and acetic acid?

2. Answer the following questions :  $2 \times 4 = 8$

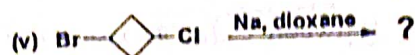
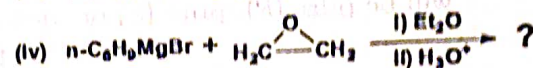
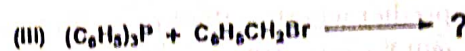
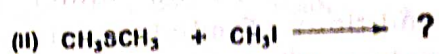
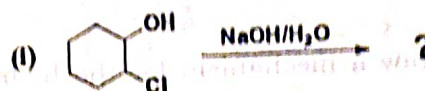
- (a) How can you prepare lactic acid from propanoic acid?
- (b) Why is Ethylacetoacetate (EAA) called an active methylene compound?
- (c) Explain why the boiling point of ethylene glycol is much lower than that of glycerol.

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(d) Between thiol and alcohol, which one is more acidic and why?

3. Answer **any three** of the following questions :  $5 \times 3 = 15$

(a) Predict the major product in each of the given reactions :  $1 \times 5 = 5$

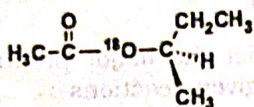


(b) What product(s) is/are obtained when *m*-chlorotoluene is treated with sodium amide in liquid  $\text{NH}_3$ ? Propose a mechanism to justify the product(s) formed.  $1+4=5$

(c) What is Bouveault-Blanc reaction? Explain the mechanism of the reaction by considering a suitable example.  $1+4=5$

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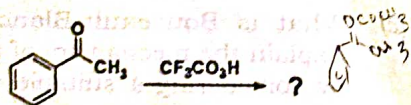
- (d) Suppose we have some optically pure (*R*)-2-butyl acetate that has been 'labeled' with the heavy  $^{18}\text{O}$  isotope at one oxygen atom as shown.



Draw a mechanism for the hydrolysis of this compound under basic conditions. Predict which of the products will contain the  $^{18}\text{O}$  label. Also predict whether the butan-2-ol product will be pure (*R*), pure (*S*) or racemized.

3+1+1=5

- (e) (i) Between  $\text{C}_6\text{H}_5\text{CHO}$  and  $\text{CH}_3\text{CHO}$ , which one is less reactive towards nucleophiles and why? 2  
 (ii) Predict the product and propose a mechanism of the following reaction: 3

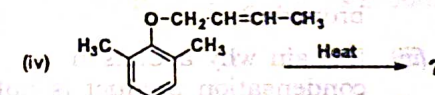
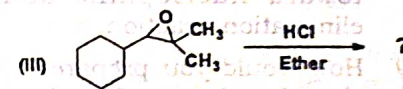
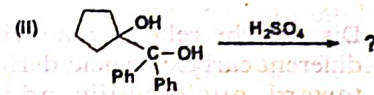
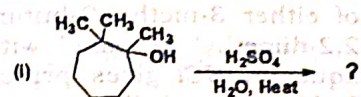


4. Answer **any three** of the following :

10×3=30

- (a) Predict the product and propose mechanisms of the following reactions :

3+3+2+2=10



- (b) (i) 2,3-Epoxypropane when reacts with methanol under acidic conditions yield 2-Methoxy-propan-1-ol as major product, but under basic conditions yield 1-Methoxy-propan-2-ol. Explain.

5

(ii) Explain why the acid-catalyzed condensation is a poor method for the synthesis of an unsymmetrical ether such as ethyl methyl ether. 2

(iii) Provide a mechanistic explanation for the observation that treatment of either 3-methyl-2-butanol or 2,2-dimethyl propanol with hot aqueous HCl gives principally 2-chloro-2-methylbutane. 3

(c) (i) Discuss the relative reactivities of different carboxylic acid derivatives toward nucleophilic addition-elimination reaction. 5

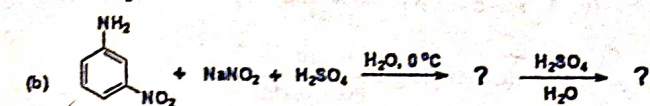
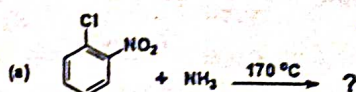
(ii) How would you prepare phenylacetic acid from benzyl bromide? 2

(iii) Explain why a Claisen condensation product is not obtained from ester such as ethyl 2-methylbutanoate. 3

(d) (i) Compare S<sub>N</sub>1 and S<sub>N</sub>2 reactions with regard to

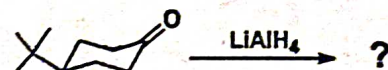
- (1) stereochemistry;
  - (2) kinetic order;
  - (3) occurrence of rearrangements.
- 2+2+1=5

(ii) Complete the following reaction and write the mechanism : (any one) 3



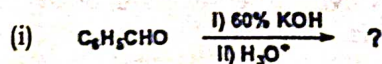
(iii) N-Methylpropanamide does not undergo Hofmann rearrangement when treated with aqueous sodium hypobromite. Explain. 2

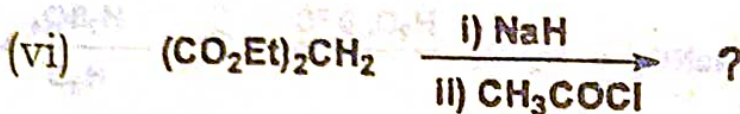
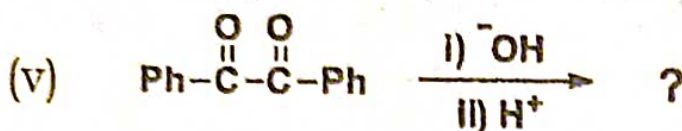
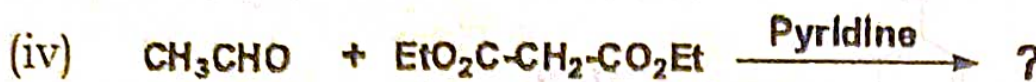
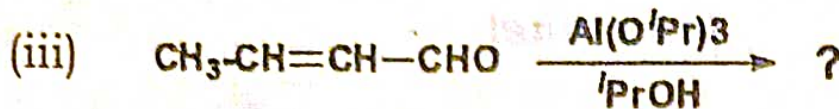
(e) (i) Write the products obtained and state whether they are related to each other as diastereomers or enantiomers. 2



(ii) How can you convert cyclohexanone to nylon? Write the reaction. 2

(iii) Predict the products formed : 1×6=6

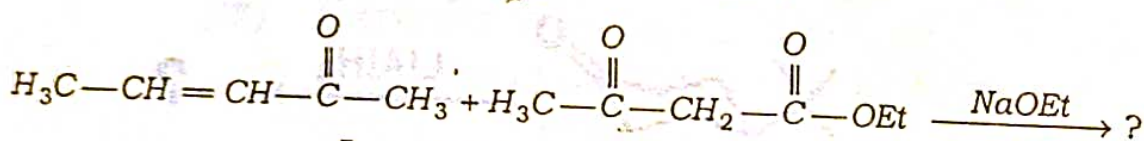




(f) (i) What are ylides? How can you prepare methylenecyclohexane using Wittig reaction? Propose a mechanism for the reaction clearly stating the steps involved.

1+1+3=5

(ii) Identify the product in the following reaction :



In this reaction which substrate is the Michael acceptor and which one is the Michael donor? 2

(iii) Propose a mechanism for acid-catalysed aldol condensation involving the reaction of acetone with HCl. 3