

2021

## CHEMISTRY — HONOURS

Third Paper

(Group - A)

Full Marks : 50

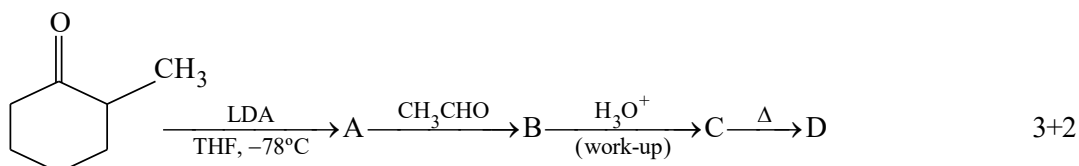
*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

CHT-22a

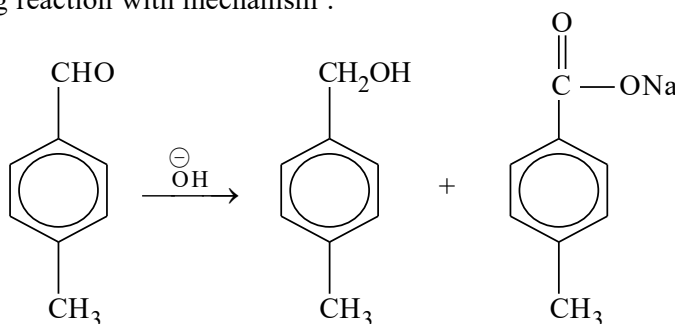
Unit - I

Answer *any three* questions.

1. (a) What are the products obtained when a mixture of  $\text{CH}_3\text{CHO}$  and  $\text{HCHO}$  is treated with  $\text{Al}(\text{OEt})_3$ ? Explain with mechanism.
- (b) Convert  $\text{H}_3\text{C} - \text{C} \equiv \text{C} - \text{CH}_3$  to  $\text{H}_3\text{C} - \text{CH}(\text{D})\text{COCH}_3$ . 3+2
2. (a) Cyclopentadiene reacts with maleic anhydride much faster than 1, 3-butadiene in a thermal Diels-Alder reaction. Explain this observation showing the adducts.
- (b) Identify A to D of the following reaction sequence (mechanism not required) :



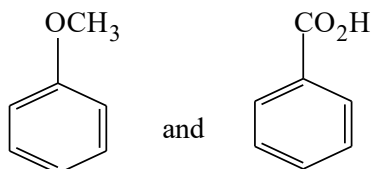
3. (a) Write down the structures of the ozonides formed when 2,3-dimethyl-2-butene is subjected to ozonolysis. Give also the mechanism of ozonide formation.
- (b) Convert  $\text{HC} \equiv \text{C} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \longrightarrow \text{H}_2\text{C} = \text{CH} - \text{CH} = \text{CH} - \text{CH}_3$  3+2
4. (a) Explain the following reaction with mechanism :



- (b) Predict the products of the reaction of  $\text{HBr}$  with (i)  $\text{F}_3\text{C} - \text{CH} = \text{CH}_2$  and (ii)  $\text{CH}_3\text{O} - \text{CH} = \text{CH}_2$ . 3+2

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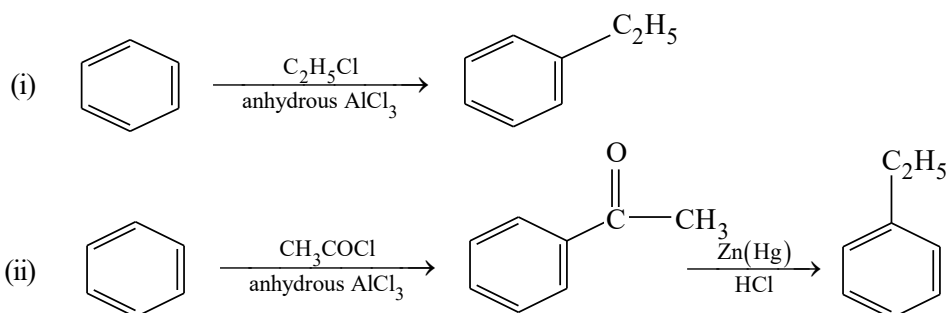
5. (a) Indicate the product stereochemistry along with mechanism, in each case, for the reactions of *cis*-2-butene and *trans*-2-butene with alkaline  $\text{KMnO}_4$ .
- (b) Predict the major product in each case of Birch reduction of the following compounds (mechanism not required) : 3+2



### Unit - II

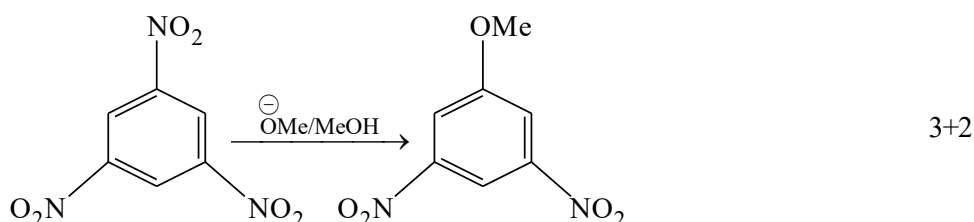
Answer *any two* questions.

6. (a) Ethylbenzene can be prepared by the following two methods :

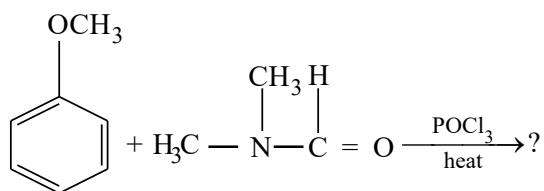


Which method is better and why?

- (b) Account for the following observation :



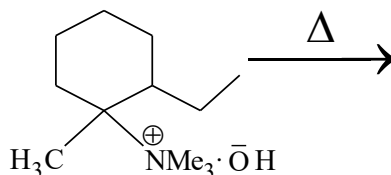
7. (a) In presence of pyridine, the *threo*- isomer of 1, 2-dibromo-1, 2-diphenylethane undergoes dehydrobromination to give (*Z*)-1-bromo-1, 2-diphenylethene, whereas the *erythro*- isomer undergoes debromination to give (*E*)-1, 2-diphenylethene. Account for this observation.
- (b) Predict the product with suitable mechanism. 3+2



(3)

T(II)-Chemistry-H-3A

8. (a) Both *o*-bromoanisole and *m*-bromoanisole give same product on treatment with  $\text{NaNH}_2/\text{liq}\cdot\text{NH}_3$ . Account for the following observation.
- (b) Write down the major product in the following reaction and explain its formation : 3+2



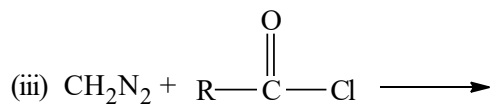
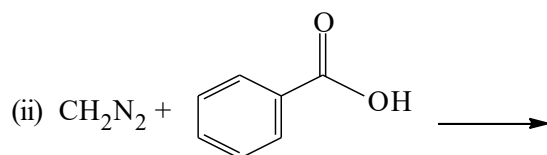
CHT-22b

Unit - I

Answer *any three* questions.

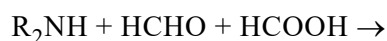
9. (a) Use Reformatsky reaction to synthesize  $\text{PhC}(\text{Me})=\text{C}(\text{Me})\text{CO}_2\text{H}$ . Why can we not use magnesium in place of zinc in this synthesis?
- (b) Alkaline hydrolysis of benzonitrile affords the salt of an acid but in presence of hydrogen peroxide, an amide is formed. Explain. 3+2
10. (a) Show how you would prepare the following compounds employing Grignard's reaction on bromobenzene :
- (i) 1-phenylethanol
  - (ii) 2-phenylpropene
  - (iii) benzyl bromide.
- (b) Convert Aniline  $\rightarrow$  1, 2, 3-Tribromobenzene. 3+2
11. (a) Write down Gabriel Phthalimide Synthesis for the preparation of  $\text{EtNH}_2$ . Why can we not prepare a primary amine like  $\text{Et}_3\text{C-NH}_2$  by this method?
- (b) Convert using an organometallic compound :
- p*-Nitrotoluene  $\longrightarrow$  *p*-Nitroacetophenone 3+2
12. (a) Explain mechanistically the difference in the pattern of coupling of benzene diazonium cation with (i) aniline and (ii) *N,N*-dimethyl aniline.
- (b) Explain why diazoacetic ester is more stable than diazomethane. 3+2
13. (a) Complete the reactions :
- (i)  $\text{CH}_2\text{N}_2 + \text{C}_2\text{H}_5\text{OH} \rightarrow$

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(b) Give the products showing plausible mechanism of the following reaction :

3+2



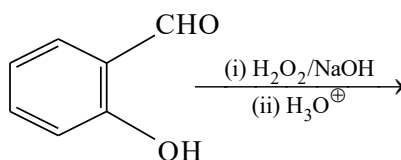
### Unit - II

Answer *any two* questions.

14. (a) How will you prepare phenol from benzene via cumene? Give the mechanism of the reactions involved.

(b) Predict the product of the following reaction with plausible mechanism :

3+2

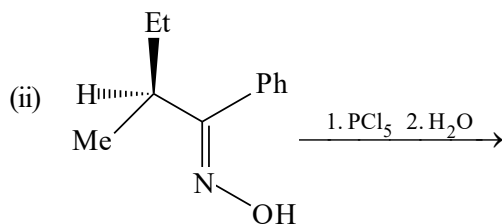
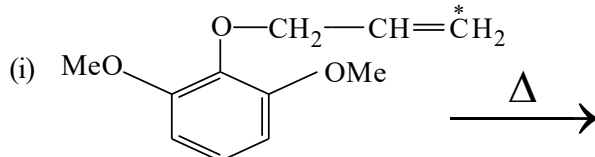


15. (a) Both  $\text{Ph}_2\text{C}(\text{OH})-\text{C}(\text{OH})\text{Me}_2$  and  $\text{Ph}(\text{Me})\text{C}(\text{OH})-\text{C}(\text{Me})(\text{OH})\text{Ph}$  on treatment with conc.  $\text{H}_2\text{SO}_4$  gives the same ketone. Explain mechanistically.

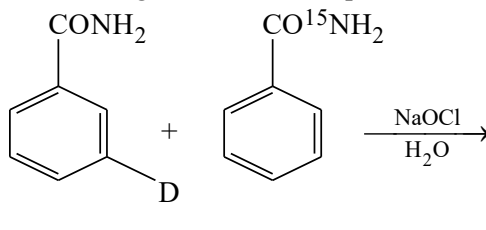
(b) What happens when diazoamino benzene is treated with dil. HCl? Explain mechanistically.

3+2

16. (a) Predict the products of the following reactions and give the mechanism :



(b) Predict the products of the following reaction and explain their formation :



3+2