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

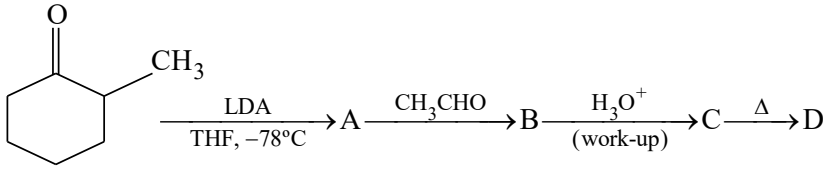
Answer ***any three*** questions.

1. (a) What are the products obtained when a mixture of CH_3CHO and HCHO is treated with $Al(OEt)_3$? Explain with mechanism.

(b) Convert $H_3C - C \equiv C - CH_3$ to $H_3C - CH(D)COCH_3$. 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) :

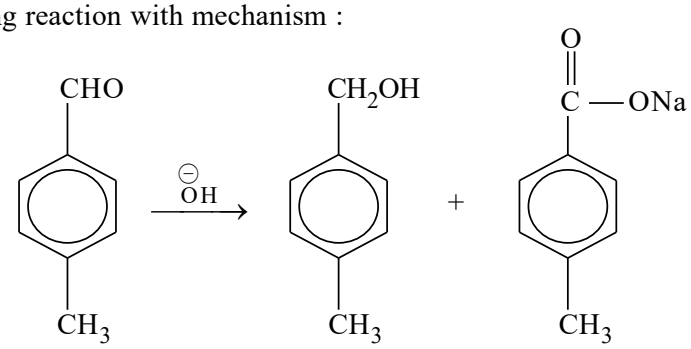


3+2

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 $HC \equiv C - CH_2 - CH_2 - CH_3 \longrightarrow H_2C = CH - CH = CH - CH_3$ 3+2

4. (a) Explain the following reaction with mechanism :

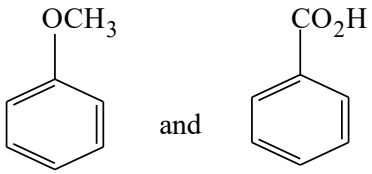


(b) Predict the products of the reaction of HBr with (i) $F_3C - CH = CH_2$ and (ii) $CH_3O - CH = CH_2$. 3+2

Please Turn Over

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 $KMnO_4$.

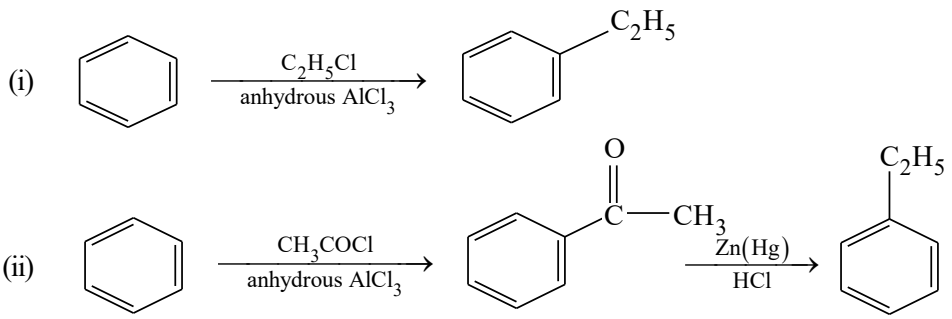
(b) Predict the major product in each case of Birch reduction of the following compounds (mechanism not required) : 3+2



Unit - II

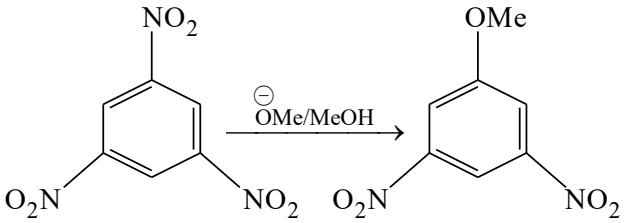
Answer ***any two*** questions.

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



Which method is better and why?

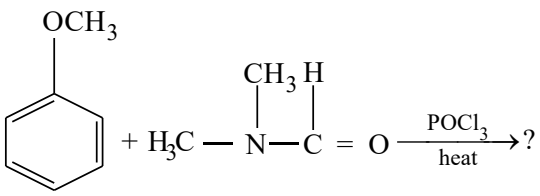
(b) Account for the following observation :



3+2

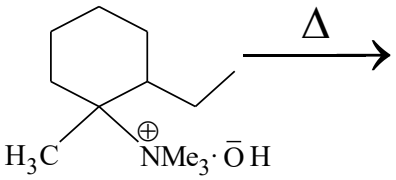
7. (a) In presence of pyridine, the *threo*- isomer of 1, 2-dibromo-1, 2-diphenylethane undergoes dehydrobromination to give (*Z*)-1-bromo-1, 2-diphenylethene, whereas the *erythro*- isomer undergoes debromination to give (*E*)-1, 2-diphenylethene. Account for this observation.

(b) Predict the product with suitable mechanism. 3+2



8. (a) Both *o*-bromoanisole and *m*-bromoanisole give same product on treatment with $NaNH_2/liq{\cdot}NH_3$. 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 $PhC(Me) = C(Me)CO_2H$. 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 → 1, 2, 3-Tribromobenzene. 3+2

11. (a) Write down Gabriel Phthalimide Synthesis for the preparation of $EtNH_2$. Why can we not prepare a primary amine like $Et_3C–NH_2$ by this method?

(b) Convert using an organometallic compound :

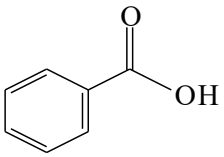
p-Nitrotoluene ⟶ *p*-Nitroacetophenone 3+2

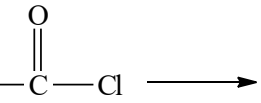
12. (a) Explain mechanistically the difference in the pattern of coupling of benzene diazonium cation with (i) aniline and (ii) N,N-dimethyl aniline.

(b) Explain why diazoacetic ester is more stable than diazomethane. 3+2

13. (a) Complete the reactions :

(i) $CH_2N_2 + C_2H_5OH \rightarrow$

(ii) CH_2N_2 +  ⟶

(iii) CH_2N_2 +  ⟶

(b) Give the products showing plausible mechanism of the following reaction : 3+2

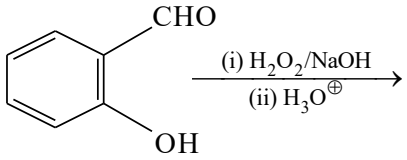
$R_2NH + HCHO + HCOOH \rightarrow$

Unit - II

Answer ***any two*** questions.

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

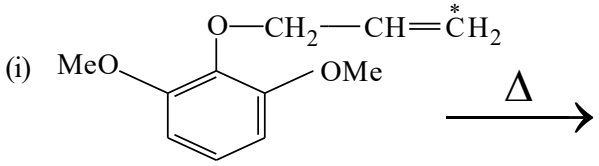
(b) Predict the product of the following reaction with plausible mechanism : 3+2

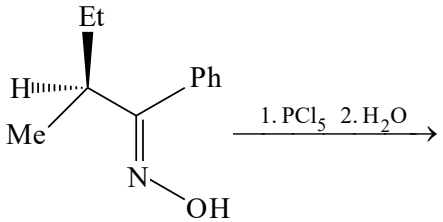


15. (a) Both $Ph_2C(OH) - C(OH)Me_2$ and $Ph(Me)C(OH) - C(Me)(OH)Ph$ on treatment with conc. H_2SO_4 gives the same ketone. Explain mechanistically.

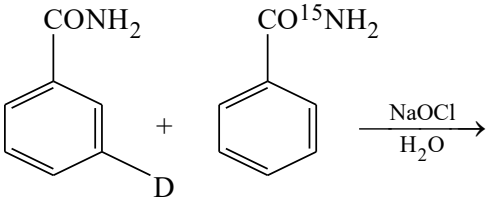
(b) What happens when diazoamino benzene is treated with dil.HCl? Explain mechanistically. 3+2

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

(i) 

(ii) 

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



3+2