

2022

CHEMISTRY — HONOURS

Paper : CC-7

(Organic Chemistry)

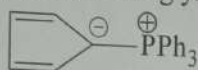
Full Marks : 50

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*Answer **question number 1** (compulsory) and **any eight (08)** questions from the rest (from **question number 2 to question number 12**).1. Answer **any ten** questions :

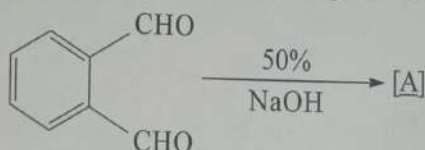
1×10

(a) Acetals are stable to bases. Explain.

(b) Explain why the following ylide does not participate in Wittig reaction :



(c) Identify the product [A] in the following reaction :

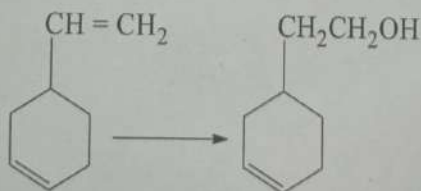


(d) What will be the major product when ketene is made to react with HCl?

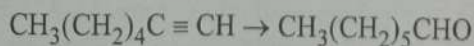
(e) In Kolbe's reaction for the synthesis of salicylic acid, NaOH is preferred over KOH. Why?

(f) Explain why β -hydroxyesters can be prepared by the Reformatsky reaction and not by Grignard reaction.

(g) How can you accomplish the following conversion?

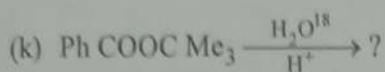


(h) Indicate the reagents required for the following conversion :

(i) CF_3CHO gives a stable hydrate. Explain.

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(j) When aniline is subjected to Friedel-Crafts alkylation in the presence of catalytic amount of AlCl_3 , alkylation does not occur; while in presence of large excess of AlCl_3 , a very small amount of *m*-alkylaniline is obtained. Explain precisely.



Identify the product(s). (Mechanism not needed)

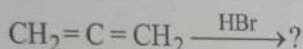
(l) How can you convert R_2CHCOOH to $\text{R}_2\text{CBrCOOH}$? (No mechanism required)

2. (a) *cis*-2-Butene produces optically inactive racemic 2,3-butanediol (resolvable) on treatment with *mcpba* followed by acid catalysed hydrolysis; whereas *trans*-2-butene produces optically inactive *meso*-2,3-butanediol (non-resolvable). Justify with plausible mechanism.

(b) A six membered cyclic compound gives $\text{CH}_2(\text{CHO})_2$ as the only product of ozonolysis. Identify the compound. 3+2

3. (a) Reaction of acetone with equivalent proportion of bromine yields monobromoacetone under an acid catalysed condition. Explain with proper reaction mechanism.

(b) Predict the product of the following reaction with proper reasonings.

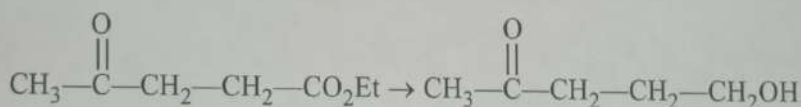


3+2

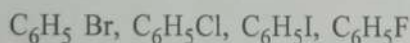
4. (a) Give two Wittig alkene synthesis of 2-methyl-1-hexene. Is one synthesis preferred over the other? Why?

(b) Carry out the following conversion :

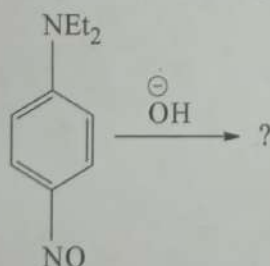
3+2



5. (a) Arrange the following halobenzenes in increasing rate for nitration reaction. Justify your answer.



(b)



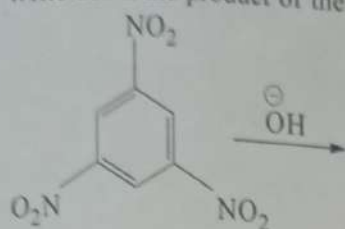
Identify the product(s) with proper justification.

3+2

6. (a) Benzene reacts with trimethylacetyl chloride in the presence of anhydrous AlCl_3 at elevated temperatures to give *p*-tertiarybutylbenzene as one of the products; but toluene with the same reagent, at a lower temperature gives *p*-tertiarybutyl acylated product only. Explain the facts showing proper reactions.

- (b) Write down the product of the following reaction showing mechanism :

3+2

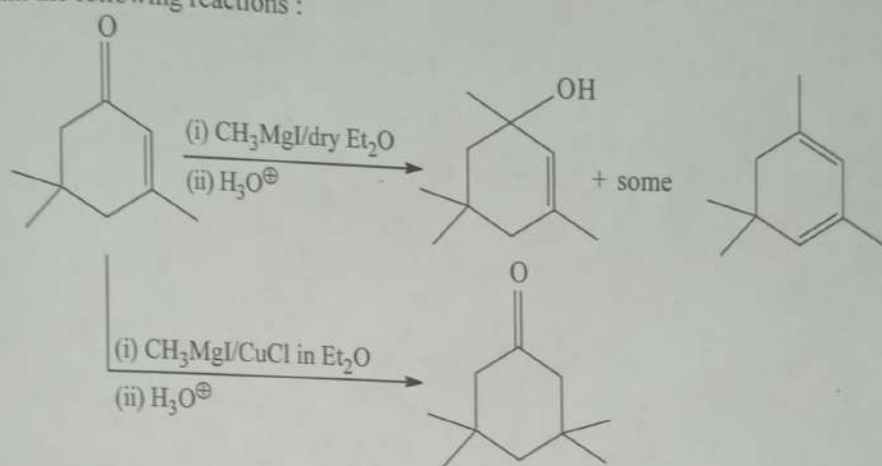


7. (a) Justify with proper mechanism, why *m*-chlorotoluene on treatment with $\text{KNH}_2/\text{NH}_3(l)$ yields *m*-toluidine in large excess over *o*- and *p*-toluidines.

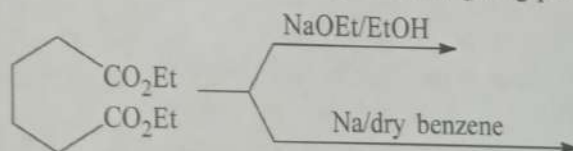
- (b) Show mechanistically how *o*-xylene when heated at 80°C with anhydrous AlCl_3 and HCl converts to *m*-xylene.

3+2

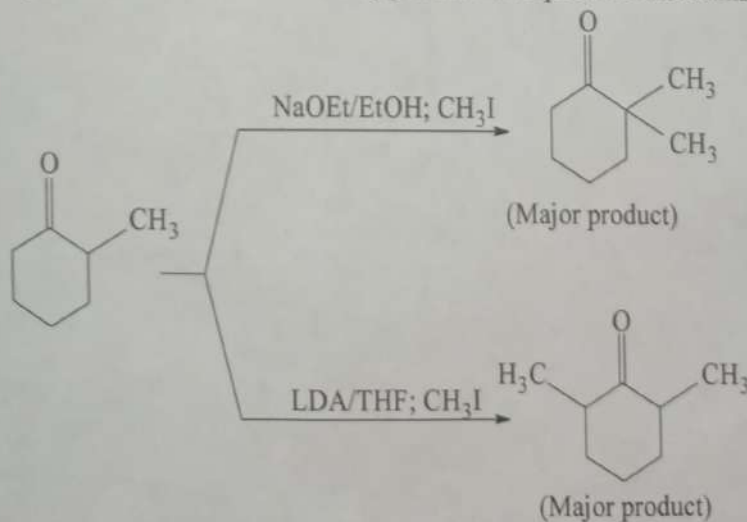
8. (a) Explain the following reactions :



- (b) Predict the product(s) in each of the following reactions giving plausible mechanistic steps : 3+2

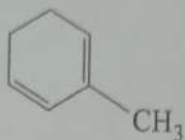


9. (a) Explain the formation of following products with plausible mechanism.

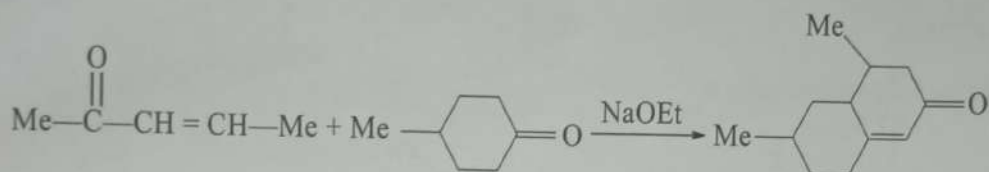


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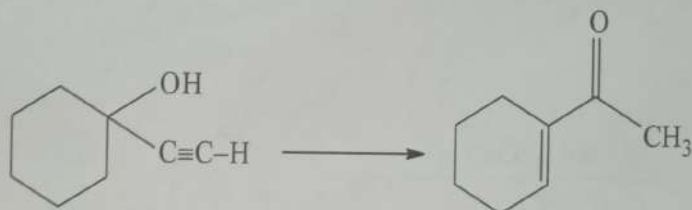
- (b) Predict the products expected to be formed from the following alkene on treatment with ozone followed by oxidative work up with H_2O_2 . 3+2



10. (a) Suggest Corey-House synthesis of 3-methyloctane using Gilman reagent. Why can't alkyllithium reagent be used for this synthesis?
 (b) Suggest mechanistic steps for the following conversion : 3+2



11. (a) Carry out the following transformation mentioning proper reagents and show the plausible mechanism.



- (b) Explain why *o*-nitrobenzaldehyde undergoes benzoin condensation but *p*-nitrobenzaldehyde does not. 3+2
12. (a) When *o*-hydroxybenzoic acid is treated with excess Br_2/H_2O , a heavy white precipitate settles down with the evolution of a colourless gas. Explain mechanistically the products formed along with proper justification of the course of the reaction.
 (b) Identify the product with proper mechanism. 3+2

