

2021

CHEMISTRY — HONOURS

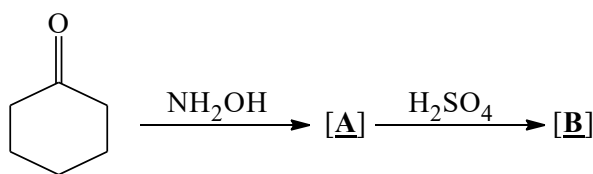
Paper : CC-8

[Organic Chemistry-4]

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 no. 1** and **any eight** questions from the rest (Q. Nos. 2-13).1. Answer **any ten** questions :

1×10

(a) Give the structures of **[A]** and **[B]** in the following reaction :(b) Convert PhCHO to PhCOCH₃ using umpolung technique.

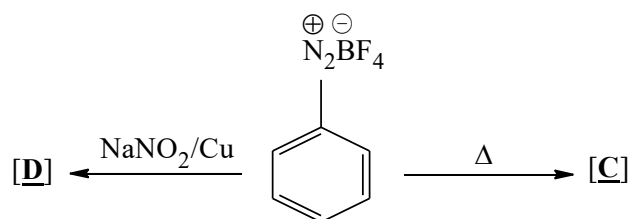
(c) Give one example of each of the following :

(i) Illogical electrophile

(ii) Illogical nucleophile.

(d) 2-Butyne does not show — C≡C — stretching frequency in its IR spectrum. Explain.

(e) The UV spectrum of aniline in dilute acid solution is very similar to that of benzene. Explain.

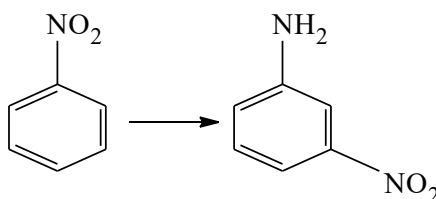
(f) Give the structures **[C]** and **[D]** in the following reaction :

(g) Give examples of two NMR active nuclei.

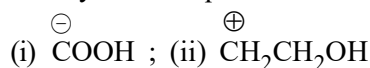
(h) What is the range of infrared radiations for organic compounds?

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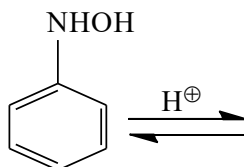
- (i) Carry out the following conversion :



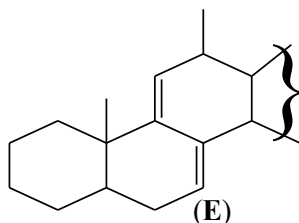
- (j) Write synthetic equivalents corresponding to the following synthons :



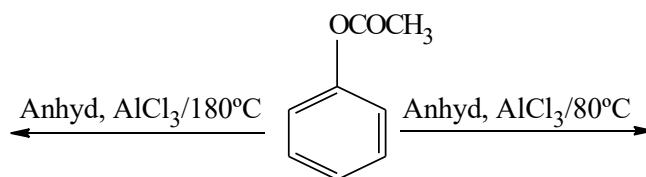
- (k) Suggest a reason for the use of
- excess*
- mineral acid in the diazotisation reaction.
-
- (l) Give the product of the following reaction along with the plausible mechanism.



2. (a) An isomeric dinitrobenzene shows three signals in its ¹H NMR spectrum. Identify the compound. Compare the relative δ values of the protons and give reasons.
- (b) Calculate λ_{max} for the following compound (**E**) using Woodward's diene rules. 3+2



3. (a) *p*-Toluidine reacts with benzenediazonium chloride to form a compound, which on boiling with H₂SO₄ gives four products (excluding nitrogen). — Discuss.
- (b) R-CONHMe does not undergo Hofmann amine formation reaction. Offer an explanation. 3+2
4. (a) Compare the reaction behaviour of aniline, N-methylaniline, and N, N-dimethylaniline towards NaNO₂ and dilute HCl. Explain the reactions.
- (b) What happens when PhCH₂COCl is treated with CH₂N₂ and the resultant product is allowed to react with Ag₂O in water? Give mechanism for the second step of the reaction. 3+2
5. (a) Give the product(s) of the following reactions along with plausible mechanisms.

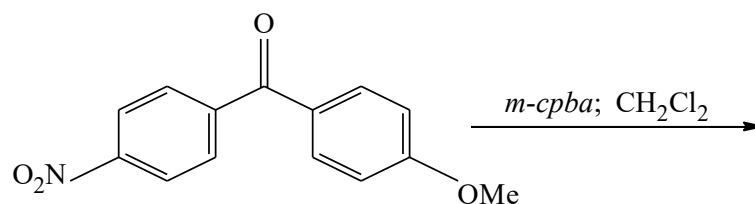


How do you justify the formation of different products with the change in reaction temperature?

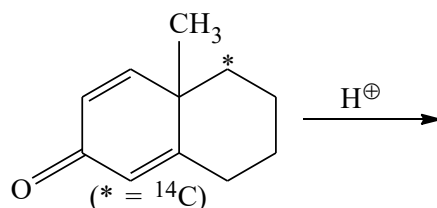
(3)

T(4th Sm.)-Chemistry-H/CC-8/CBCS

- (b) Give the product(s) of the following reaction along with the mechanism involved in it. 3+2

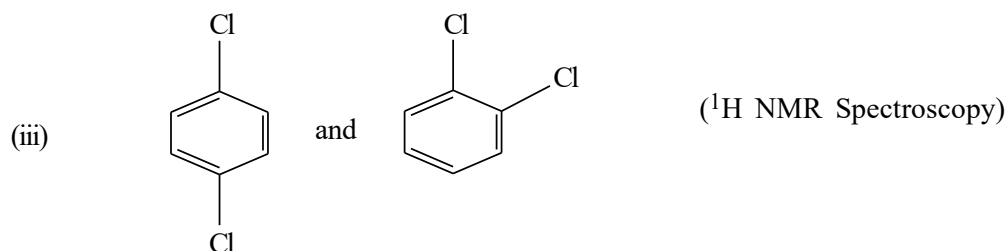
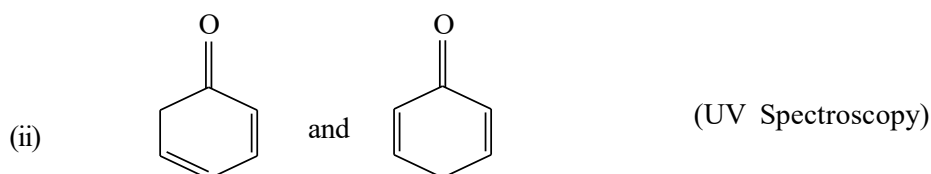
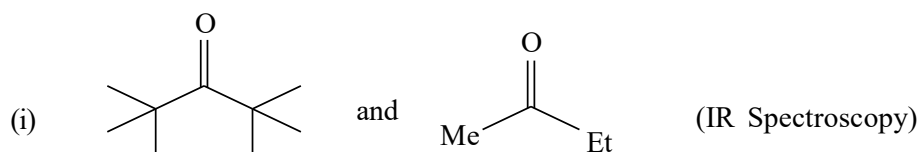


6. (a) Give the product(s) of the following reaction along with the plausible mechanism.

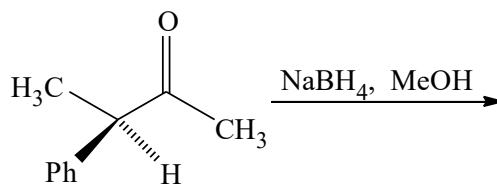


- (b) Give any two reasons for use of TMS as a reference compound in ^1H NMR spectroscopy. 3+2

7. (a) Distinguish between the following compounds with the help of spectroscopic methods given within the parenthesis.

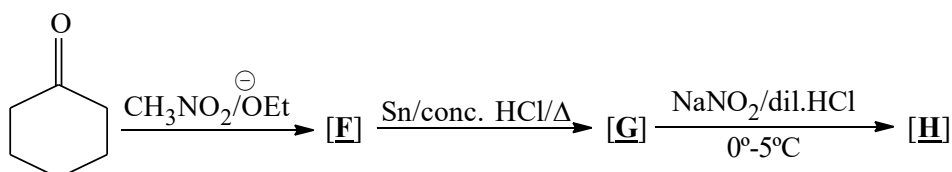


- (b) In the following reaction, use *Felkin-Anh's model* to determine the stereochemistry of the major product. 3+2



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8. (a) Suggest structures [F], [G] and [H]. Also suggest a mechanism of conversion from [G] to [H].

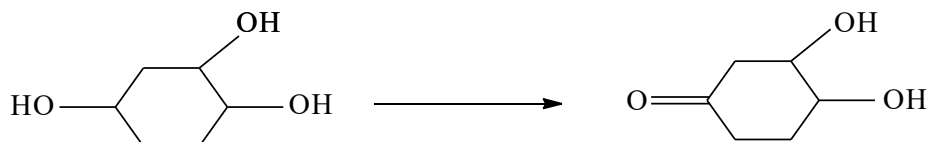


- (b) Mention two chemical differences between RCN and RNC. 3+2

9. (a) A compound $\text{C}_4\text{H}_6\text{O}_2$ shows a very strong IR peak at 1720 cm^{-1} and only a 6H,s in its ^1H NMR spectrum. Analyse the structure of the compound with proper justification.

- (b) What type of change is observed in the UV spectrum of mesityl oxide when the solvent is changed from octane to methanol? Justify your answer. 3+2

10. (a) Mention two criteria for a good protecting group. Using protection and deprotection techniques, outline the following transformation :

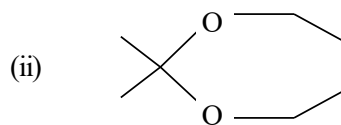
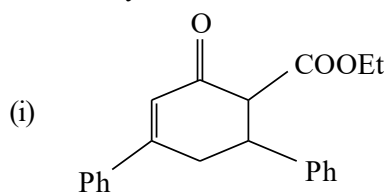


- (b) Benzaldehyde fails to undergo Dakin's reaction. Account for the observation. 3+2

11. (a) Alkyl halides give mainly cyanides with aqueous ethanolic KCN, but with AgCN, isocyanides become the major products. Account for these observations.

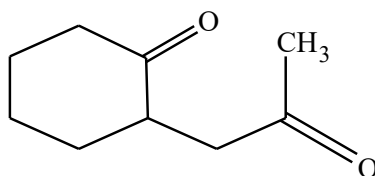
- (b) Very dilute solution of ω -bromo aliphatic acids in butanone on boiling in presence of potassium carbonate give lactones, but concentrated solution of the same give polymeric compounds. Explain. 3+2

12. (a) Give retrosynthesis and efficient synthesis of the following target molecules :



- (b) Depict both retrosynthesis and an efficient forward synthesis of the following compound :

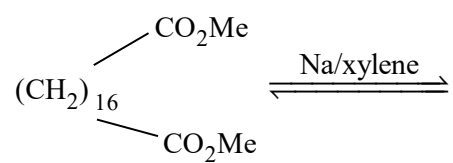
(1½+1½)+2



(5)

T(4th Sm.)-Chemistry-H/CC-8/CBCS

13. (a) Give the product and mechanism of the following reaction :



Explain how the addition of Me_3SiCl benefits the formation of product in the reaction.

(b) Benzidine rearrangement is intramolecular in nature. Justify the statement.

3+2
