2026

CHEMISTRY — HONOURS

Paper : DSCC-6

(Organic Chemistry - II)

Full Marks : 75

The figures in the margin indicate full marks.

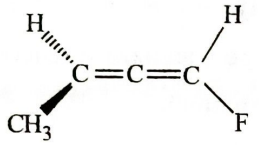
Candidates are required to give their answers in their own words as far as practicable.

Answer ***question nos.* 1, 2, 3, 4** and ***any four*** questions from ***question nos.* 5-10**.

1. Answer ***any ten*** questions : 2×10

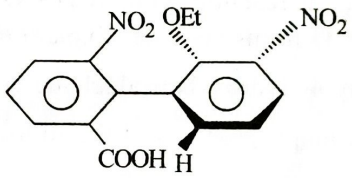
(a) Draw the most stable conformer of $CH_2OH - CH_2F$ in Newman projection formula.

(b) Assign *R*/*S* descriptors



(A)

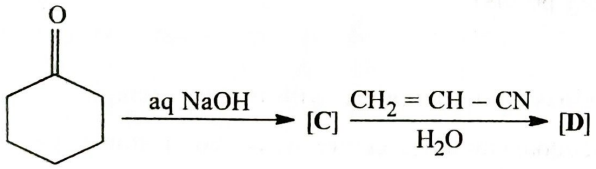
and



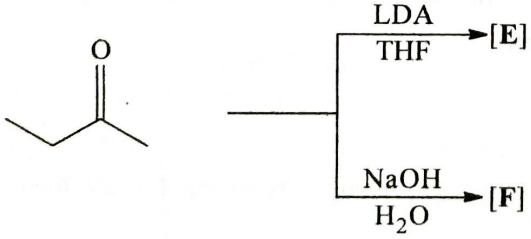
(B)

(c) Define prostereogenic centre with a suitable example.

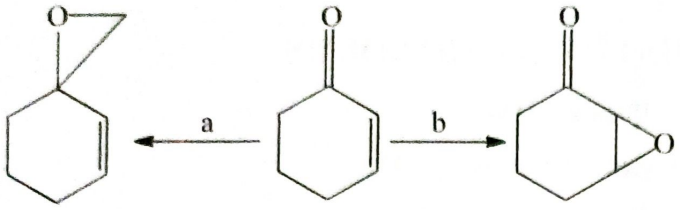
(d) Identify **[C]** and **[D]** in the following reaction with plausible mechanism :



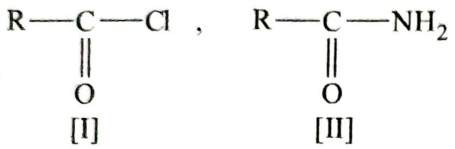
(e) Predict the structures of enolates formed.



(f) Write down the proper reagents of the following transformations :



(g) Compare the rate of hydrolysis of the following compounds with proper explanations :



[I] [II]

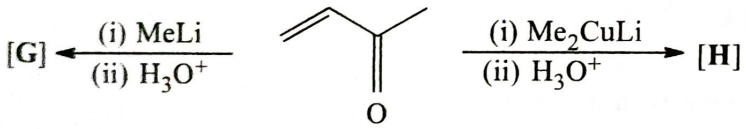
(h) What happens when two equivalents of phenyl magnesium bromide is treated with one equivalent of ethyl acetate followed by hydrolysis?

(i) Define ylide with example.

(j) $PH_3\overset{\oplus}{P}-\overset{\ominus}{C}H_2$ on reaction with RCH = O forms RCH = CH_2, whereas $Me_2\overset{\oplus}{S}-\overset{\ominus}{C}H_2$ on treatment with RCH = O forms epoxide. Explain mechanistically.

(k) Explain why 4-Hydroxybenzaldehyde does not undergo Cannizzaro reaction.

(l) Identify the major products of the following transformations :



2. Write a short note on (using the following points) :

(a) "Pseudoasymmetric centre"

(i) Definition/statement of pseudoasymmetric centre with proper example.

(ii) Taking an example of propseudoasymmetric centre with two H atoms, identify pro-R and pro-S H atoms.

(iii) A molecule having pseudoasymmetric centre may be achiral. If yes, give example. 2+2+1

Or

(b) "Cannizzaro Reaction"

(i) Substrate and reagent.

(ii) Mechanism of the reaction and deuterium labeling experiment to establish the mechanism. 2+3

3. Write a short note on (using the following points) :

(a) "Aldol condensation"

(i) Write the mechanism of Aldol condensation in basic medium taking a suitable substrate.

(ii) Mention the salient points of difference between acid and base catalysed Aldol condensation.

(iii) Give an example of intramolecular Aldol condensation. 2+2+1

Or

(b) "Michael condensation"

(i) Give an example of Michael condensation with proper mechanism taking suitable substrate(s).

(ii) Give example of Michael condensation where α, β-unsaturated acid undergo Michael condensation.

(iii) Give an example of α, β-unsaturated carbonyl compound which cannot undergo Michael condensation. 2+2+1

4. Write a short note on (using the following points) :

(a) "Acetal / Ketal"

(i) Write mechanism of acetal/ketal formation of a carbonyl compound taking a suitable substrate.

(ii) Write the condition(s) required for acetal/ketal formation. Why acetals/ketals are good protecting groups?

(iii) Cite an example of a reaction where cyclic ketal is formed. 2+2+1

Or

(b) "Reactions of Grignard Reagents"

(i) Write a reaction with mechanism, where a G. R. reacts with sterically hindered ketone.

(ii) Give example of one α, β-unsaturated ketone where same substrate can give 1,4 and 1,2-addition product with different reagents.

(iii) Write a reaction of G. R. where carboxylic acids can be prepared. 2+2+1

5. (a) Draw energy profile diagram of 1,2-dichloroethane for rotation about C-C bond and label the maxima and minima with appropriate conformation. Compare the relative stability of the conformers with explanation.

(b) Show the course of Robinson's annulation reaction for synthesizing fused ring in the reaction of cyclohexanone and methyl vinyl ketone.

(c) Write the structure of [I] to [K] in the following reaction sequence :

$$MeO-CH_2Cl \xrightarrow{Ph_3P} [I] \xrightarrow{PhLi} [J] \xrightarrow{PhCHO} [K] + Ph_3PO$$

4+3+3

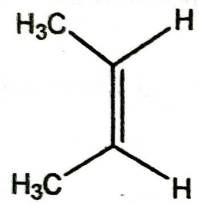
6. (a) (i) Explain the role of Li^+ ion in the reduction of carbonyl compounds with $LiAlH_4$. Give the mechanism of the reaction.

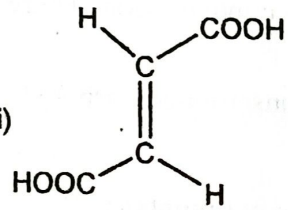
(ii) Explain why the following aldehyde with no α-hydrogen atom do not undergo Cannizaro reaction.

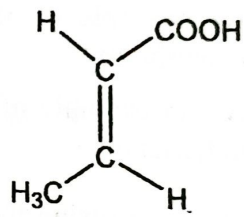
$Cl_3C\,CHO$

(b) Write $B_{AC}2$ mechanism for the hydrolysis of ethyl benzoate. Hence arrange in increasing order the rate of hydrolysis of *p*-nitro ethyl benzoate, *p*-methoxy ethyl benzoate and ethyl benzoate.

(c) Identify the Re-Re or Re-Si/Si-Re or Si-Si faces of the following compounds when viewed from the top face :

i) 

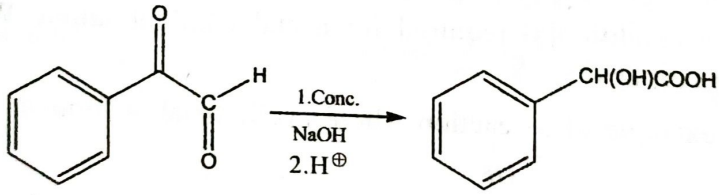
ii) 

iii) 

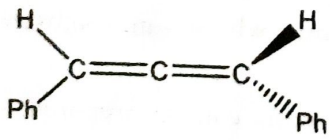
4+3+3

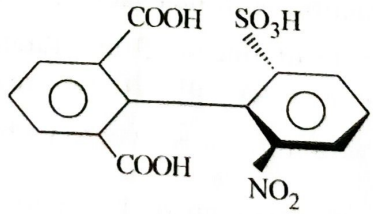
7. (a) PhCHO and $CH_3COCH_2CH_3$ give $PhCH=CHCOCH_2CH_3$ in base and $PhCH=C(Me)COCH_3$ in acid. Give the mechanistic explanation.

(b) Write the mechanism of the following reaction :

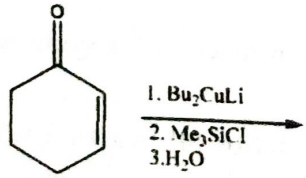


(c) Explain whether the following compounds are resolvable or not :

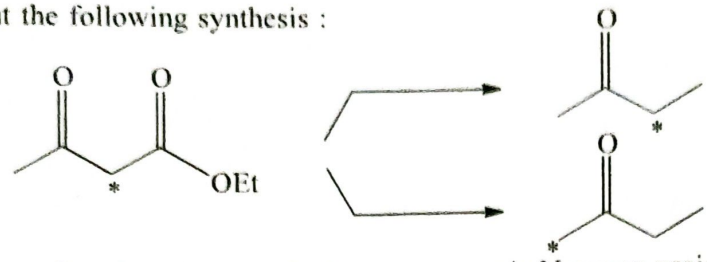




8. (a) What is Gilman cuprate? How is it prepared? Complete the following reaction : 4+3+3

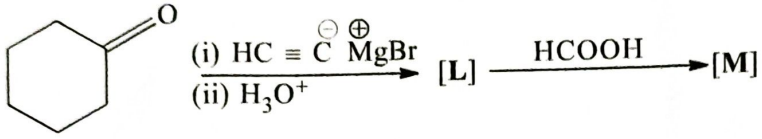


(b) Carry out the following synthesis :



(c) Draw the preferred conformer of 1-Bromopropane in Newman projection with appropriate reason. 4+3+3

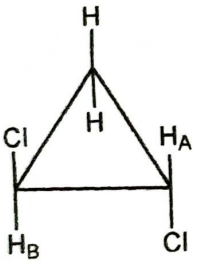
9. (a) Identify [**L**] and [**M**] in the following reaction :

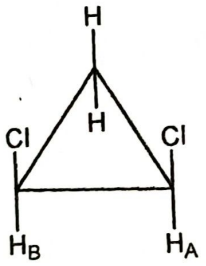


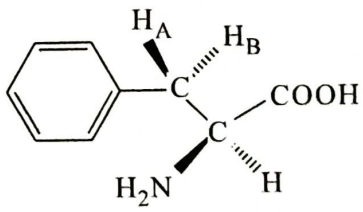
Give the mechanism for the step [**L**] → [**M**].

(b) Convert acetone to $CH_3COCH{=}CH_2$ via Mannich reaction. Give mechanism.

(c) Identify H_A and H_B in each of the following structures as homotopic, enantiotopic or diastereotopic and explain.

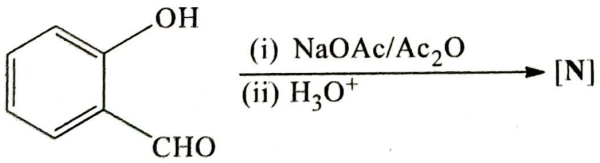
(i) 

(ii) 

(iii) 

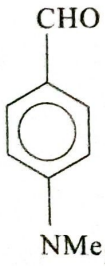
4+3+3

10. (a) Identify the product [**N**] in the following reaction with mechanism :



Name the reaction.

(b) Give the reagents for Benzoin condensation. Explain the importance of the reagent.



does not undergo Benzoin condensation. — Why?

(c) Represent $CH_3COC_2H_5$ in Re-face. One mole of vinyl magnesiumbromide is added to $CH_3COC_2H_5$ which reacts from Re-face. Find the R/S configuration of the product. 4+3+3

(7246)