2025

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**.

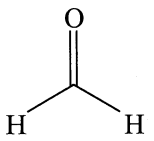
1. Answer ***any ten*** questions : 2×10

(a) Draw the most stable conformer of 1,2-dibromoethane in Newman projection formula with explanation.

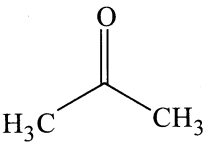
(b) Give an example of a molecule having a prostereogenic centre but no prochiral centre. Show the centre distinctly.

(c) Write two conditions for chirality in a substituted allene.

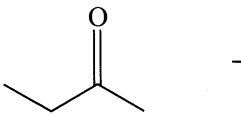
(d) Arrange the following carbonyl compounds according to their increasing reactivity to nucleophilic addition reaction with proper explanation :



and

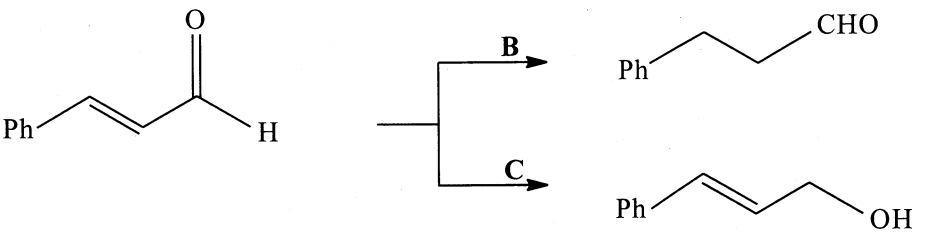


(e)

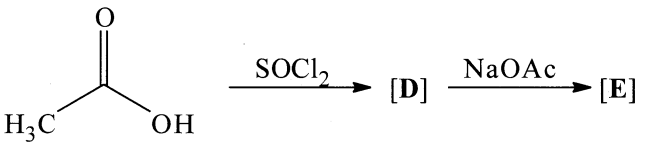


Identify [**A**] and the active electrophile involved in the reaction.

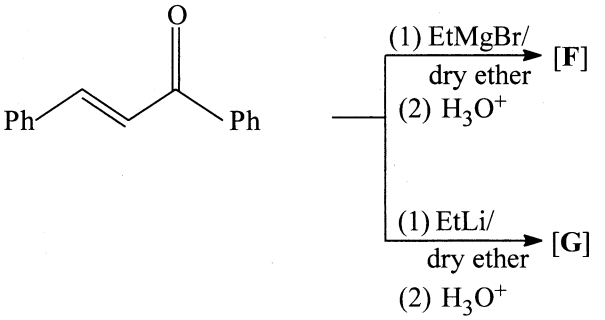
(f) Give the reagents for the following transformations (No mechanism required) :



(g) Identify [**D**] and [**E**] in the following reaction sequence :



(h) Identify the structures of [**F**] and [**G**] :



(i) Convert : $C_2H_5CHO \rightarrow C_2H_5CDO$.

(j) Explain why in Knoevenagel condensation reaction, the use of excess active methylene compound is not recommended.

(k) "Acetals are stable towards bases"— explain.

(l) What happens when EtMgBr is treated with $^{14}CO_2$ followed by acidification?

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

(i) Definition / Statement

(ii) Conditions for showing atropisomerism (*any two*)

(iii) Two examples. 1+2+2

Or

(b) Write a short note on reduction of carbonyl compounds using the following points :

(i) Mention the reagent for reduction in acidic medium. Give its mechanism using acetone as substrate.

(ii) Mention the reagent for reduction in basic medium. Give its mechanism using acetone as substrate. (1+1½)+(1+1½)

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

(i) Type of substrate used in the reaction.

(ii) Condition(s) and reagent(s) used in the reaction.

(iii) Mechanism of the reaction using any suitable substrate. 1+(1+1)+2

Or

(b) Write a short note on hydrolysis of esters using the following points :

(i) Give one appropriate substrate for each of $B_{AC}2$ and $A_{AC}2$ pathways.

(ii) Mechanism of $B_{AC}2$ and $A_{AC}2$ pathways using substrate of your choice.

(1+1)+(1½+1½)

4. (a) Write a short note on MPV (Meerwin-Pondorf-Verley) reduction using the following points :

(i) One suitable substrate and reagent.

(ii) Mechanism of MPV reduction.

(iii) Why are ionic alkoxides not used in MPV reduction? (1+1)+2+1

Or

(b) Write a short note on 'Reformatsky reaction' using the following points :

(i) One proper substrate and reagents used.

(ii) Give a general equation for the reaction along with its mechanism.

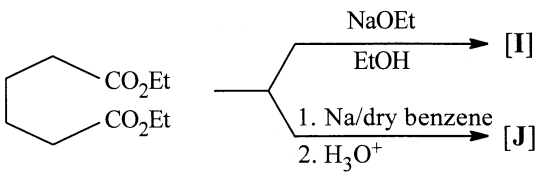
(iii) Role of the metal used in the Reformatsky reaction. (1+1)+(1+1)+1

5. (a) Draw the energy profile diagram of *n*-butane for $C_2 - C_3$ bond rotation. Compare the relative stabilities of all conformations.

(b) Predict the product [**H**] of the following reaction with mechanism :

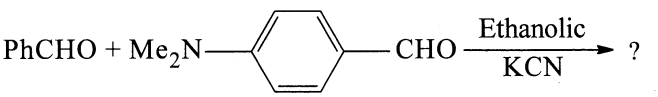
$$PhCOCH_3 + HCHO + Me_2NH \xrightarrow[\text{reflux}]{HCl\,/\,MeOH} [\mathbf{H}]$$

(c) Predict the products [**I**] and [**J**] in each of the following reactions. Also give the corresponding mechanisms.

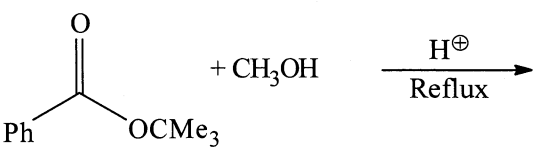


4+3+3

6. (a) Give the product with mechanism and explain its formation. Why is the cyanide ion regarded as an unique catalyst for this reaction?



(b) Complete the following reaction with mechanism :

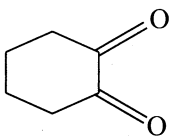
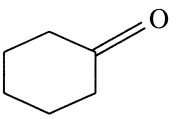


Please Turn Over

(c) Represent $H_3C-CO-C_2H_5$ in *Si*-face. One mole of PhMgBr is added to it from *Si*-face. Write down the structure of the product and find out its *R*/*S* configuration. 4+3+3

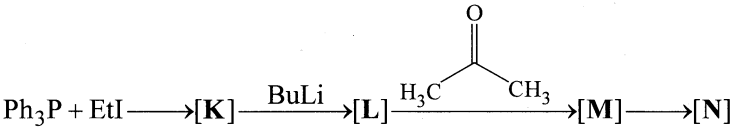
7. (a) Synthesize the following compounds :

(i) $H_3C-CH_2-C(=O)-CH_2CO_2Et$ from EAA.

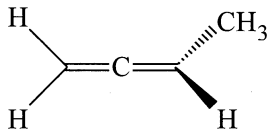
(ii)  from 

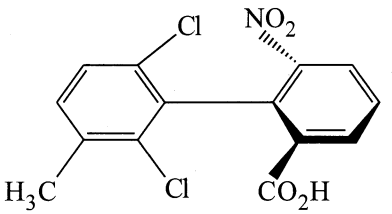
Give mechanism for the reaction involved in 7a (ii)

(b) Identify [**K**] – [**N**] in the following reaction sequence :



(c) Explain whether the following compounds are resolvable or not. Give *R*/*S* descriptors wherever applicable.

(i) 

(ii) 

4+3+3

8. (a) (i) Give the product(s) of reaction of MeMgI (1 mole) with each of the following compounds : (mechanism not required)

(I) $HC(OEt)_3$; (II) $Et-C\equiv C-H$

(ii) The reaction of Me_3CMgCl and $Me_3CCOCMe_3$ after hydrolysis gives a gas [**O**] and a secondary alcohol [**P**] instead of the expected product. Give the structures of [**O**] and [**P**].

(b) What is the product formed when salicylaldehyde is condensed with anhydrous acetic anhydride in the presence of sodium acetate followed by hydrolysis? Give the mechanism involved in the reaction.

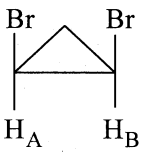
(c) Draw the **staggered** conformations of 1-Chlorobutane for rotation about C_1-C_2 bond and also about C_2-C_3 bond. Comment on the relative stabilities of the conformers. (2+2)+3+3

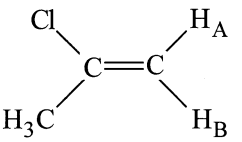
9. (a) (i) What happens when equivalent amount of PhCHO and HCHO are heated with conc. NaOH solution? Discuss the mechanism involved.

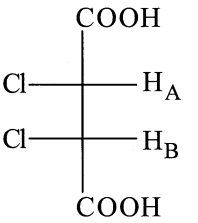
(ii) What happens when the above reaction is carried out in D_2O? What is the inference from the above observation?

(b) When NaCN/HCN is added to methyl vinyl ketone at 0°–5°C, [**Q**] is formed as a major product whereas at 80°C, [**R**] is formed as major product. Identify [**Q**] and [**R**] and offer explanation for their formation.

(c) Label the H_A and H_B of the following molecules as homotopic, enantiotopic or diastereotopic ligands : 4+3+3

(i) 

(ii) 

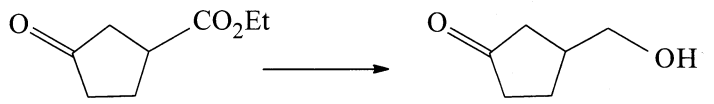
(iii) 

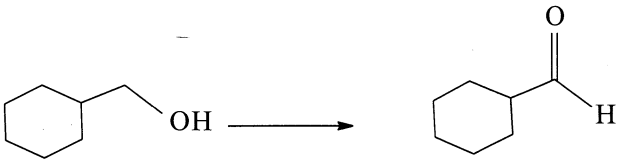
10. (a) $H_3C\ COCH_2CH_3 \xrightarrow{I_2, NaOH} [S] + CHI_3\downarrow$

$\xrightarrow{I_2,\ HOAc} [T]$

Write the structural formulae of [**S**] and [**T**] and show the mechanisms for their formation with explanation.

(b) Convert the following (Reagents only) :

(i) 

(ii) 

(c) (i) What do you mean by 'gauche–butane interaction'? Show the interaction pictorially using an appropriate example.

(ii) Draw the *anti* conformer of the following molecule :

Ph CH(OH) — $CH(CH_3)$ — $COCH_3$. 4+3+3
