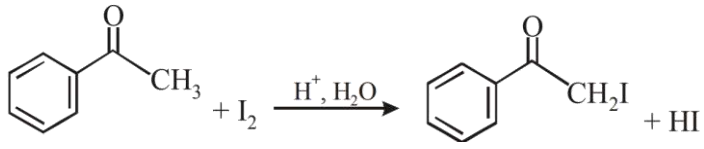
# (Organic Chemistry) Aldol Similar Name Reaction

## HALOGENATION OF THE α-CARBON OF ALDEHYDES AND KETONES

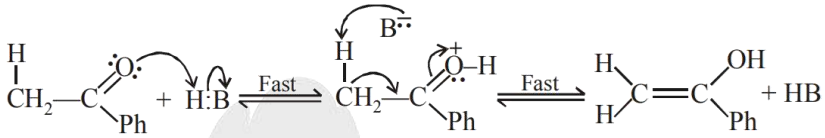
**(I) Acid-Catalyzed halogenation: -**

When $Br_2$, $Cl_2$ and $I_2$ is added to an acidic solution of an aldehyde or a ketone, a halogen replaces one of the α-hydrogens of the carbonyl compound. Halogenation takes place through the slow formation of an enol followed by rapid reaction of the enol with the halogen.

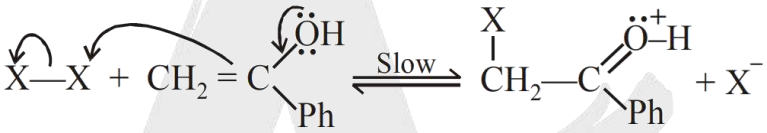
**Mechanism:**



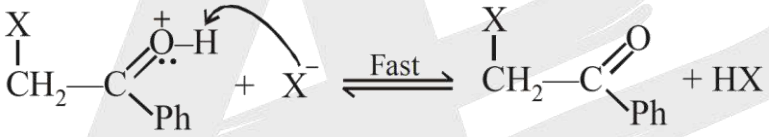
**Step - I:**



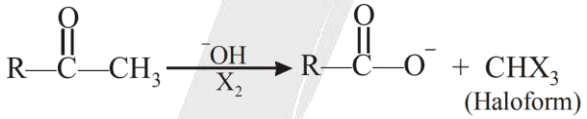
**Step - II:**



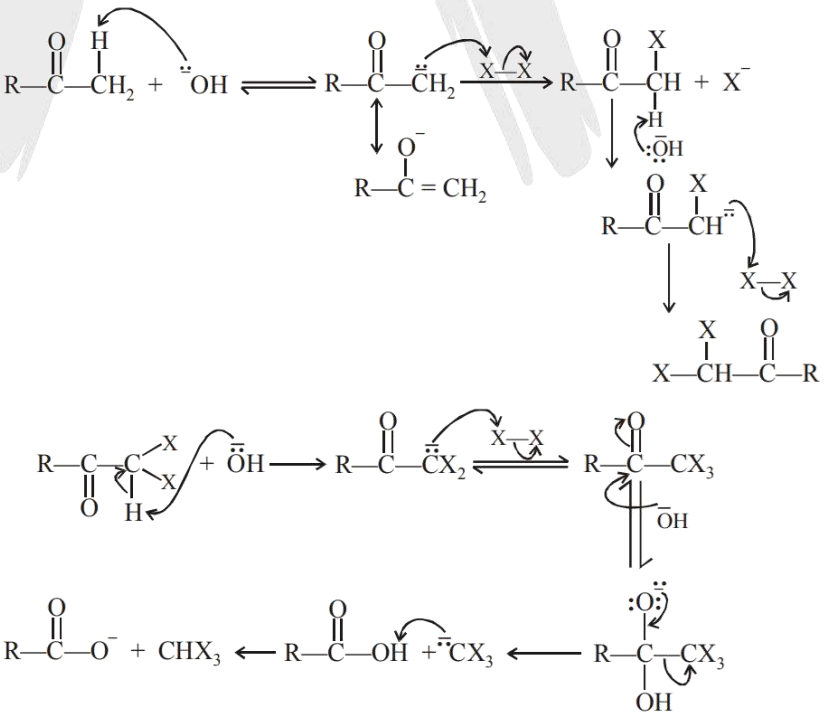
**Step - III:**



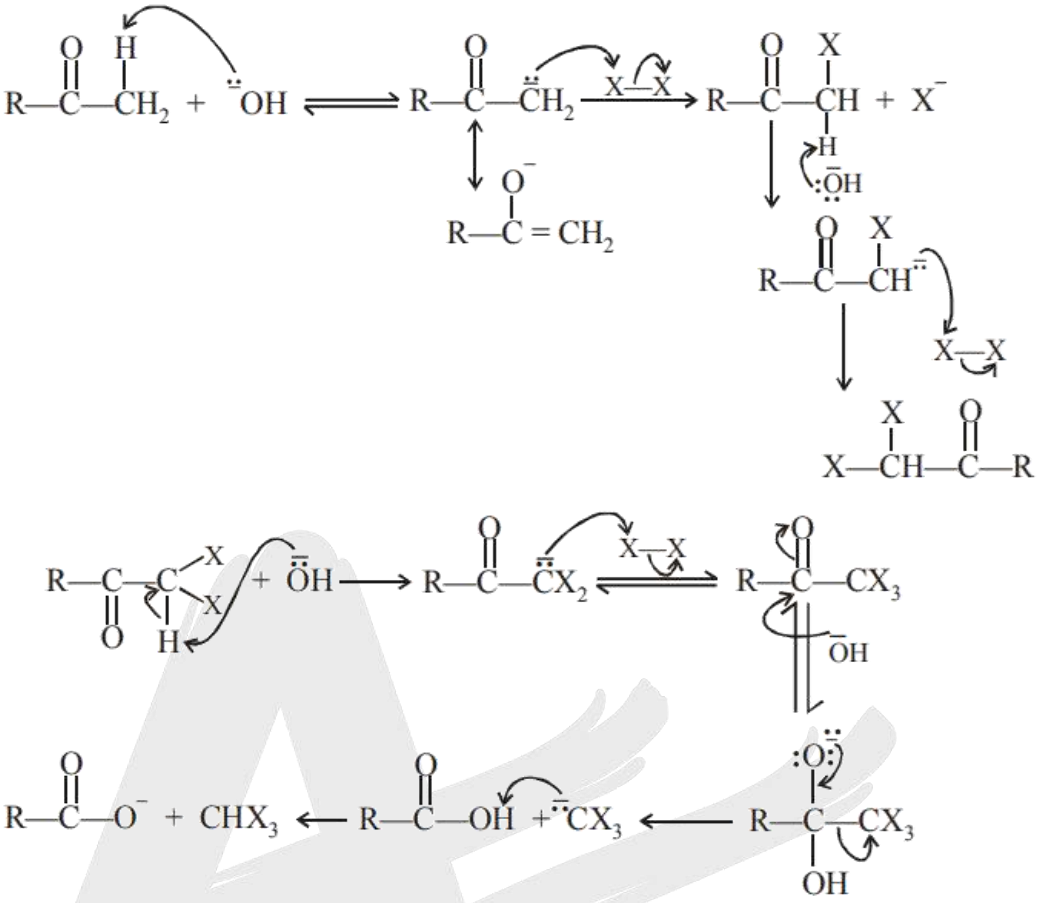
II[nd] Base-Catalyzed halogenation: - In the presence of excess base and excess halogen, a methyl ketone is converted first into a trihalo-substituted ketone and then into a carboxylic acid.



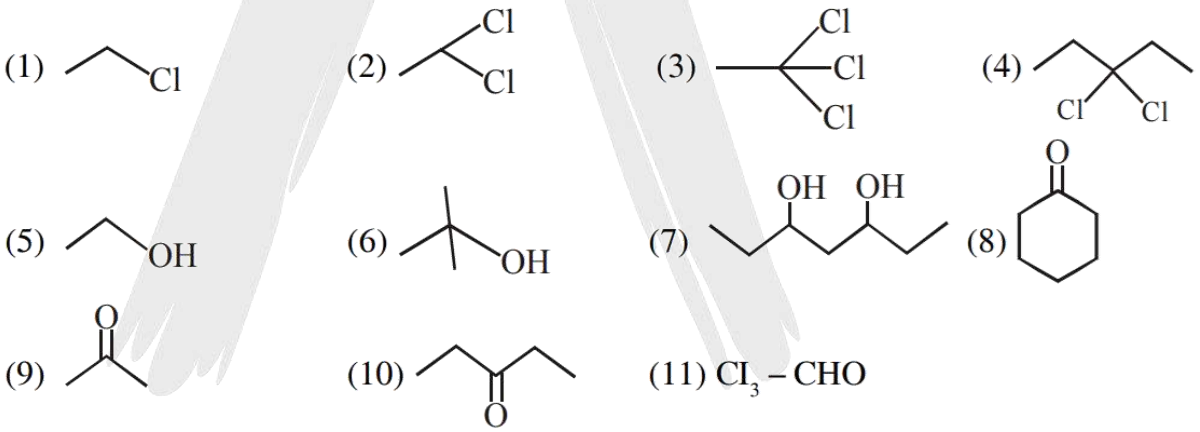
**Mechanism:**



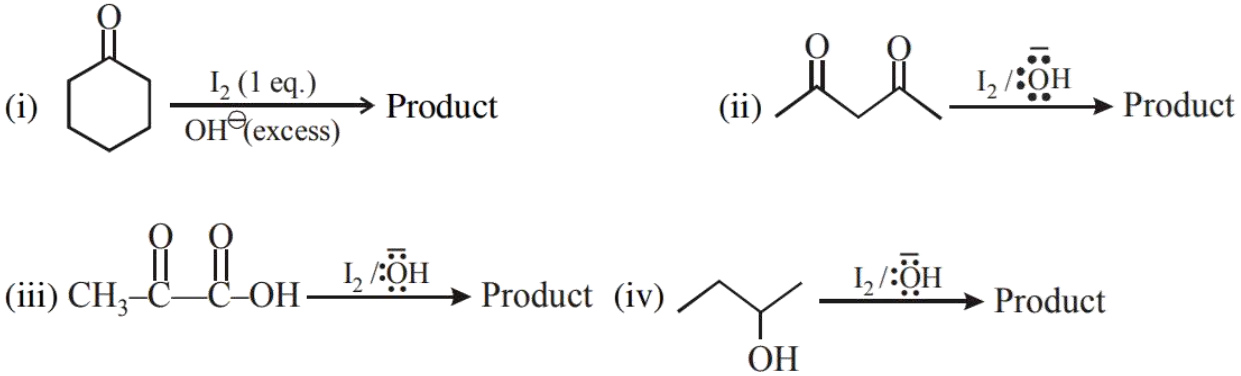
# (Organic Chemistry) Aldol Similar Name Reaction



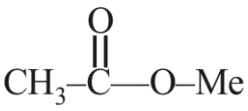
**Q.1** Identify the compounds which can show iodoform reaction and complete the reaction?

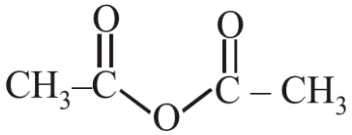



**Q.2** Complete the following given reaction:

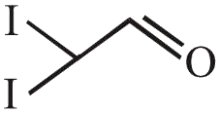


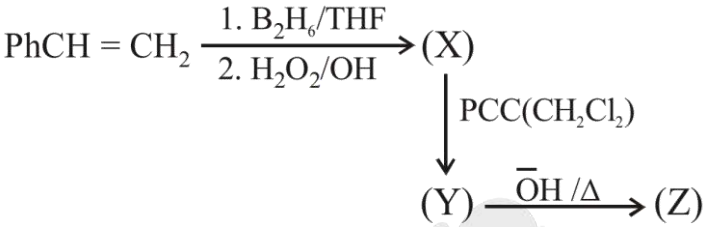
**Q.3** Select the compound which does not show haloform reaction is/are:

(A) 

(B) 

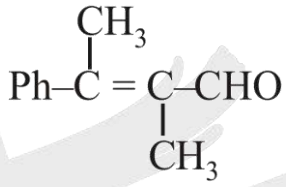
(C) Pyruvic acid

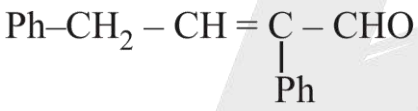
(D) 

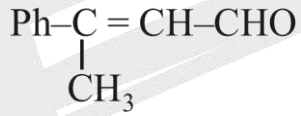
**Q.4** 

(**Z**) is:

(A) **Ph − CH = CH − CHO**

(B) 

(C) 

(D) 

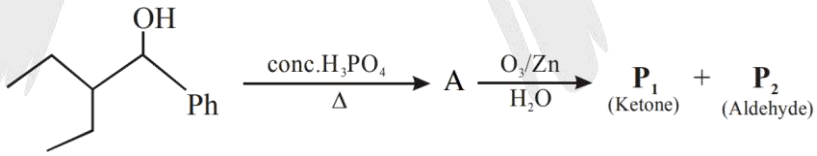
**Q.5** Two isomeric ketones, 3-pentanone and 2-pentanone can be distinguished by:

(A) $I_2$/NaOH (B) NaOH (C) NaCN/HCl (D) 2,4-DNP

**Q.6** Which of the reagent is used to convert 2-Butanone into propanoic acid –

(A) NaOH, $I_2/H^+$ (B) Tollen's reagent (C) Fehling solution (D) NaOH, NaI/$H^+$

**Paragraph for Q.07 to Q.09**



**Q.7** Which one of the following reagent is best suitable for distinction between $P_1$ and $P_2$ –

(A) Braddy's reagent (2,4 DNP) (B) $NaHSO_3$

(C) $NaHCO_3$ (D) $NaOH/I_2$

**Q.8** Select the correct statement among the following -

(A) $P_1$ will show aldol reaction & $P_2$ will show cannizaro reaction

(B) $P_1$ will show cannizaro reaction & $P_2$ will show aldol reaction

(C) Both $P_1$&$P_2$ will show cannizaro reaction

(D) Both $P_1$&$P_2$ will show aldol reaction

**Q.9** $P_2 \xrightarrow[(ii)H^+]{(i)\text{conc.NaOH}}$ products

Select incorrect statement for the above reaction -

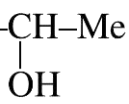
(A) It is a redox reaction

(B) It is a disproportion reaction

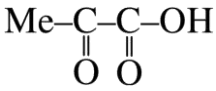
(C) Two products formed are alcohol & carboxylic acid

(D) It is an intramolecular reaction

**Q.10** Which of the following will give yellow precipitate with $NaOH/I_2$

(A) 

(B) $CI_3CHO$

(C) 

(D) EtOH

**Q.11** Ethylmethanoate $\xrightarrow[(ii)H_3O^+]{(i)\text{MeMgBr(2eq)}}$ $\underbrace{W+X}_{\text{organic product}}$

$W \xrightarrow{CaOCl_2} CHCl_3 + Y$

$X \xrightarrow{CaOCl_2} CHCl_3 + Y$

$Y + Z \xrightarrow[\text{Distillation}]{\text{Dry}} \text{Organic product}(s) + CaCO_3$

Which of the following is major organic product

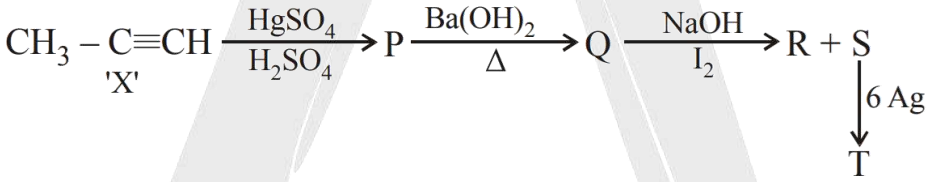
(A) $CH_3 - CHO$

(B) $CH_3 - CO - CH_3$

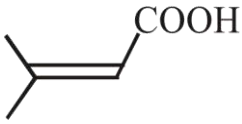
(C) $CH_3 - CH = CH - CH_3$

(D) HCHO

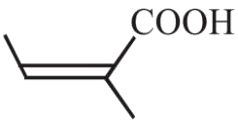
**Q.12** Correct option regarding following reaction sequence.



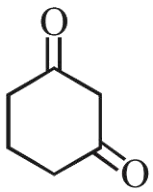
(A) T is homologue of ' X '

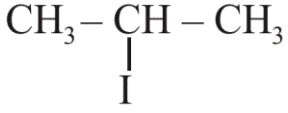
(B) R is sodium salt of 

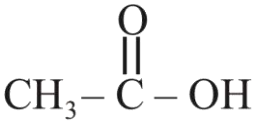
(C) P can produce **S** with NaOI

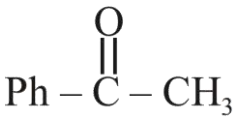
(D) R is sodium salt of 

**Q.13** Which of the following compounds(s) give a sweet-smelling product having anesthetic use in presence of $Cl_2$, NaOH, Δ.

(A) 

(B) 

(C) 

(D) 

**Q.14** Reaction in which product can show positive haloform test :-

(A) $CH_3MgBr + PhCN \xrightarrow[H_3O^{\oplus}]{}$

(B) $CH_3 - CH_2MgBr + Ph - COOEt \xrightarrow[H_3O^{\oplus}]{}$ (1 : 1)

(C) $CH_3MgBr + H - \underset{\underset{O}{\|}}{C} - OMe \xrightarrow[NH_4Cl]{}$ (1:1)

(D) $CH_3MgBr + H - \underset{\underset{O}{\|}}{C} - OMe \xrightarrow[NH_4Cl]{}$

**Q.15** In which reaction haloform is obtained as one product: -

(A) Electrolysis of ethanolic aqueous solution of NaCl

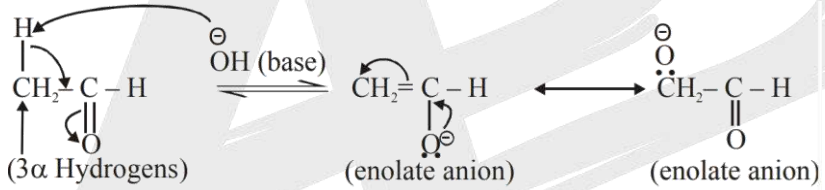
(B) Isopropanol with bleaching powder

(C) Chlorination of methane in sun light

(D) Chloral is treated with NaOH

**(2) ALDOL CONDENSATION**

The **α** – hydrogen of carbonyl compounds are acidic due to the fact that the anion (enolate ion) is stabilized by resonance.



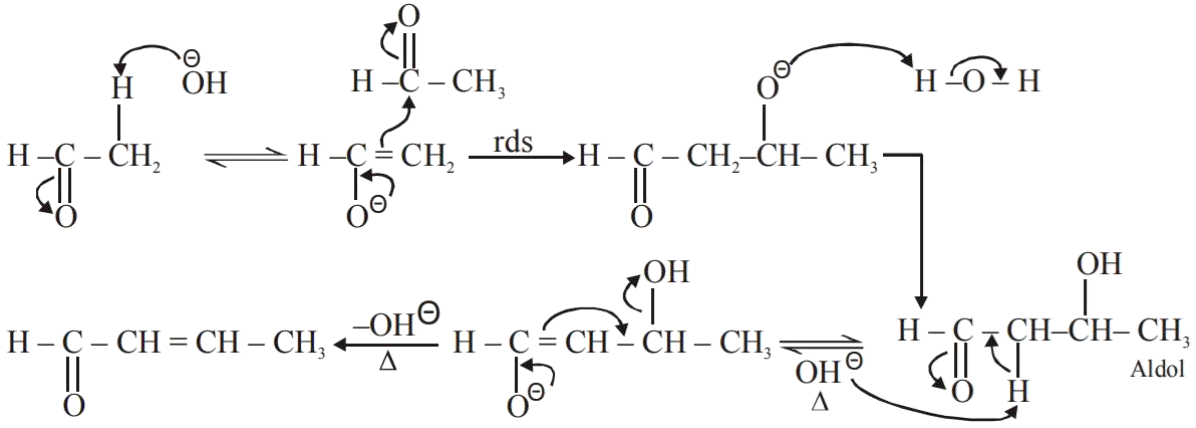

Base catalysed Aldol

In aqueous base, two acetaldehyde molecules react to form β-hydroxy aldehyde called aldol. The reaction is called Aldol condensation. The enolate ion is the intermediate in the aldol condensation of aldehyde and ketone. Acetaldehyde for instance, forms a dimeric product aldol in presence of a dilute base (≈ 10%NaOH)

$$2CH_3CHO \xrightarrow[5°C]{\overset{\ominus}{O}H \,/\, HOH} CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - CHO \xrightarrow[-H_2O]{\Delta} CH_3 - CH = CH - CHO$$

β–hydroxy butyraldehyde (Aldol)

**Mechanism:**



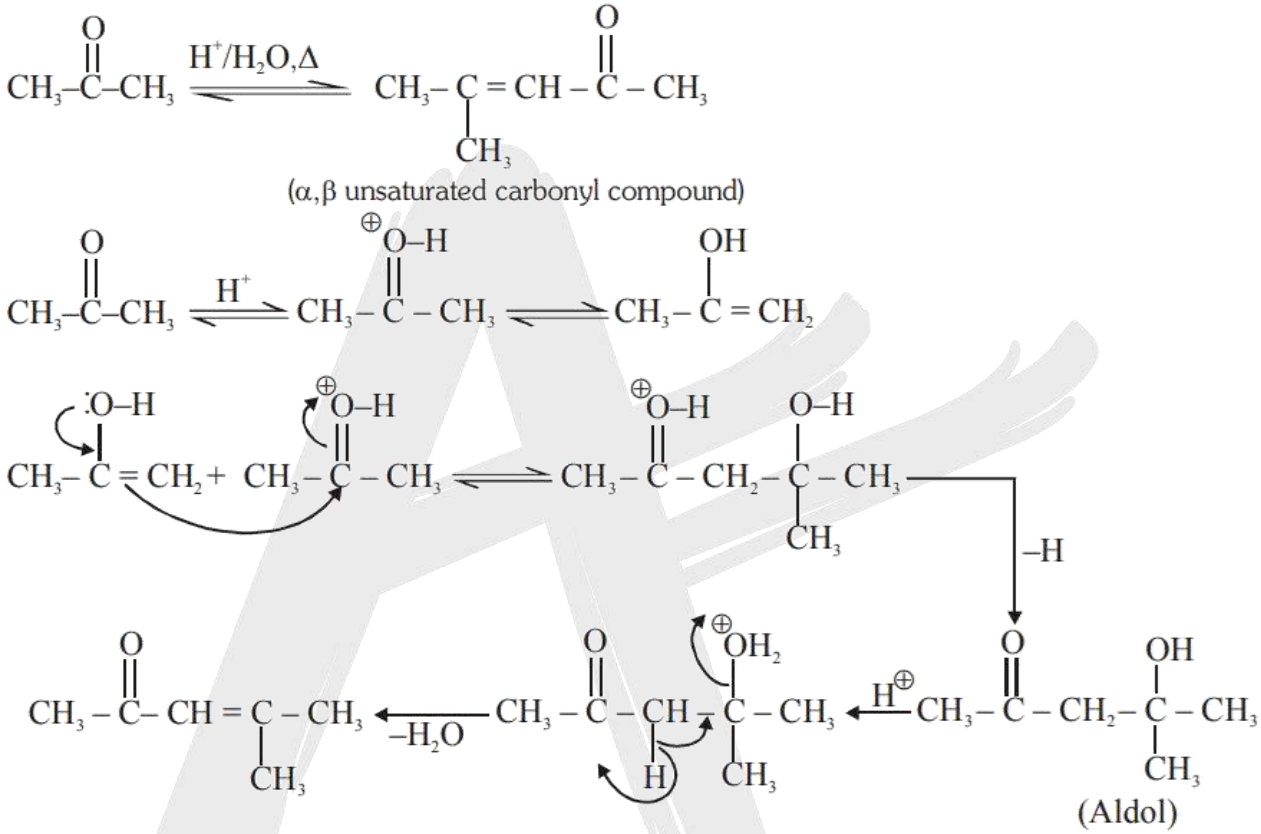
# (Organic Chemistry) Aldol Similar Name Reaction

Aldols are stable and may be isolated. They, however can be dehydrated easily by heating the basic reaction mixture or by a separate acid catalyzed reaction. Thus if the above reaction is heated the product is dehydrated to 2-butenal (crotonaldehyde).

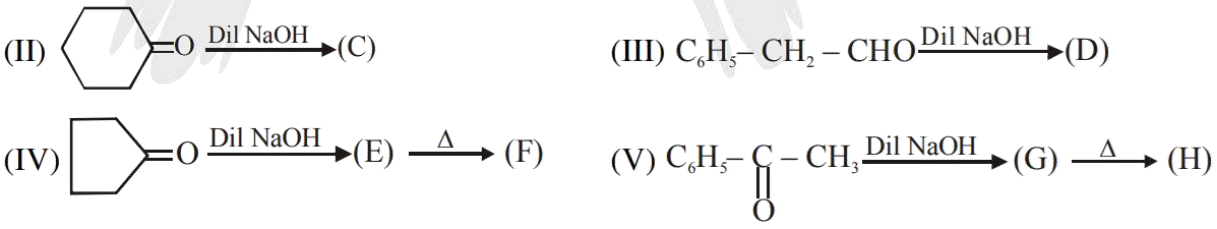
Acid cataysed Aldol:

In acid catalysed aldol condensation enol form of carbonyl is the nucelophile in place of enolate.

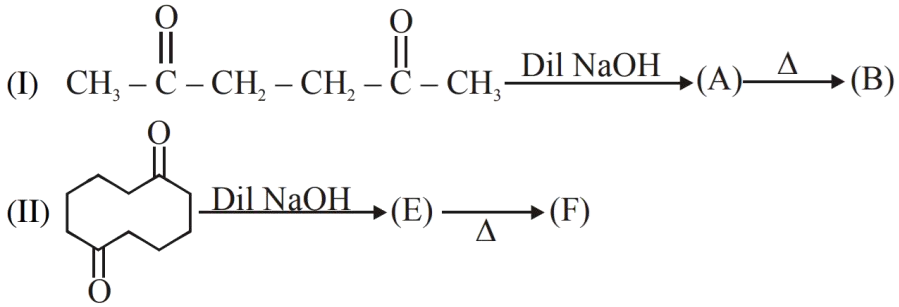
**Mechanism:**




**Q.1** Write the product and mechanism for given reactions.




**Q.2** Identify the intramolecular aldol product?

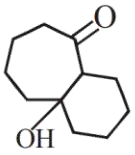


**Q.3** Find out the total number of possible aldol products (including and excluding stereo products).

(I) $C_6H_5-CHO + CH_3-CHO \xrightarrow[5^oC]{NaOH/HOH}$

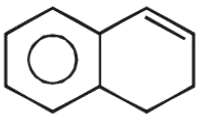
(II) $CH_3-CH=O + CH_3-CH_2-\underset{\underset{O}{\|}}{C}-CH_3 \xrightarrow[5^oC]{NaOH/HOH}$

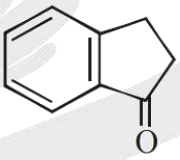
**Q.4** Identify the structure of substrate?

(I) A $\xrightarrow{\text{Dil. NaOH}}$  A = ?

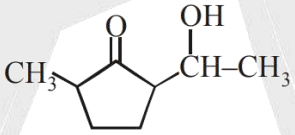
(II) A (2 mole) $\xrightarrow[5°C]{\text{Dil.NaOH}}$ $CH_3-\underset{\underset{O}{\|}}{C}-CH_2-\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}-CH_3$ A = ?

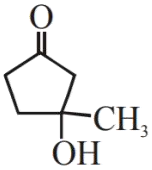
**Q.5** Complete reaction sequence:

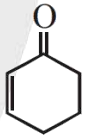
(I)  $\xrightarrow[(ii)\ Zn/H_2O]{(i)\ O_3(1eq)}$ (a) $\xrightarrow[(ii)\ \Delta]{(i)\ \overset{\ominus}{O}H}$ (b)

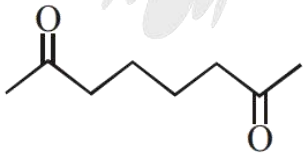
(II)  $\xrightarrow[(ii)C_6H_5CHO\ (iii)\ \Delta]{(i)\ \overset{\ominus}{O}H}$ Product

**Q.6** Complete the following reactions:

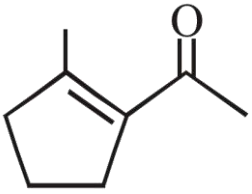
(I) (X) + (Y) $\xrightarrow{\overset{\ominus}{O}H}$ 

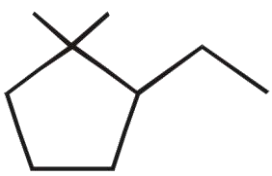
(II) (X) $\xrightarrow{OH^{\ominus}}$ 

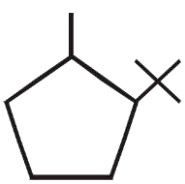
(III) [X] $\xrightarrow[(ii)\Delta]{(i)\ \overset{\ominus}{O}H}$ 

**Q.7**  $\xrightarrow[heat]{\overline{O}H}$ A $\xrightarrow[CuBr]{CH_3MgBr}$ B $\xrightarrow[conc.HCl]{Zn-Hg}$ C ; the product 'C' is

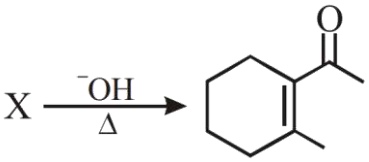
(A) 

(B) 

(C) 

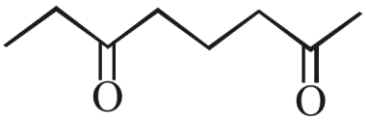
(D) 

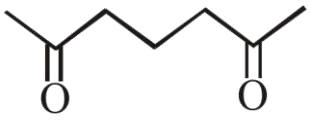
**Q.8** Consider following intramolecular aldol condensation reaction:




; X can be :

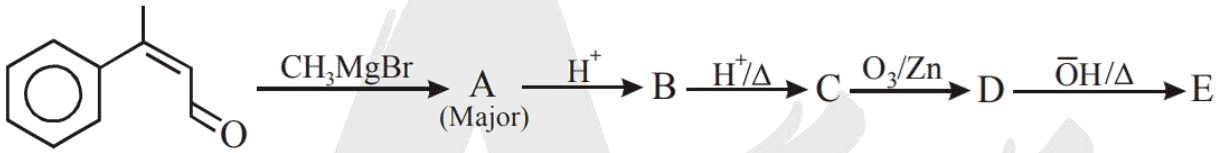
(A) 

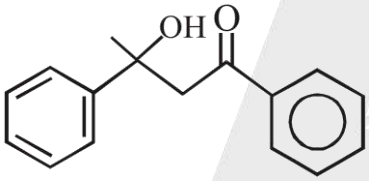
(B) 

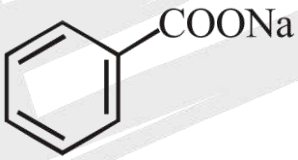
(C) 

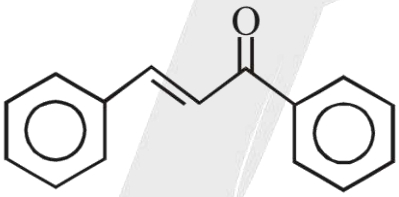
(D) 

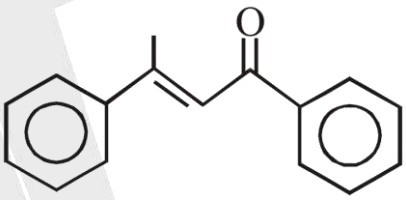
**Q.9** Product 'E' is:



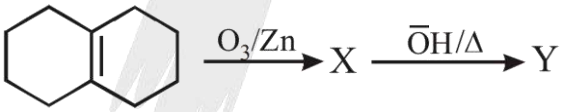

(A) 

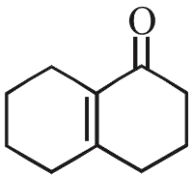

(B) 

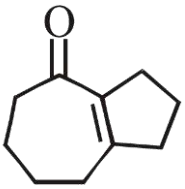

(C) 

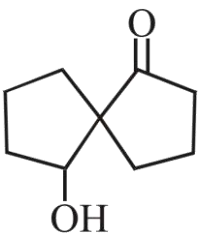

(D) 

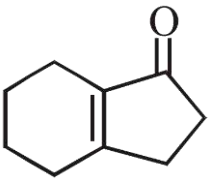

**Q.10** Product '**Y**' formed in the given reaction is:



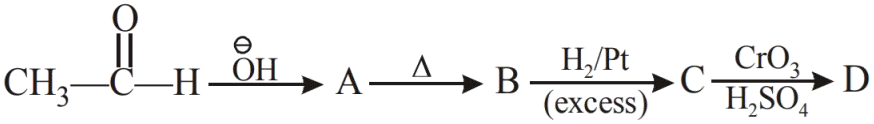

(A) 


(B) 


(C) 


(D) 


**Q.11** Product 'D' is:




(A) $CH_3 - CH_2 - CH = CH_2$

(B) $CH_3 - CH_2 - CH_2 - CHO$

(C) $CH_2 - CH_2 - CH_2 - COOH$

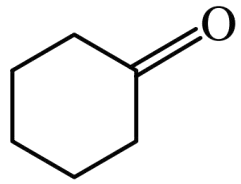
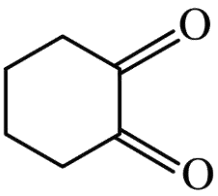
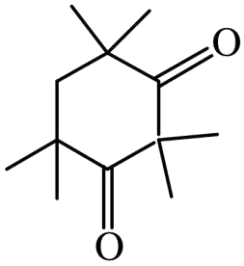
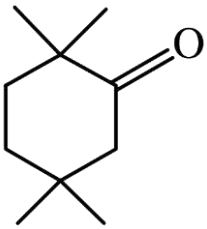
(D) $CH_2 = CH - CH = CH_2$

**Q.12** $CH_3CH=CHCHO \xrightarrow[\text{aldol}]{OH^-} \xrightarrow{\Delta}$ A, A is

(A) $CH_3(CH=CH)_3CHO$ (B) $CH_3CH_2CH_2(CH=CH)_2CHO$

(C) $CH_3(CH_2CH_2)_3CH=CH-CHO$ (D) None is correct

**Q.13** Which one of the following will undergo aldol reaction most readily.

(A)  (B)  (C)  (D) 

**Q.14** $MeCHO \xrightarrow{NaOH,\Delta} A \xrightarrow{NaOH,\Delta} B$; B is:

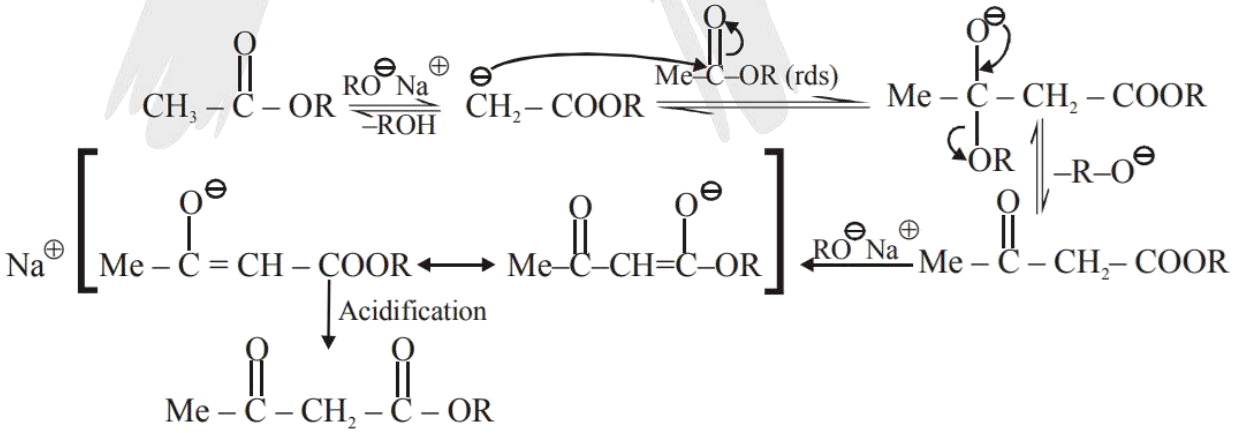
(A) $Me(CH=CH)_3CHO$ (B) $MeCH=CHCHO$

(C) $Me(CH=CH)_2-CHO$ (D) $Me+(CH=CH)_4CHO$

**(3) CLAISEN CONDENSATION**

Esters undergo $S_NAE$ Reaction. when attacked by a $Nu^-$generated by the interaction of a base (usually base related to the Alkoxy anion of ester) with one of the molecule of ester and this $Nu^-$ attacks on another molecule. The reaction over all is considered as condensation of ester known as claisen ester condensation.


**Mechanism:**




Sometimes, when two ester group are present within the molecule then the condensation occurs intramolecule then cyclization caused thus is known as Dieckmann cyclization or Dieckmann's condensation.

# (Organic Chemistry) Aldol Similar Name Reaction

**Q.1** $MeCOOEt \xrightarrow[(ii)\,Acidification]{(i)\,EtOK} A$

**Q.2** $EtCOOMe \xrightarrow[(ii)\,Acidification]{(i)\,MeOK} B$

**Q.3** $MeCOOMe + EtCOOMe \xrightarrow[(ii)\,Acidification]{(i)\,MeOK} C$

**Q.4** $C_6H_5COOC_2H_5 + CH_3COOC_2H_5 \xrightarrow[(ii)\,Acidification]{(i)\,C_2H_5ONa} D + D'$

**Q.5** $\begin{matrix}COOC_2H_5\\ |\\ COOC_2H_5\end{matrix} + C_6H_5CH_2COOC_2H_5 \xrightarrow[(ii)\ Acidification]{(i)\ C_2H_5ONa} E$ [Cross Product]

**Q.6** $PhOOC\text{-}(CH_2)_4\text{-}COOPh \xrightarrow[(ii)\ Acidification]{(i)\ PhONa} F$

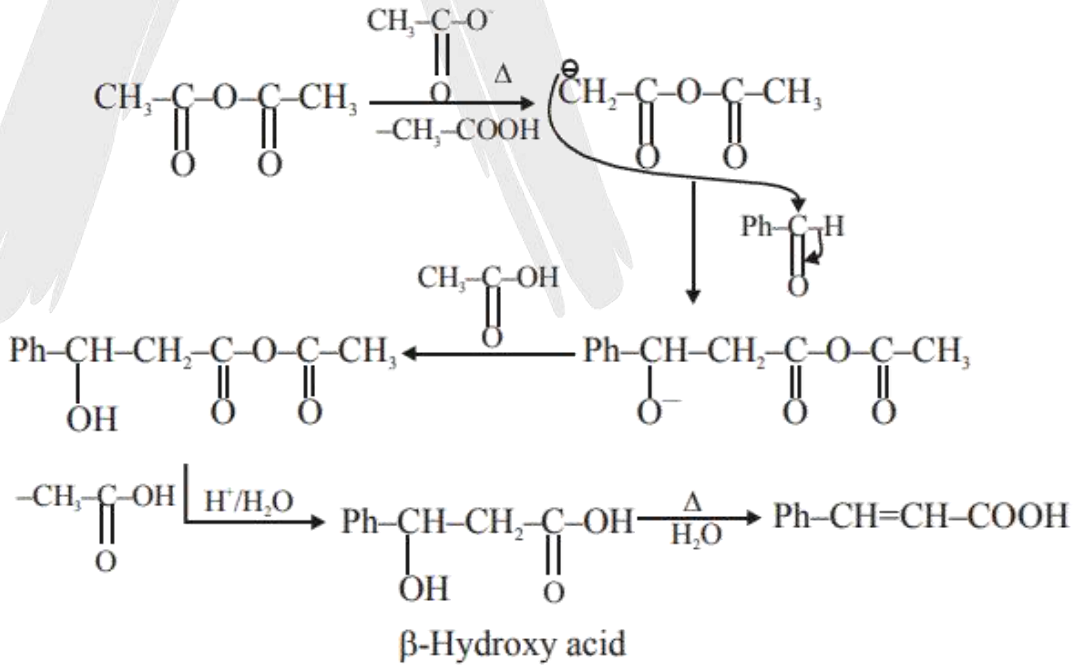
**Q.7** $C_2H_5\text{–}N(CH_2CH_2COOEt)_2 \xrightarrow[(ii)\ Acidification]{(i)\ C_2H_5ONa} G \xrightarrow[\Delta]{H_3O^{\oplus}} H$ (Piperidone derivative)

## (4) PERKIN CONDENSATION

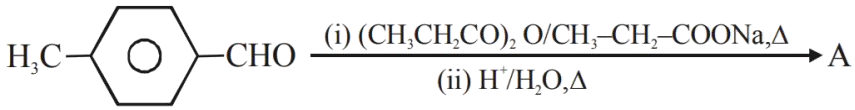
In Perkin reaction, condensation has been effected between aromatic aldehydes and aliphatic acid anhydrides in the presence of sodium or potassium salt of corresponding acid of that anhydride, to yield α, β - unsaturated aromatic acids.

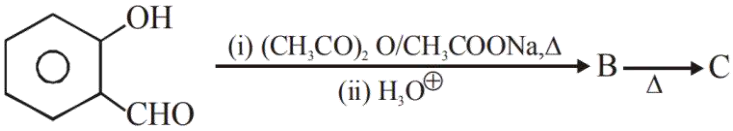
$$C_6H_5\text{–}CHO + CH_3\text{–}\underset{\underset{O}{\|}}{C}\text{–}O\text{–}\underset{\underset{O}{\|}}{C}\text{–}CH_3 \xrightarrow[(ii)\ H^+/H_2O,\Delta]{(i)\ CH_3COONa,\Delta} C_6H_5\text{–}CH{=}CH\text{–}COOH + CH_3COOH$$

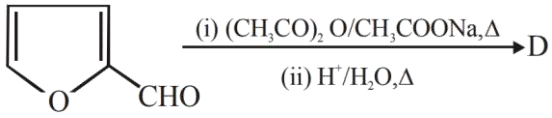
**Mech.**

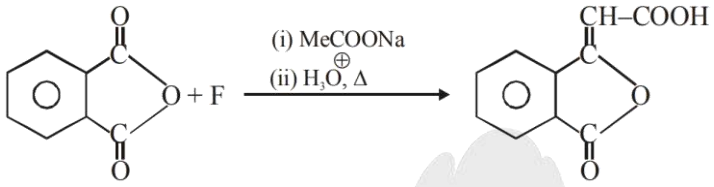



β-Hydroxy acid

**Q.1** 


**Q.2** 

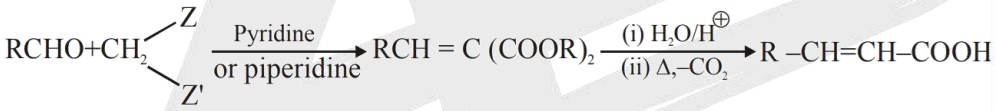

**Q.3** 


**Q.4** 

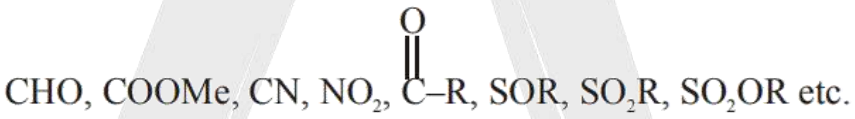

Phthalylacetic acid

**(5) KNOEVENAGEL REACTION**

Reaction of active methylene group with aldehyde & Ketones is known as knoevenagel reaction.

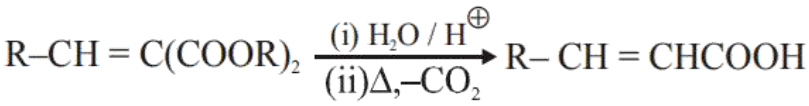



**Z can be**




**Mechanism :**






High reactivity of the methylene group of the active methylene compound prevents self-condensation of the aldehyde.

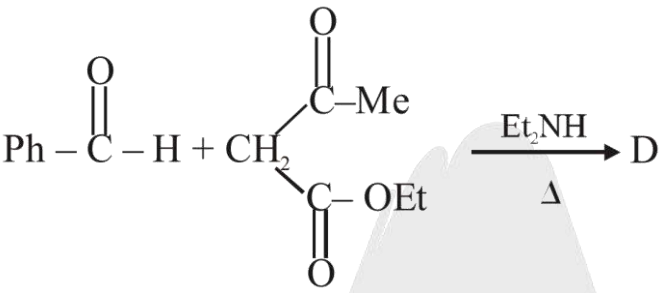
## (Organic Chemistry) Aldol Similar Name Reaction

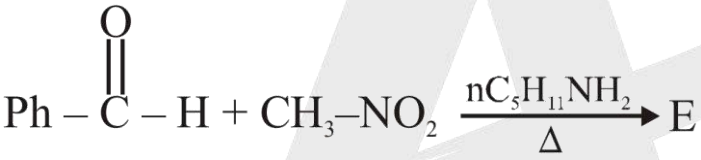
**Q.1** $CH_3CHO + H_2C(COOR)_2 \xrightarrow[(ii)H_3O^{\oplus},\Delta]{(i)\ Pip} A$

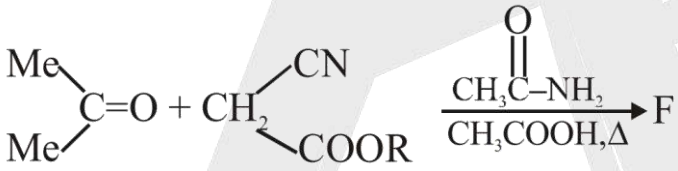
**Q.2** $C_6H_5CHO + H_2C(COOR)_2 \xrightarrow[(ii)H_3O^{\oplus},\Delta]{(i)\ Pip} B$

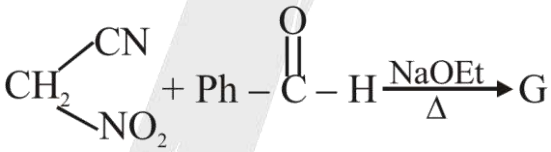
**Q.3** $HOOC - CHO + H_2C(COOR)_2 \xrightarrow[(ii)H_3O^{\oplus},\Delta]{(i)\ Pip} C$

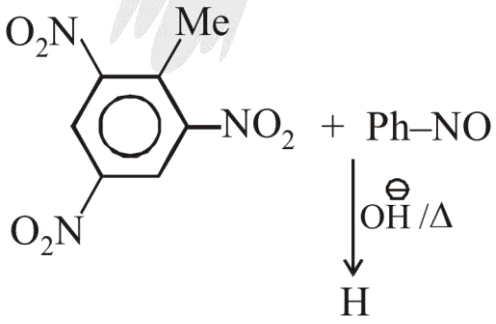
Glyoxalic acid

**Q.4** 

**Q.5** 

**Q.6** 

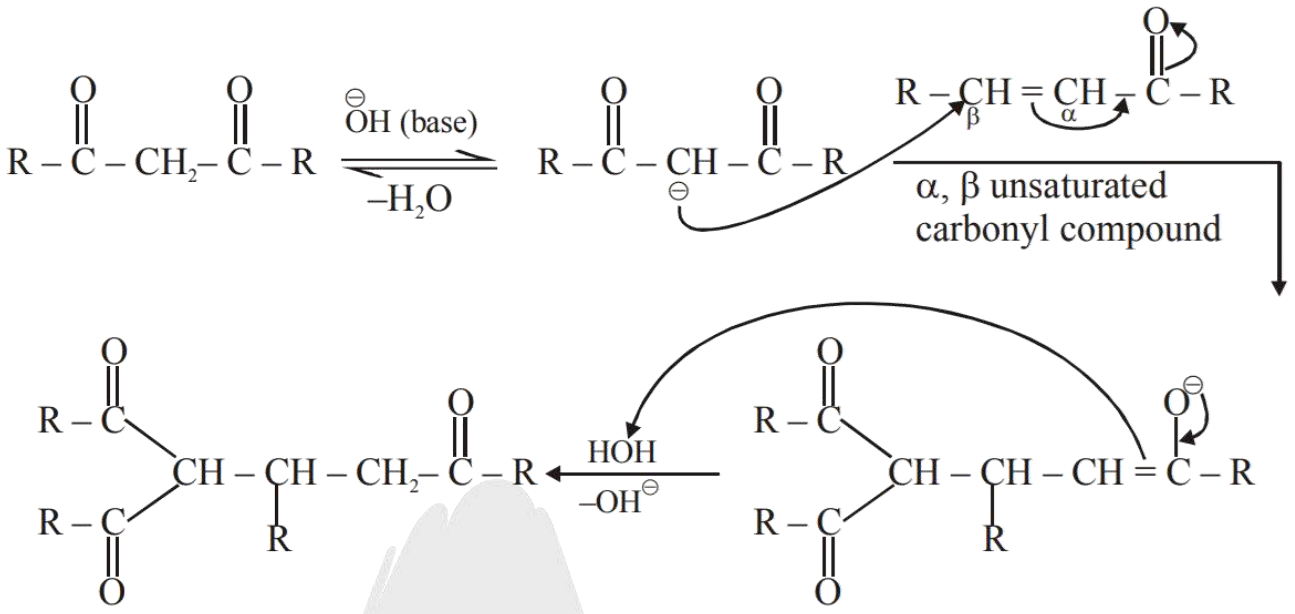
**Q.7** 

**Q.8** 

### (6) MICHAEL ADDITION

Michael Addition: $\alpha - \beta$ unsaturated carbonyl compound undergo michael reaction with compounds having active methylene. Many different nuclephile can add to $\alpha - \beta$ unsaturated carbonyl compound. When the nucleophile is an enolate the addition reaction has a special name MICHAEL REACTON.

**Mechanism:**

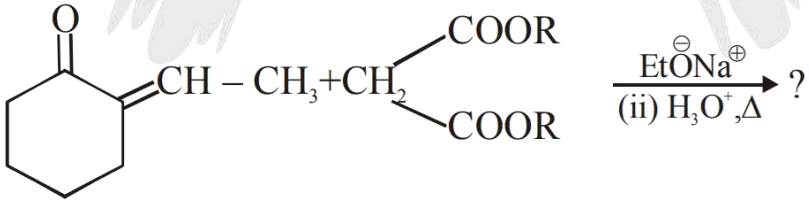



**Q.1** $CH_3-C(=O)-CH_2-C(=O)-CH_3 + CH_2=CH-CHO \xrightarrow[-H_2O]{OH^{\ominus}} ?$

**Q.2** $CH_3CH=CH-C(=O)-CH_3 + CH(COOEt)_2 \xrightarrow{CH_3CH_2O^{\ominus}} ?$

**Q.3** $CH_3CH=CH-C(=O)-NH_2 + CH_3-CH_2-C(=O)-CH_2-C(=O)-O-CH_3 \xrightarrow{CH_3O^{\ominus}} ?$

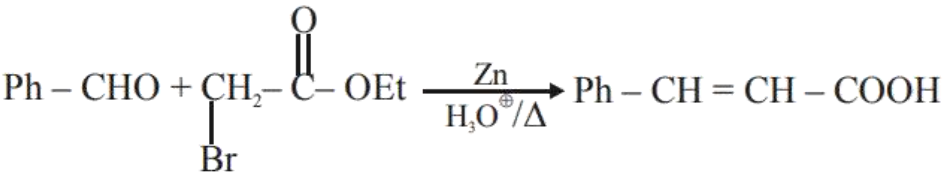
**Q.4** $CH_3CH_2CH=CH-C(=O)-OCH_3 + CH_3-C(=O)-CH_2-C\equiv N \xrightarrow{CH_3O^{\ominus}} ?$

**Q.5** 


**(7) REFORMATSKY REACTION**

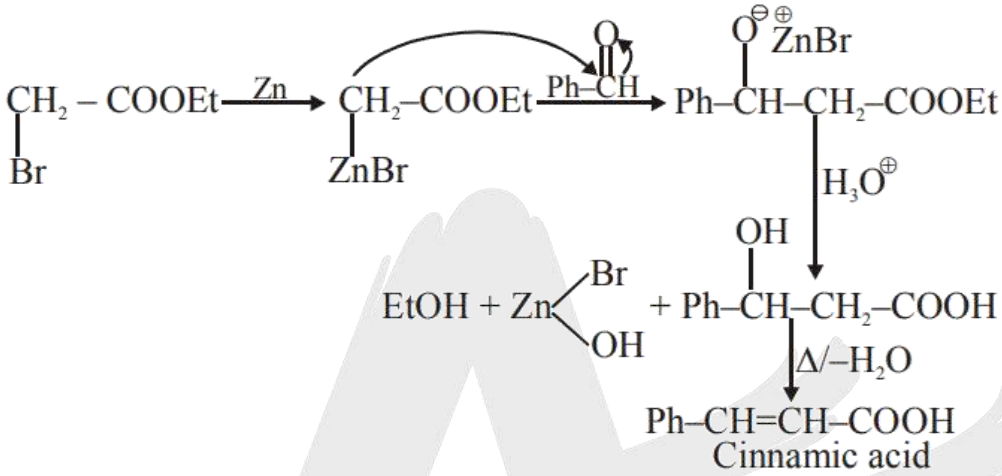
α-halo esters when treated with Zn in gives organometallic halo ester which provides the attacking $Nu^-$ for the another reactant, which is a carbonyl compound. When $Nu^-$ attacks on carbonyl compound it gives an intermediate which upon acidic hydrolysis followed by heating, results in formation of α, β - unsaturated acid. The overall reaction is known as Reformatsky reaction.

## (Organic Chemistry) Aldol Similar Name Reaction

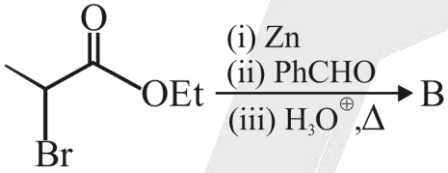



Benzaldehyde — Cinnamic acid

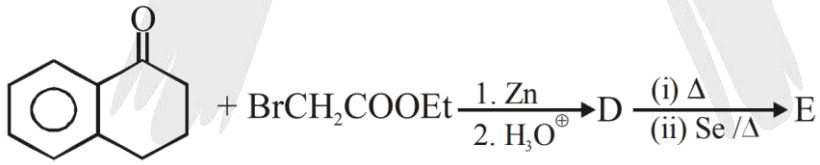
***Mechanism :***



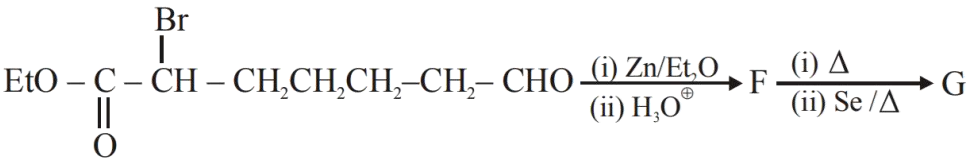

**Q.1** $C_6H_5COCH_3 + BrCH_2COOEt \xrightarrow[2.H_3O^{\oplus},\Delta]{1.Zn} A$

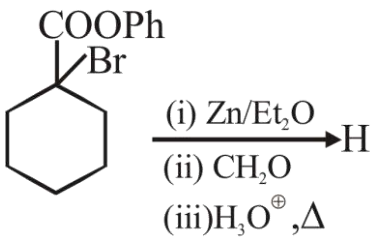
**Q.2** 


**Q.3** 

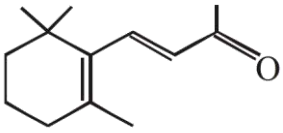

**Q.4** 


α-Tetralone

**Q.5** 


**Q.6** 

**Q.7**



β-Ionone

$$\xrightarrow[(2)\ H_3O^{\oplus}\quad (3)\ \Delta,\ -H_2O]{(1)Zn + BrCHCH = CH - COOCH_3} I$$

**Q.8** Matrix Match:

**Match the column-**

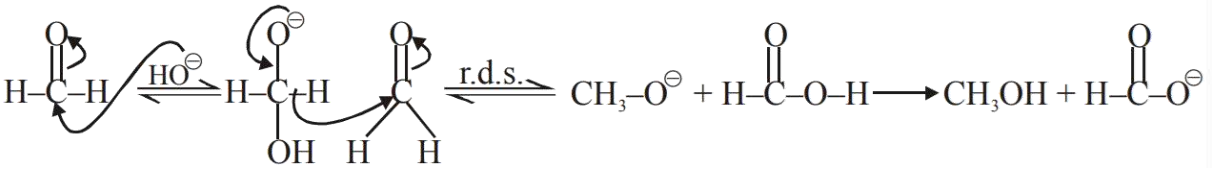
| **Column – I** | **Column – II** |
|---|---|
| (A) $Ph–CHO + CH_2(COOEt)_2 \xrightarrow[(2)H_3O^{\oplus}/\Delta]{(1)EtONa}$ | (P) Perkin's reaction. |
| (B) $Ph–CHO + \underset{\underset{Br}{|}}{CH_2}–COOCH_3 \xrightarrow[(2)H_3O^{\oplus}/\Delta]{(1)Zn}$ | (Q) Reformatskii reaction. |
| (C) $Ph-CHO + CH_3COOCOCH_3 \xrightarrow[(2)H_3O^{\oplus}/\Delta]{(1)CH_3COONa/\Delta}$ | (R) Product is a carboxylic acid with aromatic ring within the same molecule. |
| (D) $Ph–\overset{O}{\overset{\|}{C}}–\overset{O}{\overset{\|}{C}}–Ph + NaOH \xrightarrow[(2)H^{\oplus}]{}$ | (S) Double bond equivalent of the product formed is less than or equal to 8. |
| | (T) The major product cannot show optical isomerism |

**(8) CANNIZARO REACTION**

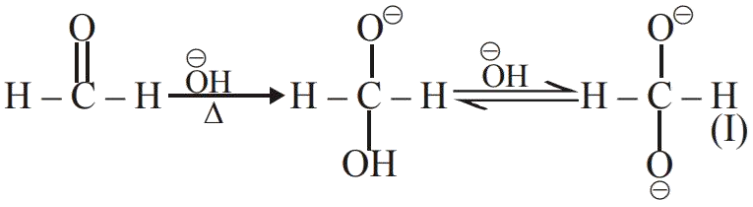
This reaction is given by aldehyde having no α - hydrogen in the presence of conc. NaOH/Δ or KOH/Δ.

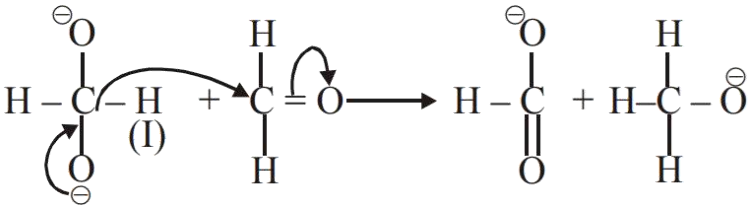
$$H-\overset{O}{\overset{\|}{C}}-H \xrightarrow[\Delta]{KOH} H-\overset{O}{\overset{\|}{C}}-O^{\ominus}K^{+} + CH_3OH$$

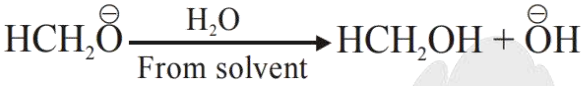
Mechanism:



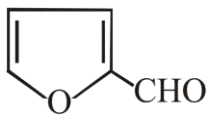
In the presence of a very strong concentration of alkali, aldehyde first forms a doubly charged anion (I) from which a hydride anion is transferred to the second milecule of the aldehyde to form acid and an alkoxide ion. Subsequently, the alkoxide ion acquires a proton from the solvent.

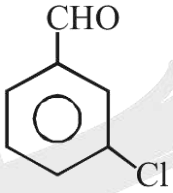


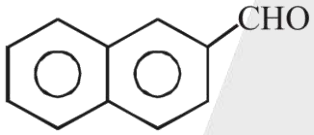




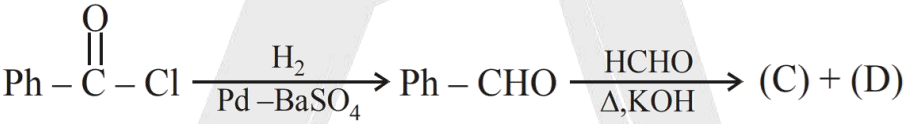
**Q.1** Which of following will not undergo Cannizaro reaction

(A) 

(B) 

(C) 

(D) $Cl_3C-CHO$

**Q.2** 

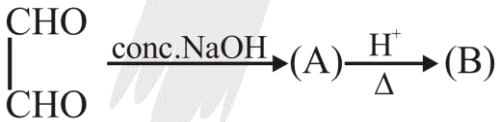
Product (C) & (D) are:

(A) $Ph-CO_2H, Ph-OH$

(B) $Ph-CO_2^-, HCO_2^-$

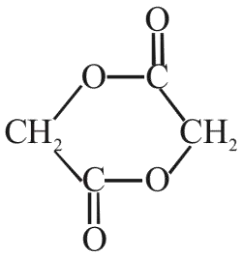
(C) $Ph-CH_2OH, H-CO_2^-$

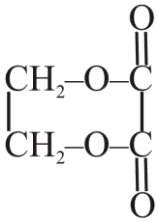
(D) $Ph-CO_2^-, CH_3OH$

**Q.3** 

Product (B) is

(A) $H_2C=CH-CO_2H$

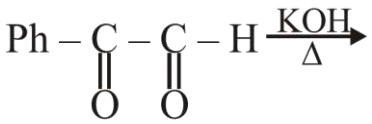
(B) 

(C) 

(D) $H_2C=C=O$

**Q.4** (i) $HCHO \xrightarrow[\Delta]{NaOD}$ (ii) $DCHO \xrightarrow[\Delta]{NaOD}$

**Q.5** (i) $Ph-CHO \xrightarrow[\Delta]{\overset{\ominus}{O}D/DOD}$ (ii) $Ph-CHO \xrightarrow[\Delta]{^{18}\overset{\ominus}{O}H}$

**Q.6** (i) $Ph-CHO+HCHO \xrightarrow[\Delta]{KOH}$ (ii) 

**Q.7** (i) $MeCH_2-CHO \xrightarrow[\Delta]{KOH}$ (ii) $Me_2CH-CHO \xrightarrow[\Delta]{conc.KOH}$

**Q.8** (i) $Me-NO_2+\underset{(excess)}{HCHO} \xrightarrow{KOH}$ (ii) $MeCHO-\underset{(excess)}{HCHO} \xrightarrow{KOH}$

**Q.9** $PhCOCHBr_2 \xrightarrow{Aq.\bar{O}H} A \xrightarrow{Conc.\bar{O}H} B \xrightarrow{H^+}$ ;the compound ' **C** ' is:

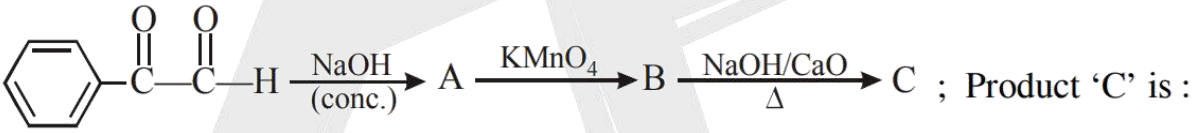
(A) PhCH(OH)CHO (B) PhCH(OH)COOH

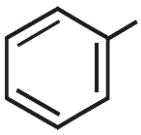
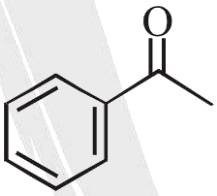
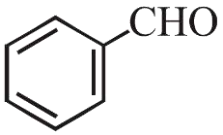
(C) PhCOOH (D) None of these

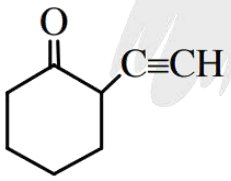
**Q.10** Matrix Match:

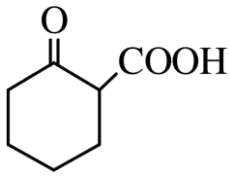
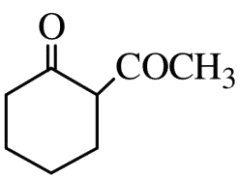
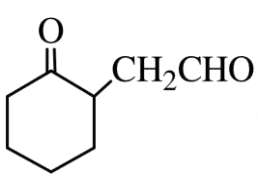
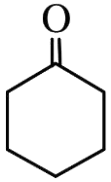
Match the column-

| **Column – I** | **Column – II** |
|---|---|
| (A) HCHO + NaOD (conc.) | (P) $DCOO^- + CDH_2OH$ |
| (B) DCHO + NaOH (conc.) | (Q) $DCOO^- + CD_2OH$ |
| (C) DCDO + NaOH (conc.) | (R) $DCOO^- + CDH_2OD$ |
| (D) DCHO + NaOD (conc.) | (S) $HCOO^- + CH_3OD$ |

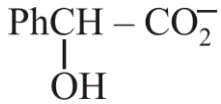
**Q.11**  ; Product 'C' is :

(A)  (B)  (C)  (D) 

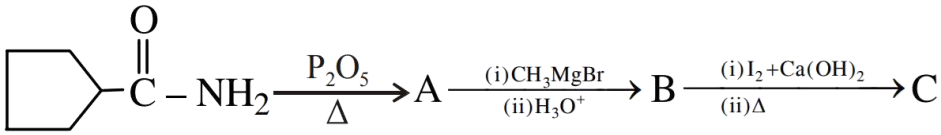
**Q.12**  ; X is :

(A)  (B)  (C)  (D) 

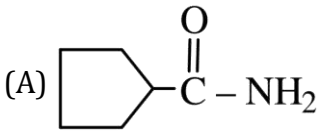
**Q.13** The Cannizaro reaction of PhCOCHO forms the product(s)

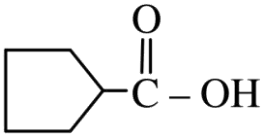
(A) $PhCOCH_2OH + PhCOCO_2^-$ (B) 

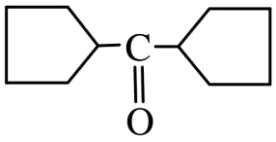
(C) $PhCO_2^- + PhCOCH_2OH$ (D) Both (A) and (C)

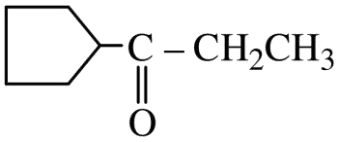
**Q.14** 

; Product is:

(A) 


(B) 


(C) 


(D) 


**Q.15** 

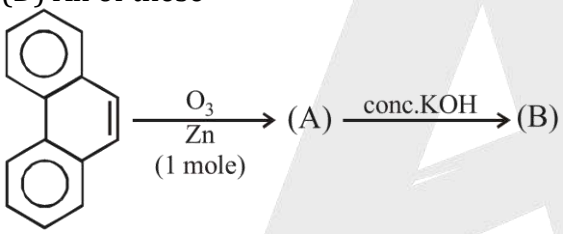

True about this reaction is / are

(A) Cannizaro name is associated with this reaction

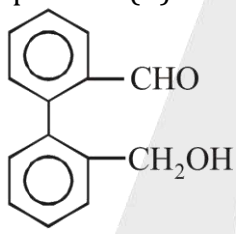
(B) It is a disproportion reaction

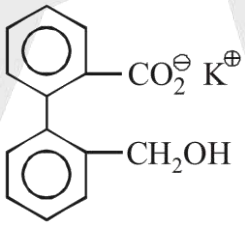
(C) It is a bimolecular reaction in r.d.s.

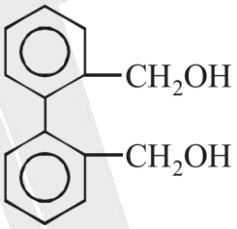
(D) All of these

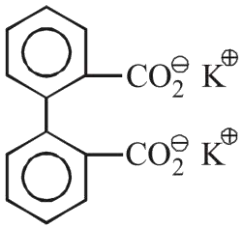
**Q.16** 


End product (B) of above reaction is:

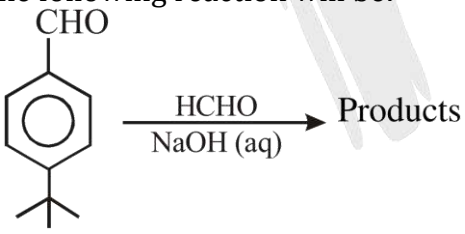
(A) 

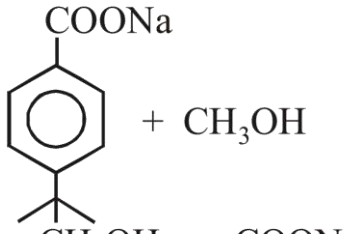

(B) 

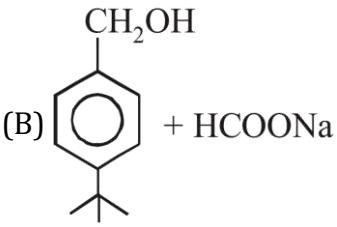

(C) 

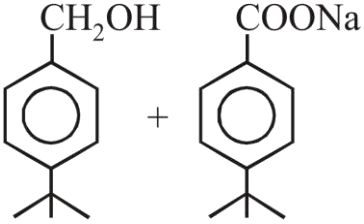

(D) 


**Q.17** The major product pair of the following reaction will be:



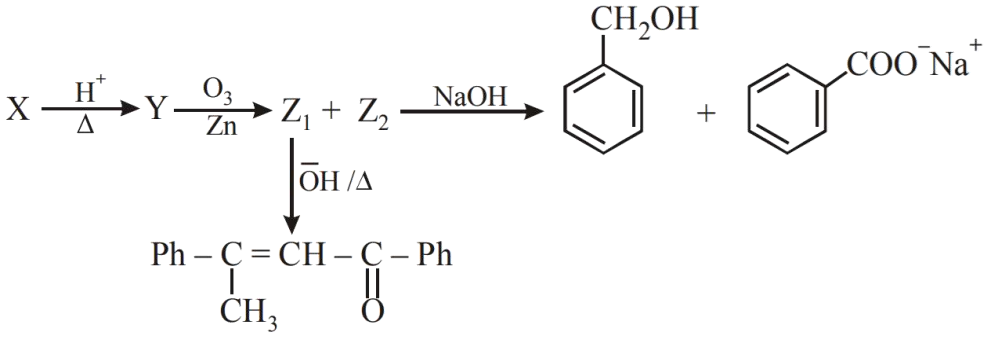

(A) 

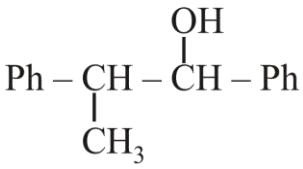

(B) 

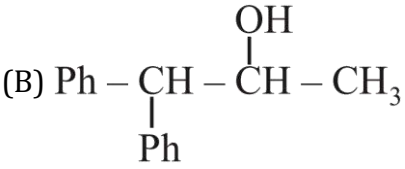

(C) 

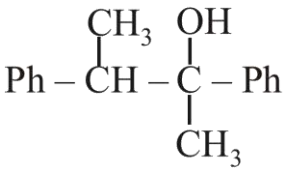

(D) $CH_3OH$ + $HCOONa$

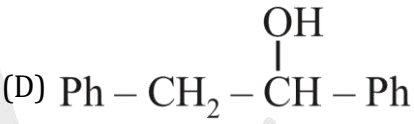
**Q.18** Reactant 'X' will be:



(A) 

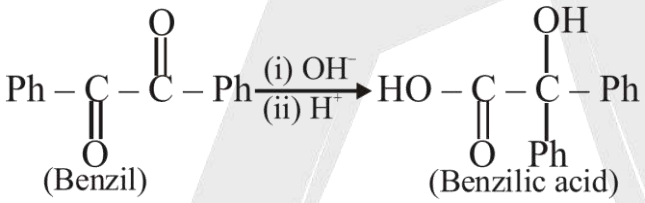
(B) 

(C) 

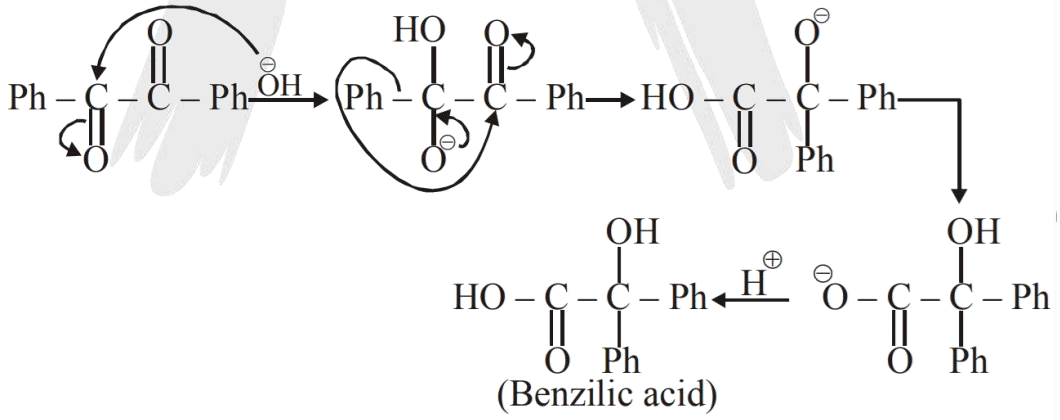
(D) 

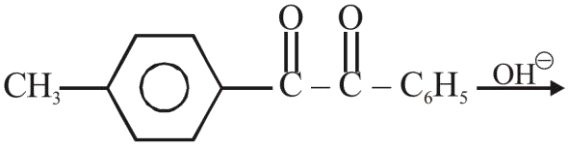
**(9) BENZIL-BENZILIC REARRANGEMENT OR BENZILIC ACID REARRANGEMENT**

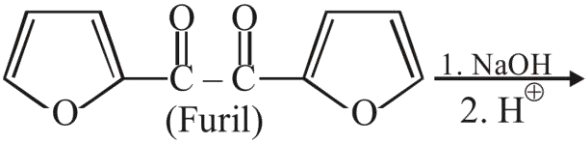
The base catalysed reaction of 1,2-diketones to a salt of -2-hydroxy carboxylic acid is known as Benzilic acid rearrangement, this reaction is mainly applicable when aryl group is present on both carbonyl carbons.



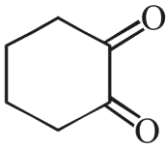
Mechanism:

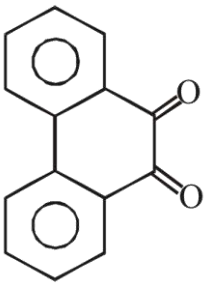


**Q.1** 

**Q.2** 

**Q.3** $C_6H_5-\overset{O}{\overset{\|}{C}}-\overset{OH}{\overset{|}{C}}H-C_6H_5 \xrightarrow{\text{Fenton reagent}} A \xrightarrow[(ii)\ HOH/H^{\oplus}]{(i)\ OH^{\ominus}} B.$

**Q.4**  $\xrightarrow[(ii)\ H_3O^{\oplus}]{(i)\ NaOH}$

**Q.5**  $\xrightarrow[(ii)\ H_3O^{\oplus}]{(i)\ NaOH}$

**Q.6** $Ph-CHO \xrightarrow[\Delta]{KCN} P_1 \xrightarrow[Reagent]{Fenton's} P_2 \xrightarrow[(2)H^+]{NaOH} P_3$

## (10) TISCHENKO REACTION /CONDENSATION

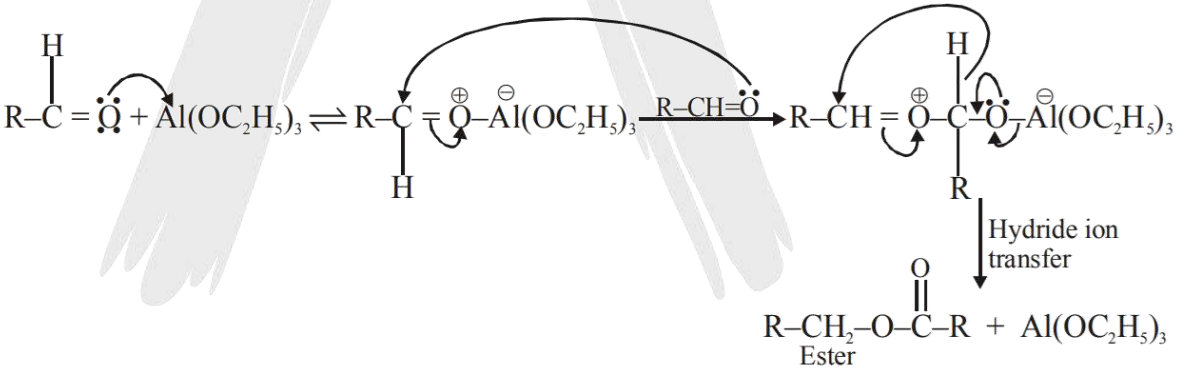
(1) This reaction takes place between two molecules of aldehydes.

(2) Reaction is catalysed by aluminimum ethoxide.

(3) This is a two-step reaction, i.e., redox reaction followed by ester formation. Thus, this reaction is extension of Cannizzaro reaction.

$$R-CHO + R-CHO \xrightarrow[\Delta]{(C_2H_5O)_3Al} R-CH_2-O-\overset{O}{\overset{\|}{C}}-R$$

**Mechanism:**




**Q.1** $CH_3-CHO \xrightarrow[\Delta]{(C_2H_5O)_3Al} ?$

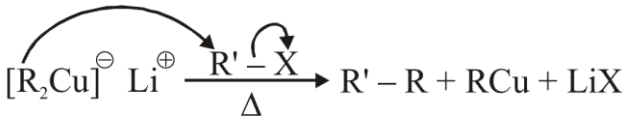
**Q.2** $CH_3-CH_2-CHO \xrightarrow[\Delta]{(C_2H_5O)_3Al} ?$

**Q.3** $OHC-CH_2-CH_2-CH_2-CHO \xrightarrow[\Delta]{(C_2H_5O)_3Al} ?$

**Q.4** $CH_3CHO + CH_3-CH_2-CHO \xrightarrow[\Delta]{(C_2H_5O)_3Al} ?$

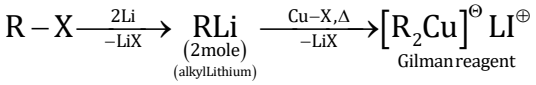
## (11) COREY HOUSE SYNTHESIS

Reaction of Gilman's reagent with alkyl halide gives alkane as one of the product which is known as Corey House synthesis,

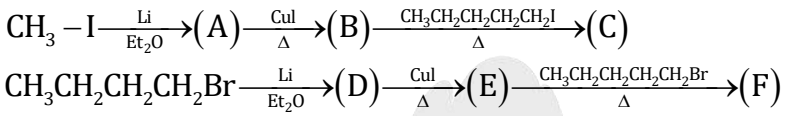


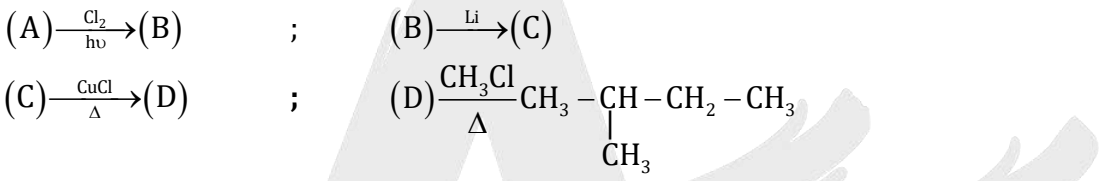
Gilman reagent
(Lithium dialkyl cuprate)

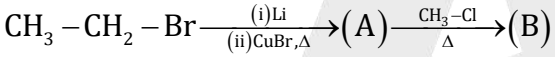
To obtained good yield of alkane, the alkyl halide $R' - X$ must be either a methyl halide, a primary alkyl halide, or a secondary cycloalkyl halide. (Best $CH_3X$, if possible) Preparation of Gilman reagent:

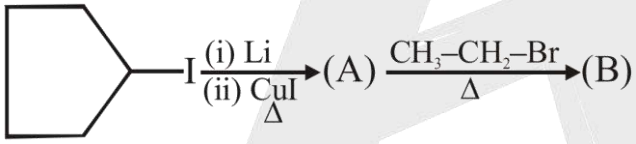


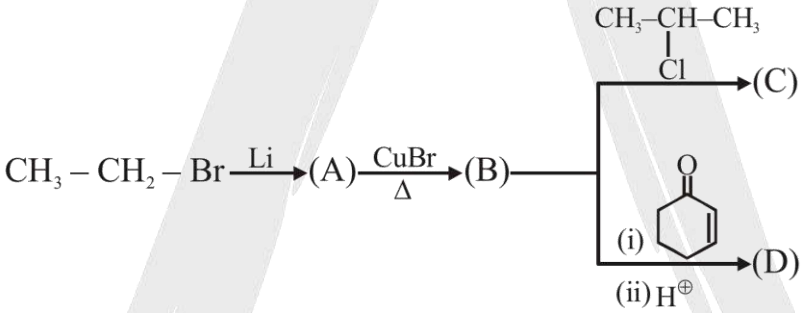
Complete the following reaction sequence:

**Q.1** 

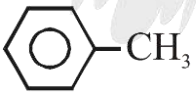
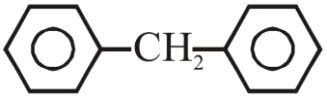
**Q.2** 

**Q.3** 

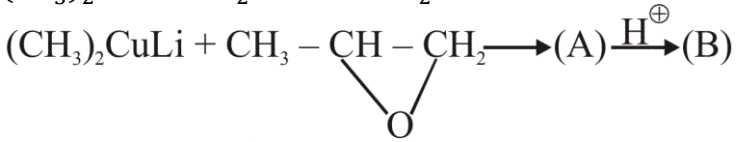
**Q.4** 

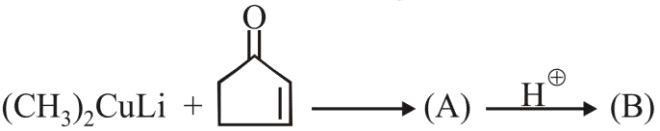
**Q.5** 

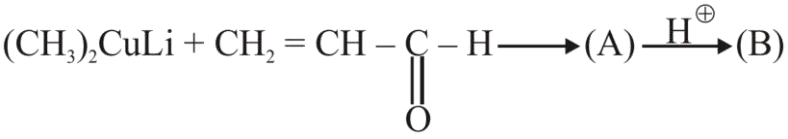
**Q.6** How can you prepare following compounds using corey house synthesis.

(i)  (ii) $CH_2 = CH - CH_2 - CH_3$ (iii) 

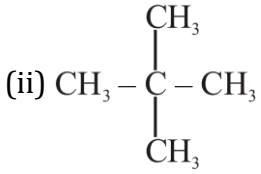
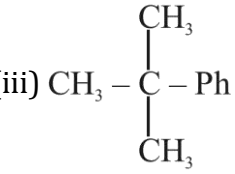
**Q.7** $(CH_3)_2CuLi + CH_2 = CH - \overset{14}{C}H_2 - Cl \rightarrow$

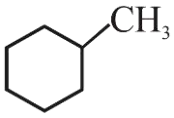
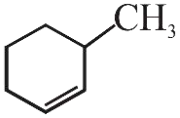
**Q.8** 

**Q.9** 

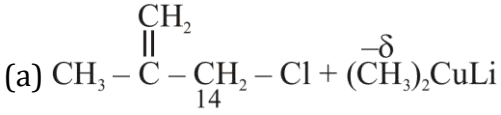
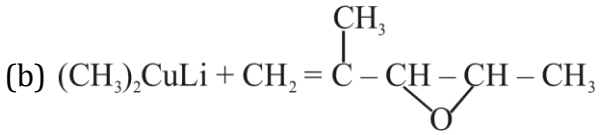
**Q.10** 

**Q.11** Which of the combination of Gilman's reagent & alkylhalide will be most suitable for preparation of following compounds.

(i) $CH_3 - CH_2 - CH_3$ (ii)  (iii) 

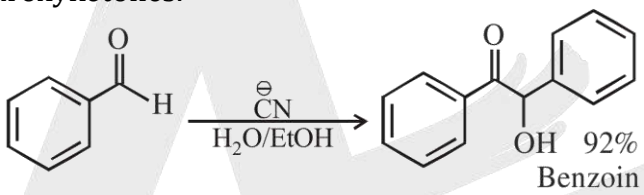
(iv)  (v) 

**Q.12** Identify the product of following reactions:

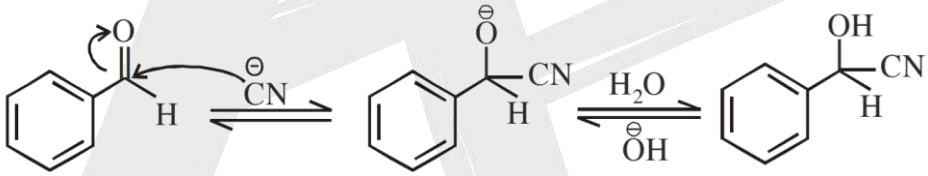
(a)  (b) 

**(12) BENZOIN CONDENSATION**

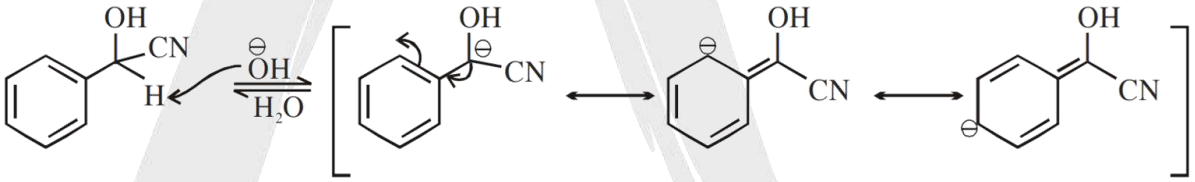
The Benzoin Condensation is a coupling reaction between two aldehyades that allows the preparation of ***α***-hydroxyketones.



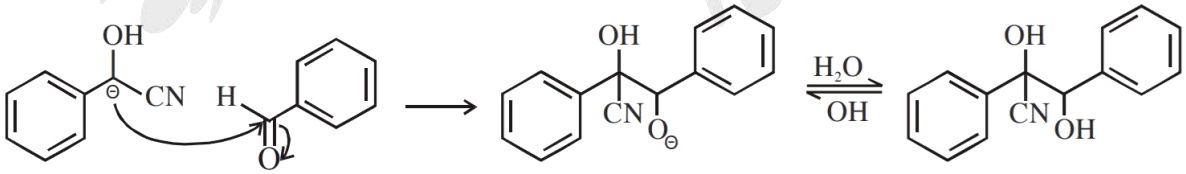

Mechanism of Benzoin Condensation

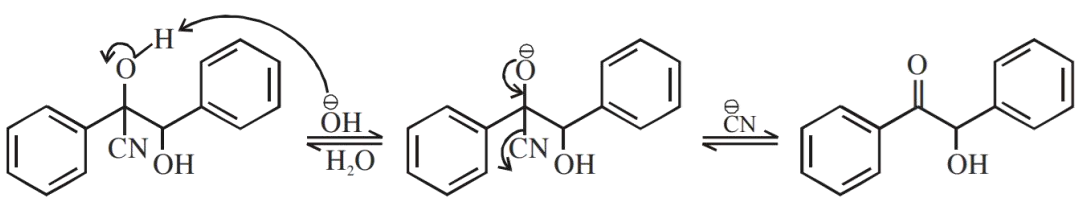



A strong base is now able to deprotonate at the former carbonyl C-atom.




A second equivalent of aldehyde reacts with this carbanion, elimination of the catalyst regenerates the carbonyl compound at the end of the reaction



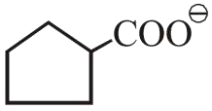



# (Organic Chemistry) Aldol Similar Name Reaction

**ANSWER KEY**

## (1) HALOGENATION OF THE $\alpha$-CARBON OF ALDEHYDES AND KETONES

**Q.1** (1,2,5,7,9,11)

**Q.2** (i) 

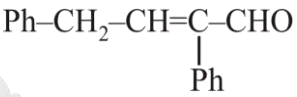
(ii) $CH_3 - COO^- + CHI_3$

(iii) 

(iv) 

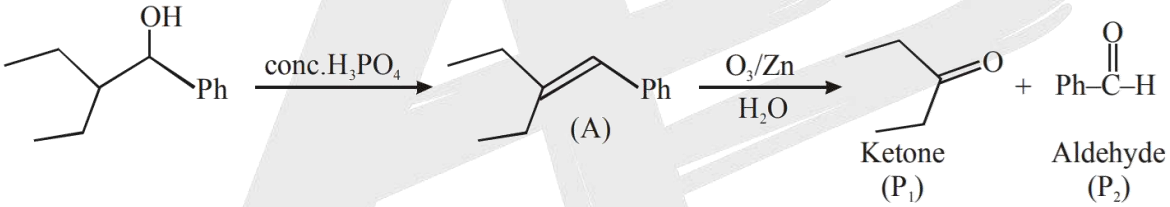
**Q.3** (A, B)

**Q.4** (C)

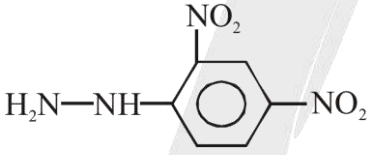
X: $PhCH_2CH_2OH$ Y: $PhCH_2CHO$ Z : 

**Q.5** (A) **Q.6** (A)

**Q.7** (B)



(A) Both ketone & aldehyde react with braddy's reagent



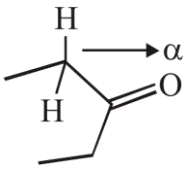
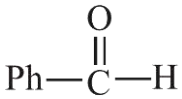
2, 4 dinitrophenyl hydrazine.

(B) With $NaHSO_3$ only aldehyde give crystalline bisulphite adduct whereas hindered ketone is unable react.

(C) $NaHCO_3$ will not react any of them.

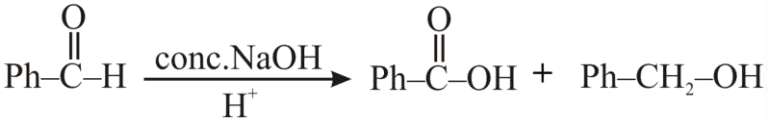
(D) Both $P_1$ &$P_2$ are unable to form idoform with $NaOH/I_2$

**Q.8** (A)

For aldol $\alpha$H should be present i.e.  Hydrogen $P_1$ where as $P_2$ 

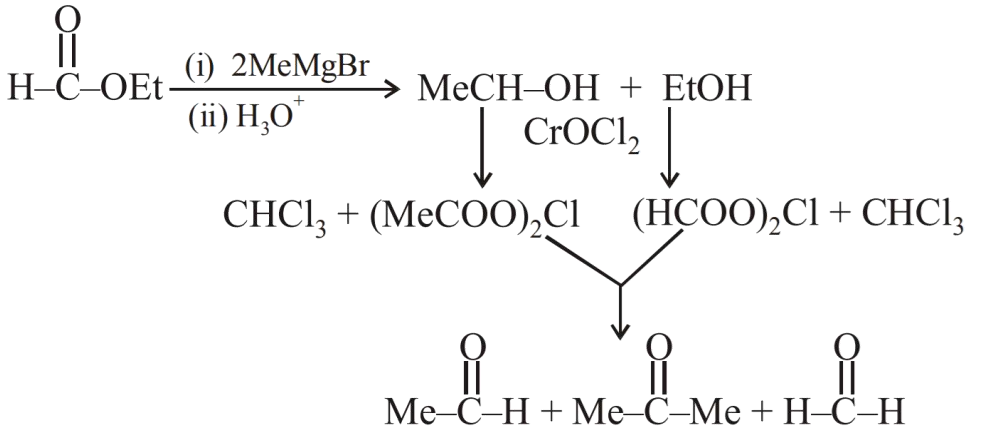
Will give cannizaro's as there is no. $\alpha$H in $P_2$.

**Q.9** (D)

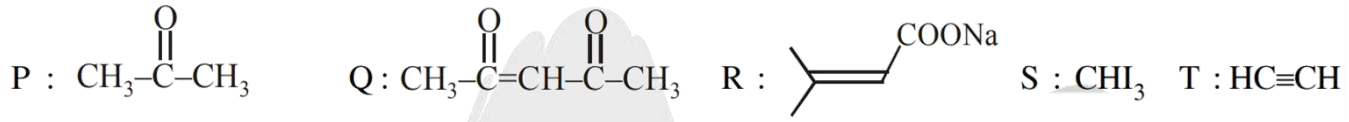


The above reaction is intermolecular redox reaction. In which desprotionation is taking place as a result of which 2 different products are formed from singlet reactant.

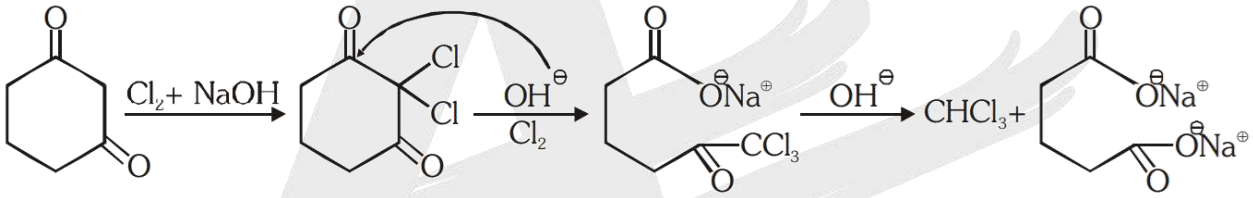
**Q.10** (A,B,C,D)

**Q.11** 

**Q.12** (A, B, C)



**Q.13** (A, B, D)

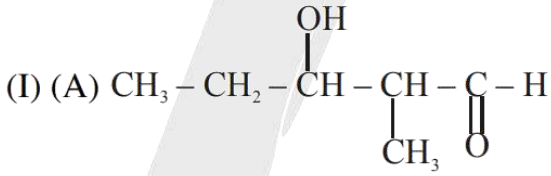


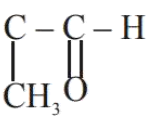
**Q.14** (A, B, C, D)

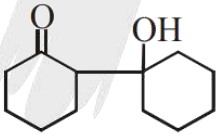
**Q.15** (A, B, C, D)

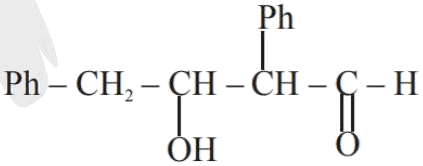
## (2) ALDOL CONDENSATION

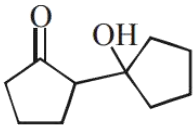
**Q.1**

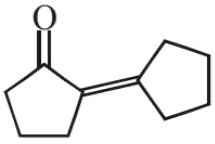
(I) (A) 

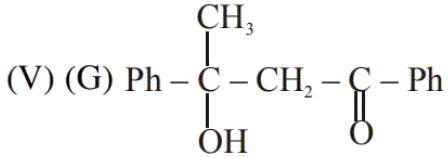
(B) 

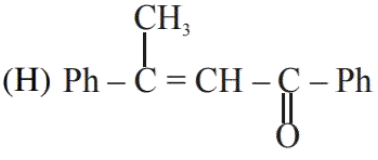
(II) (C) 

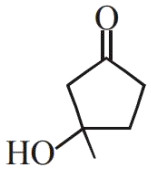
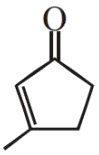
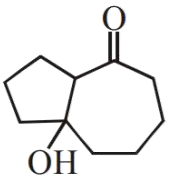
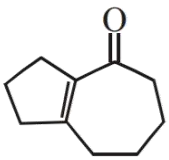
(III) (D) 

(IV) (E) 

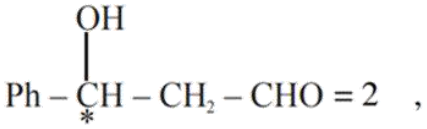
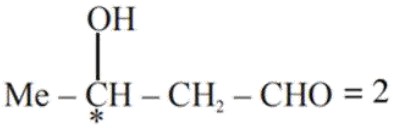
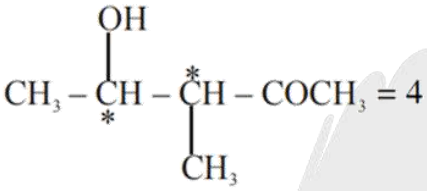
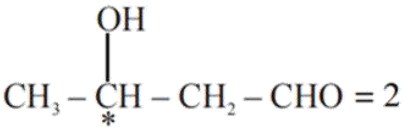
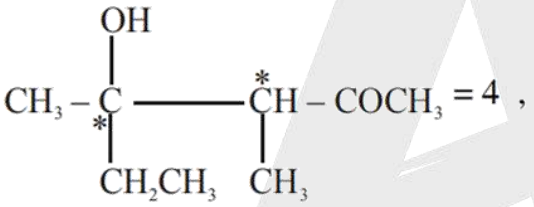
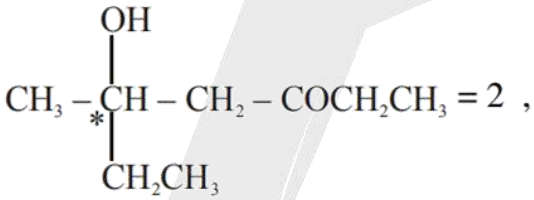
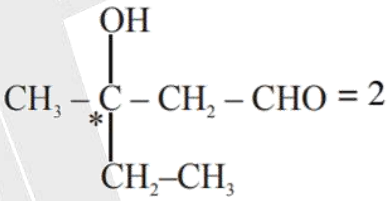
(F) 

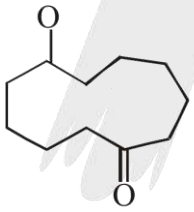
(V) (G) 

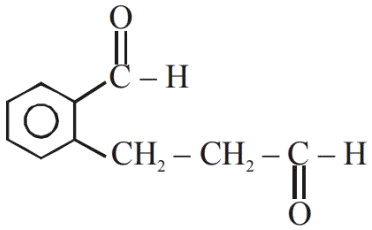
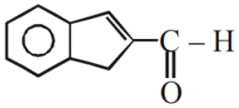
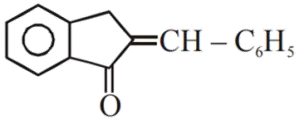
(H) 

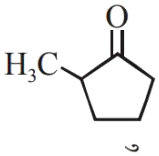
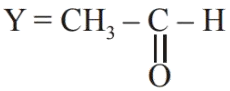
**Q.2** (A)  (B)  ; (II) (E)  (F) 

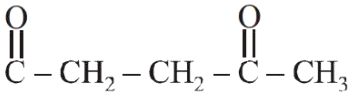
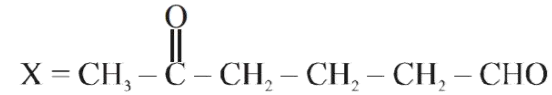
**Q.3**

| | Excluding Stereo | Including Stereo |
|---|---|---|
| (I) |  |  |
| (II) |  |  |
| |  |  |
| |  |  |

**Q.4** (I)  (II) 

**Q.5** (i) (a)  (b)  (ii) 

**Q.6** (i) X =  Y = 

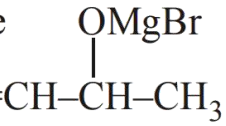
(ii)  (iii) 

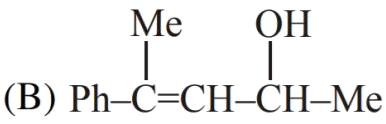
**Q.7** (C)

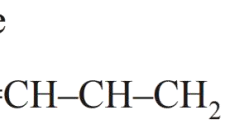
Intramolecular aldol condensation the 1,4-additon and finally clemmesion reduction.

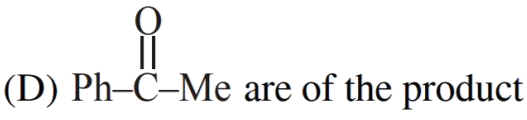
**Q.8** (D)

**Q.9** (D)

(A) 

(B) 

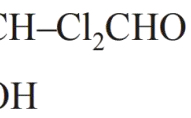
(C) 

(D)  are of the product

**Q.10** (B)

Ozonolysis followed by intramolecular aldol.

**Q.11** (C)

(A) 

(B) $CH_3CH=CH-CH=O$

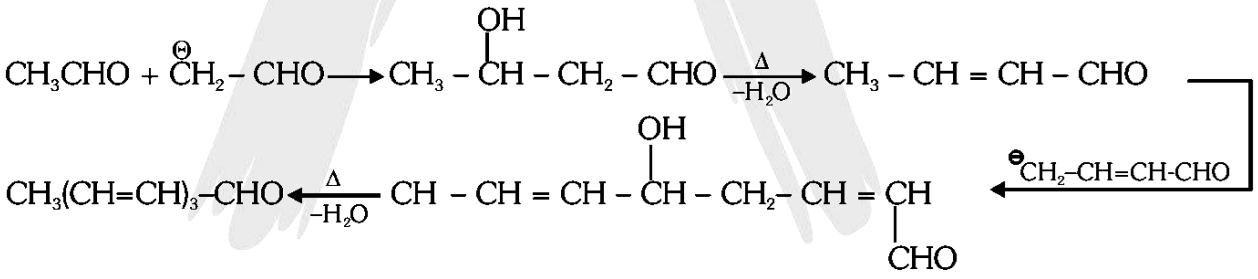
(C) $CH_3CH_2CH_2CH_2OH$

(D) $CH_3CH_2CH_2COOH$

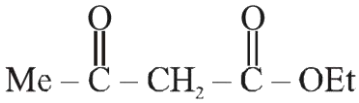
**Q.12** (A)

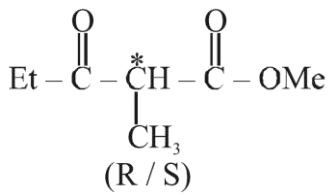
**Q.13** (A)

**Q.14** (A)



## (3) CLAISEN CONDENSATION

**Q.1** 

**Q.2** 

**Q.3** 4 products

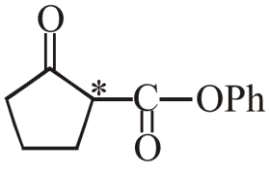
**Q.4** $C_6H_5COCH_2COOC_2H_5$, $CH_3COCH_2COOC_2H_5$

Ethtl benzolyacetate

**Q.5**

Diethyl-α-oxalyphenyl acetate

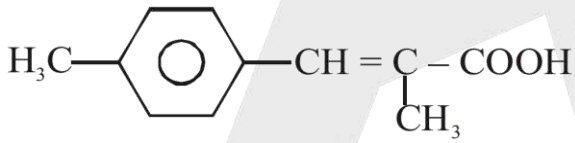
**Q.6**



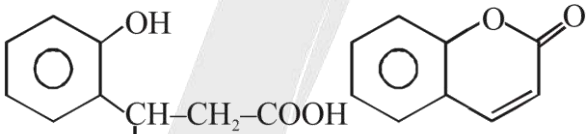
(R / S)

## (4) PERKIN CONDENSATION

Q.1

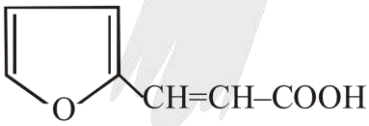


Q.2



(B) (C)

Q.3



Q.4 $CH_3COOCOCH_3$

## (5) KNOEVENAGEL REACTION

**Q.1** $CH_3 - CH = CH - COOH$

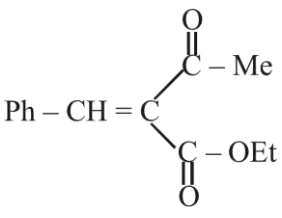
Cinnamic acid

**Q.2** $C_6H_5 - CH=CH - COOH$

Cinnamic acid

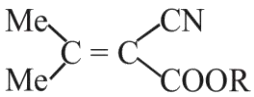
**Q.3** $HOOC - CH = CH - COOH$

**Q.4**

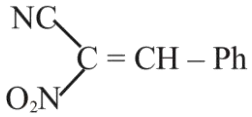


**Q.5** $Ph - CH = CH - NO_2$

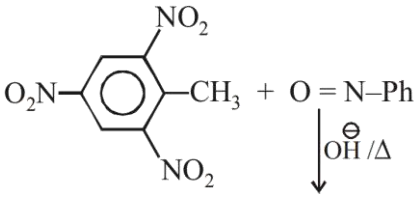
**Q.6**

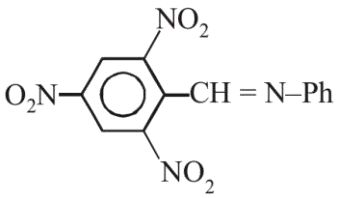


**Q.7**



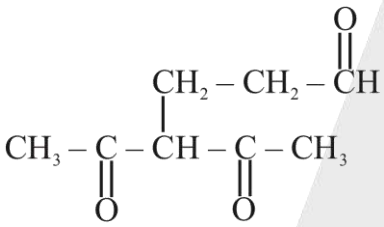
**Q.8**



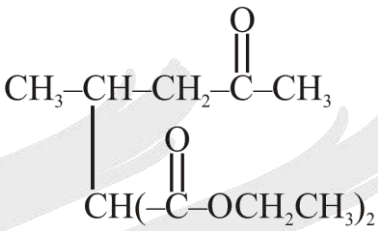


## (6) MICHAEL ADDITION

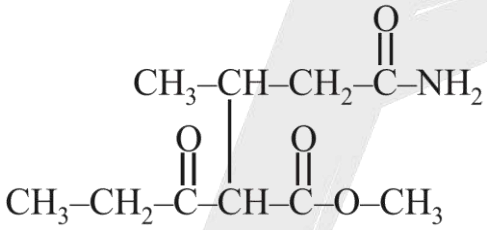
**Q.1**



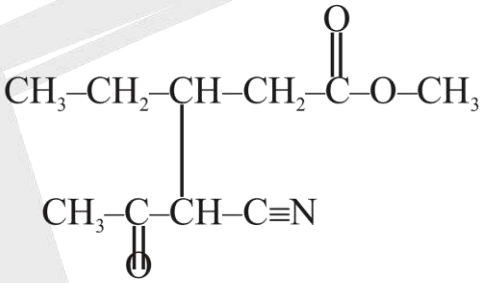
**Q.2**



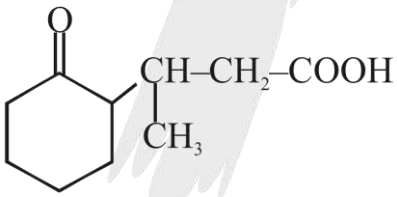
**Q.3**



**Q.4**

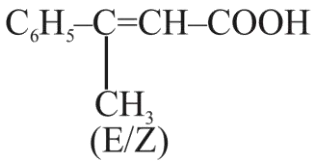


**Q.5**

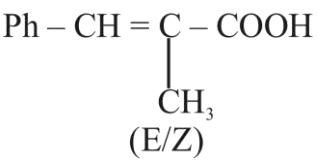


## (7) REFORMATSKY REACTION

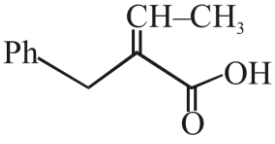
**Q.1**



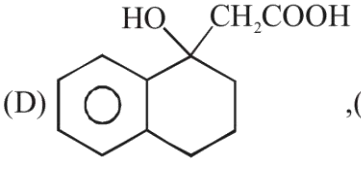
**Q.2**

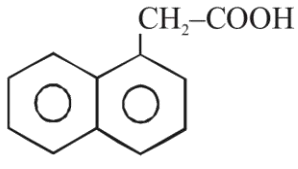


**Q.3**

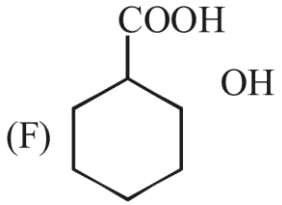


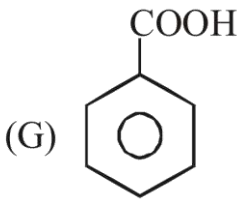
**Q.4**

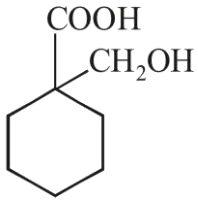


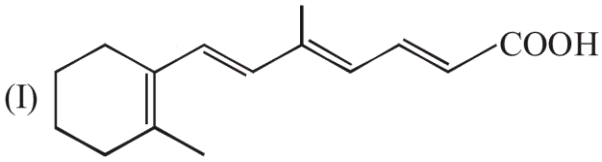


α-Naphthylacetic acid

**Q.5** 




**Q.6** 


**Q.7** 


**Q.8** (A)-RST, (B) -Q,R,S,T (C)-P,R,S,T (D) R,T

## (8) CANNIZARO REACTION

**Q.1** (D) As $Cl_3C-CHO$ given chloroform

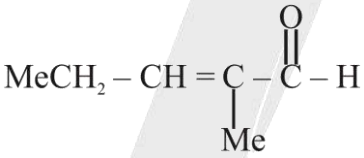
**Q.2** (C) In cross cannizzaro reaction move reactive carbonyl compound is oxidised & less in reduced.

**Q.3** (B) Intramolecular cannizzaro followed by heating effect

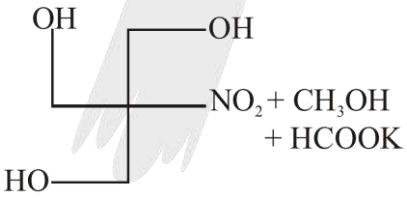
**Q.4** (i) $CH_3OD + HCOONa$ (ii) $DCH_2OD + DCOONa$

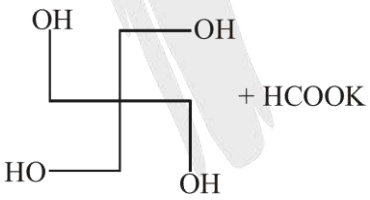
**Q.5** (i) $PhCH_2OD + PhCOONa$ (ii) $Ph-CH_2OH + PhCOONa$

**Q.6** (i) $Ph-CH_2OH + HCOOK$ (ii) 

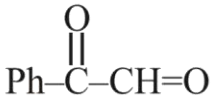

**Q.7** (i) 

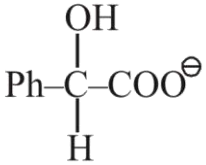
(ii) $Me_2CH-CH_2OH + Me_2CHCOOK$

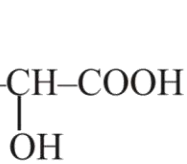
**Q.8** (i) 

(ii) 


**Q.9** (B)

A : 

B : 

C : 

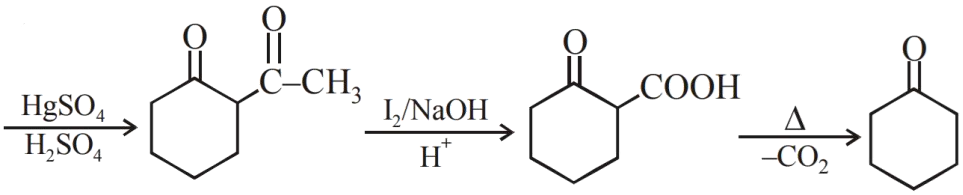

**Q.10** (A) → S; (B) → P; (C) → Q; (D) → R

**Q.11** (A)

A : 

B : PhCOOH C : 

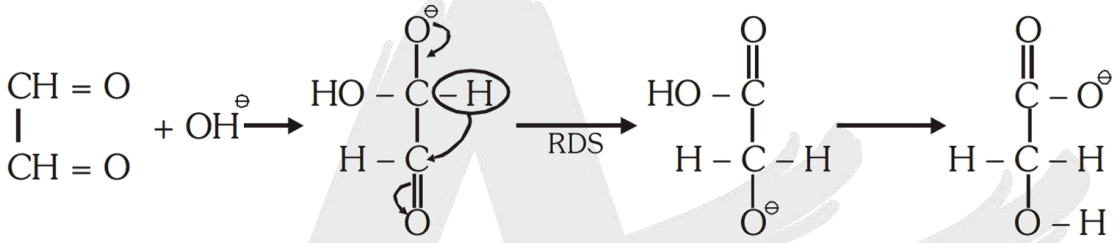
**Q.12** (D)




**Q.13** (B)

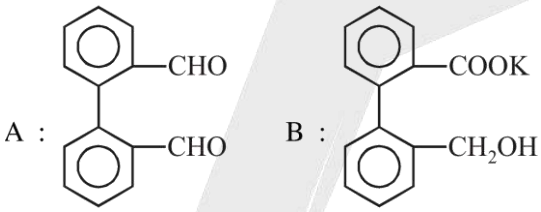
**Q.14** (C)


**Q.15** (A)



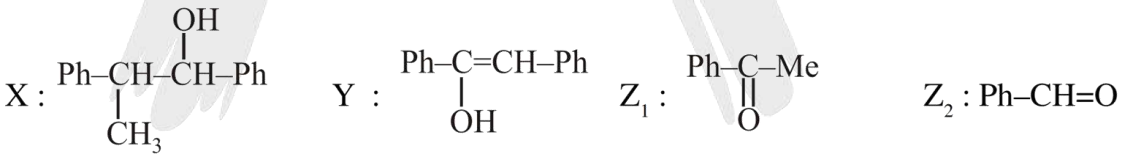

option A is correct.

**Q.16** (B)



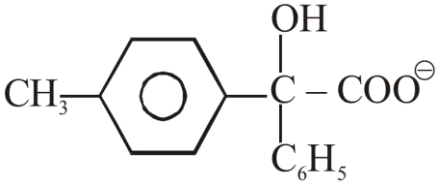

**Q.17** (B) Cross cannizaro reaction

**Q.18** (A)

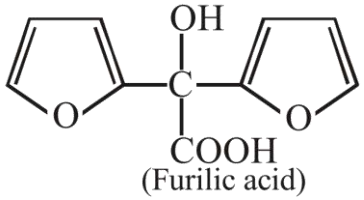



**(9) BENZIL-BENZILIC REARRANGEMENT OR BENZILIC ACID REARRANGEMENT**

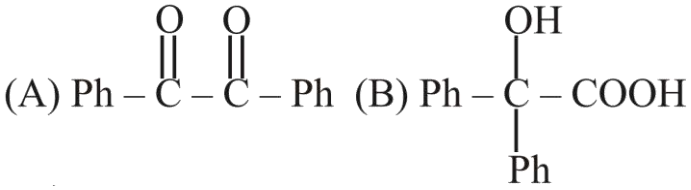
**Q.1**

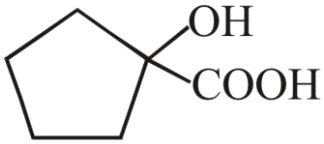


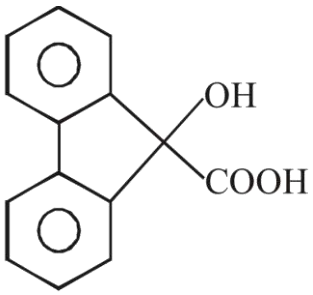

**Q.2**




**Q.3**



**Q.4** 

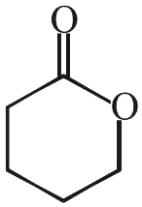
**Q.5** 

**Q.6** $(P_1)$ Ph – C(=O) – CH(OH) – Ph $(P_2)$ Ph – C(=O) – C(=O) – Ph $(P_3)$ Ph – C(OH)(Ph) – COOH

## (10) TISCHENKO REACTION/CONDENSATION

**Q.1** $CH_3–C(=O)–O–C_2H_5$

**Q.2** $CH_3–CH_2–C(=O)–O–CH_2–CH_2–CH_3$

**Q.3** 

**Q.4** 4 products

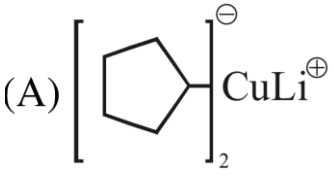
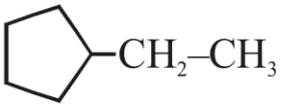
## (11) COREY HOUSE SYNTHESIS

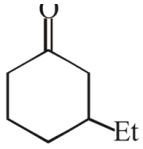
**Q.1** (A) $CH_3Li$, (B) $(CH_3)_2CuLi$,
(C) $CH_3 - CH_2CH_2CH_2CH_2CH_3$, (D) $CH_3CH_2CH_2CH_2Li$,
(E) $(CH_3CH_2CH_2CH_2)_2CuLi$, (F) $CH_3CH_2CH_2CH_2 - CH_2CH_2CH_2CH_2CH_3$

**Q.2** (A) $CH_3–CH(CH_3)–CH_2$ (B) $CH_3–CH(CH_3)–CH_2–Cl$

(C) $CH_3–CH(CH_3)–CH_2Li$ (D) $[CH_3–CH(CH_3)–CH_2]_3^{\ominus}CuLi^{\oplus}$

**Q.3** (A) $[CH_3CH_2]_2^{\ominus}CuLi^{\oplus}$ (B) $CH_3 - CH_2 - CH_3$

**Q.4** (A)  (B) 

**Q.5** (A) $CH_3 - CH_2^{\ominus\delta}\,Li^{\oplus\delta}$ (B) $[CH_3CH_2]_2^{\ominus}CuLi^{\oplus}$ (C) $CH_3 - CH(Et) - CH_3$ (D) 

**Q.6** (i) $[Ph]_2^{\ominus}CuLi^{\oplus} \xrightarrow{CH_3-Cl} Ph-CH_3$

(ii) $[CH_2=CH-CH_2]_2^{\ominus}CuLi^{\oplus} \xrightarrow{CH_3-Cl} CH_2-CH-CH_2-CH_3$

(iii) $[Ph]_2^{\ominus}CuLi^{\oplus} \xrightarrow{Ph-CH_2-Cl} Ph-CH_2-Ph$

14

**Q.7** $CH_3 - CH_2 - CH = CH_2$

**Q.8** not available

**Q.9** (A) $CH_3 - \underset{\underset{O^{\ominus}Li^{\oplus}}{|}}{CH} - CH_2 - CH_3$ (B) $CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - CH_3$

**Q.10** (A) $CH_3 - CH_2 - CH = \underset{\underset{\ominus OLi^{\oplus}}{|}}{C} - H$ (B) $CH_3 - CH_2 - CH_2 - \underset{\underset{O}{||}}{C} - H$

**Q.11** (i) $[CH_3 - CH_2]_2^{\ominus}CuLi^{\oplus} + CH_3 - Cl$ (ii) $[Me_3C]_2^{\ominus}CuLi^{\oplus} + CH_3 - Cl$

(iii) $\left(Me-\underset{Me}{\overset{Ph}{\underset{|}{\overset{|}{C}}}}-\right)_2 CuLi + Me-Cl$ (iv) $\left(\text{C}_6\text{H}_5-\right)_2 CuLi + Me-Cl$ (v) $\left(\text{C}_6\text{H}_5-\right)_2 CuLi + Me-Cl$

**Q.12** (a) $CH_3 - \underset{\underset{CH_2}{||}}{C} - CH_2 - CH_3$ (b) $CH_3 - CH_2 - \overset{CH_3}{\underset{|}{C}} = CH - \underset{\underset{OLi}{|}}{CH} - CH_3$

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