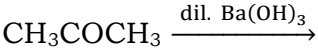
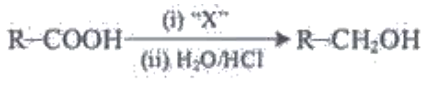
Aldehydes, Ketones and Carboxylic Acids

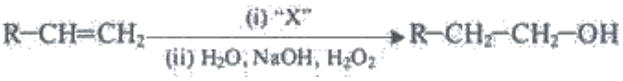
1. Consider the given reaction:



The functional groups present in compound "X" are: **(2023)**

(a) ketone and double bond
(b) double bond and aldehyde
(c) alcohol and aldehyde
(d) alcohol and ketone

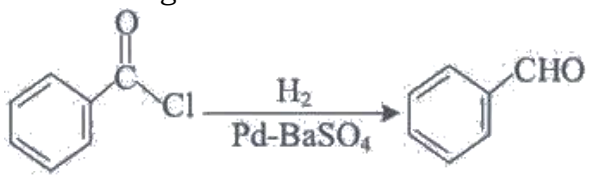
2. 



Identify 'X' in above reactions **(2023)**

(a) B_2H_6
(b) $LiAlH_4$
(c) $NaBH_4$
(d) H_2/Pd

3. The following conversion is known as:



(2023)

(a) Stephen reaction
(b) Gattermann-Koch reaction
(c) Etard reaction
(d) Rsenmund reaction

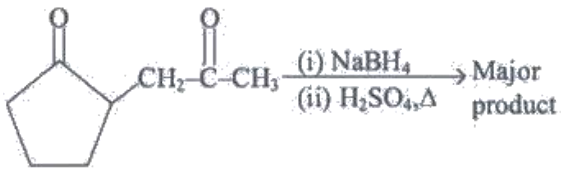
4. Reagents which can be used to convert alcohols to carboxylic acids, are

(A) $CrO_3 - H_2SO_4$
(B) $K_2Cr_2O_7 + H_2SO_4$
(C) $KMnO_4 + KOH/H_3O^+$
(D) Cu, 573 K
(E) CrO_3, $(CH_3CO)_2O$

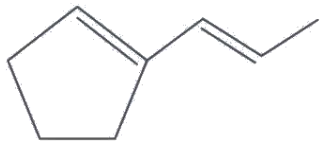
Choose the most appropriate answer from the options given below: **(2023)**

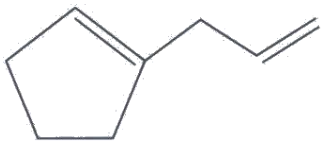
(a) B, C and D only
(b) B, D and E only
(c) A, B and C only
(d) A, B and E only

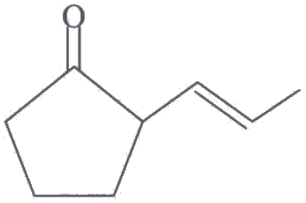
5. The major product formed in the following conversion is _____.

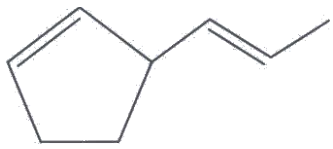


(2023)

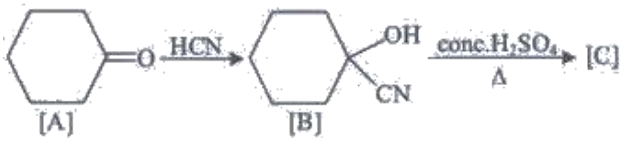
(a) 

(b) 

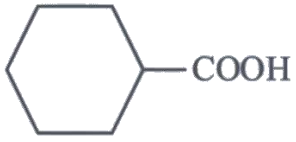
(c) 

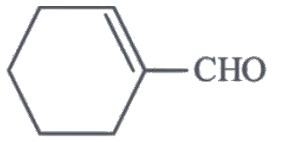
(d) 

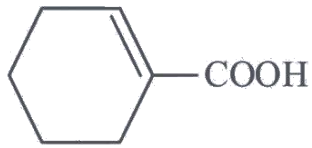
6. Complete the following reaction:

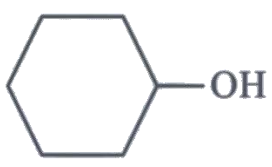


[C] is: **(2023)**

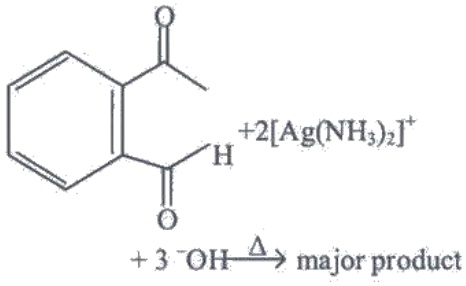
(a) 

(b) 

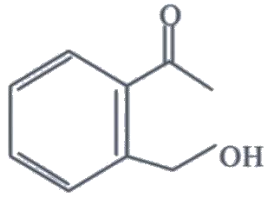
(c) 

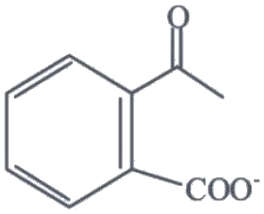
(d) 

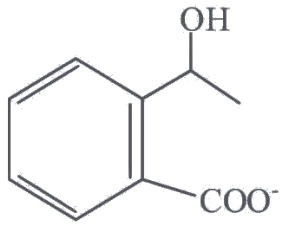
7. Identify the major product obtained in the following reaction:

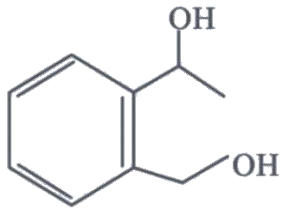


(2023)

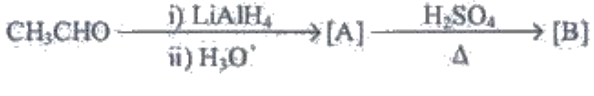
(a) 

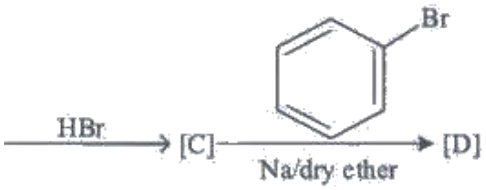
(b) 

(c) 

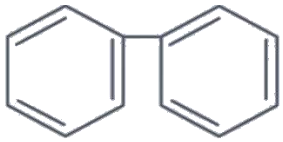
(d) 

8. Identify the final product [D] obtained in the following sequence of reactions.



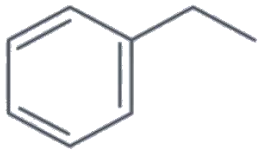


(2023)

(a) 

(b) C_4H_{10}

(c) $HC \equiv C^{\ominus}Na^{+}$

(d) 

9. Which of the following reactions is not an example for nucleophilic addition-elimination reaction? **(2022)**

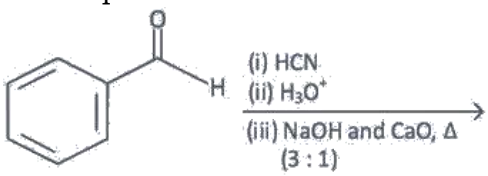
(a) $CH_3CHO + NH_3 \rightleftharpoons CH_3CH = NH + H_2O$

(b) $CH_3CHO + NaHSO_3 \rightleftharpoons CH_3 - \underset{H}{\overset{OH}{C}} - OSO_2Na$

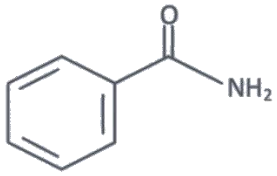
(c) $CH_3CHO + NH_2OH \rightleftharpoons CH_3CH = N - OH + H_2O$

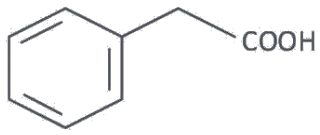
(d) $CH_3CHO + C_6H_5NHNH_2 \rightleftharpoons CH_3CH = N - NHC_6H_5 + H_2O$

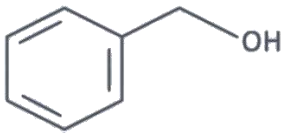
10. The product formed from the following reaction sequence is

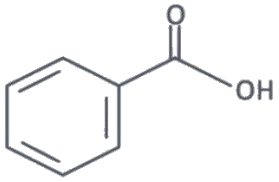


(2022)

(a) 

(b) 

(c) 

(d) 

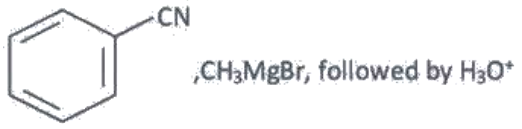
11. Match List I with List II:

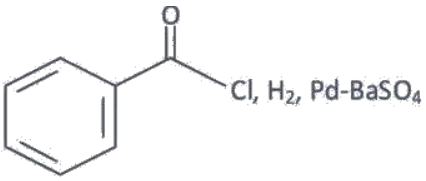
List I (Reaction)		List II (Product formed)	
A.	Gabriel synthesis	1.	Benzaldehyde
B.	Kolbe synthesis	2.	Ethers
C.	Williamson synthesis	3.	Primary amines
D.	Etard reaction	4.	Salicylic acid

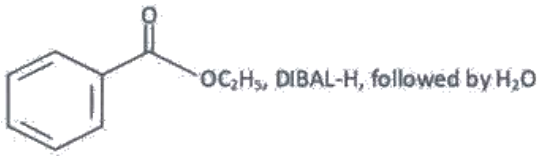
Choose the correct answer from the options given below: **(2022)**

(a) A-3, B-4, C-2, D-1
(b) A-3, B-1, C-2, D-4
(c) A-2, B-3, C-1, D-4
(d) A-4, B-3, C-1, D-2

12. The incorrect method to synthesize benzaldehyde is: **(2022)**

(a) 

(b) 

(c) 

(d) 

13. Given below are two statements:

Statement I: The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses because of weak molecular association in aldehydes and ketones due to dipole-dipole interactions.

Statement II: The boiling point of aldehydes and ketones are lower than the alcohols of similar molecular masses due to the absence of H-bonding.

In the light of the above statements, choose the most appropriate answer from the given below. **(2022)**

(a) Both Statement I and Statement II are correct.
(b) Both Statement I and Statement II are incorrect.
(c) Statement I is correct but Statement II is incorrect.
(d) Statement I is incorrect but Statement II is correct.

14. $RMgX + CO_2 \xrightarrow[ether]{dry} Y \xrightarrow{H_3O^+} RCOOH$

What is Y in the above reaction? **(2022)**

(a) $RCOO^-Mg^+X$
(b) $R_3CO^-Mg^+X$
(c) $RCOO^-X^+$
(d) $(RCOO)_2Mg$

15. Match List I with List II.

List I (Product formed)		List II (Reaction of carbonyl compound with)	
A.	Cyanohydrin	1.	NH_2OH
B.	Acetal	2.	RNH_2
C.	Schiff's base	3.	Alcohol
D.	Oxime	4.	HCN

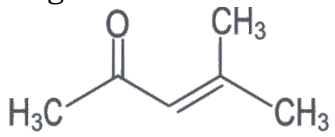
Choose the correct answer from the options given below. **(2022)**

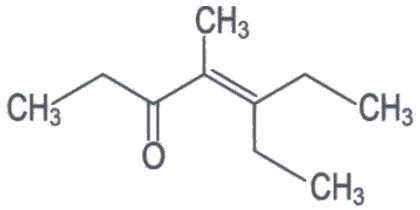
(a) A-3, B-4, C-2, D-1
(b) A-2, B-3, C-4, D-1
(c) A-1, B-3, C-2, D-4
(d) A-4, B-3, C-2, D-1

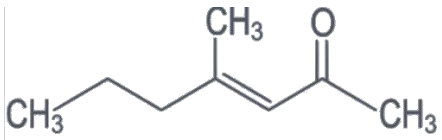
16. Compound X on reaction with O_3 followed by Zn/H_2O gives formaldehyde and 2-methyl propanal as products. The compound X is **(2022)**

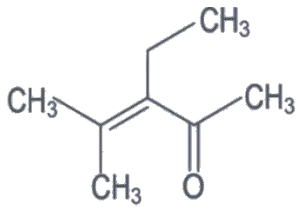
(a) 3-Methylbut-1-ene
(b) 2-Methylbut-1-ene
(c) 2-Methylbut-2-ene
(d) Pent-2-ene

17. Which one of the following is not formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating? **(2022)**

(a) 

(b) 

(c) 

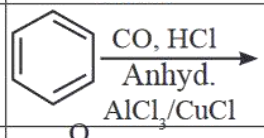
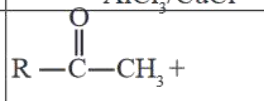
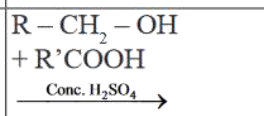
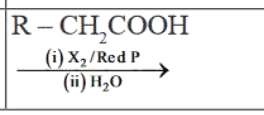
(d) 

18. $CH_3CH_2COO^-Na^+ \xrightarrow[Heat]{NaOH,+?} CH_3CH_3 + Na_2CO_3$

Consider the above reaction and identify the missing reagent/chemical. **(2021)**

(a) Red Phosphorus
(b) CaO
(c) DIBAL-H
(d) B_2H_6

19. Match List-I with List-II.

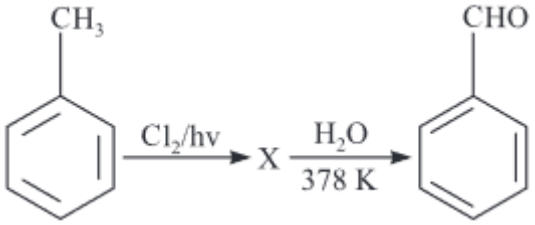
	List-I		List-II
(A)		(i)	Hell-Volhard-Zelinsky reaction
(B)		(ii)	Gattermann-Koch reaction
(C)		(iii)	Haloform reaction
(D)		(iv)	Esterification

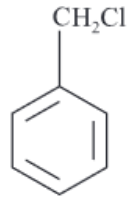
Choose the correct answer from the options given below. **(2021)**

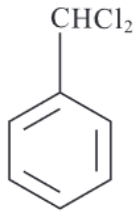
(a) A-iii B-ii C-i D-iv
(b) A-i B-iv C-iii D-ii
(c) A-ii B-iii C-iv D-i
(d) A-iv B-I C-ii D-iii

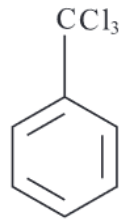
20. Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as: **(2020)**
(a) Cannizzaro's reaction
(b) Cross Cannizzaro's reaction
(c) Cross Aldol condensation
(d) Aldol condensation

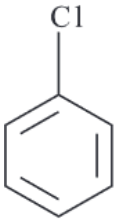
21. Identify compound X in the following sequence of reactions: **(2020)**



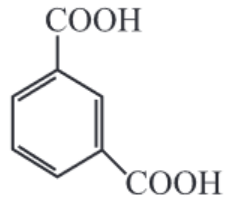
(a) 

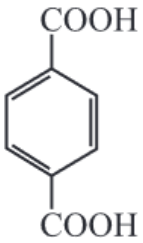
(b) 

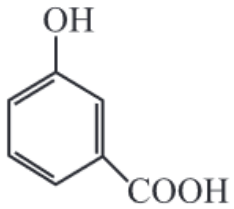
(c) 

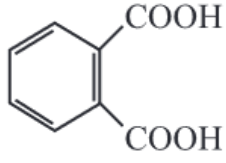
(d) 

22. Which of the following acid will form an (i) Anhydride on heating and (ii) Acid imide on strong heating with ammonia? **(2020 Covid Re-NEET)**

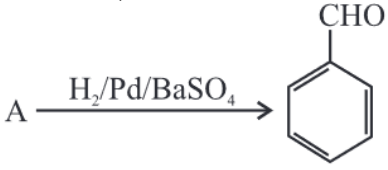
(a) 

(b) 

(c) 

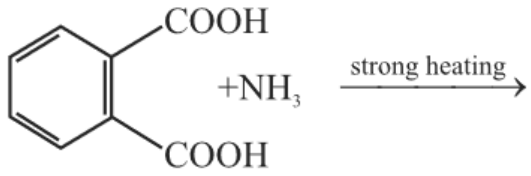
(d) 

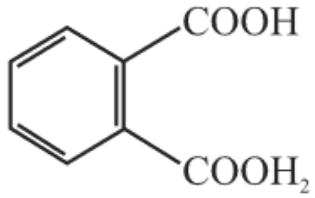
23. Identify compound (A) in the following reaction **(2020 Covid Re-NEET)**

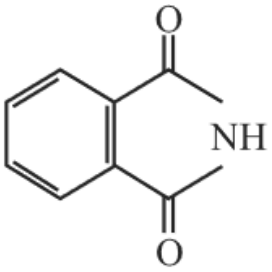


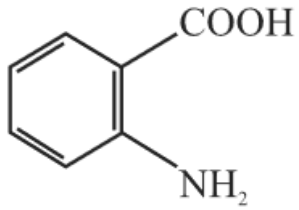
(a) Toluene
(b) Acetophenone
(c) Benzoic acid
(d) Benzoyl chloride

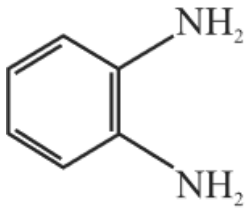
24. The major product of the following reaction is: **(2019)**



(a) 

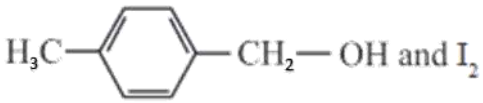
(b) 

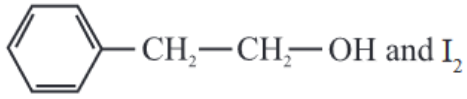
(c) 

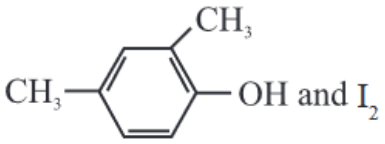
(d) 

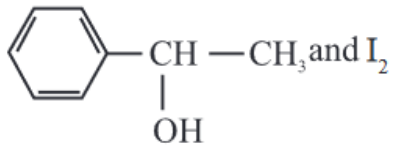
25. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their: **(2018)**
(a) Formation of intramolecular H-bonding
(b) Formation of carboxylate ion
(c) Formation of intermolecular H-bonding
(d) More extensive association of carboxylic acid via van der Waals force of attraction

26. Compound A, $C_8H_{10}O$, is found to react with NaOI (produced by reacting Y with NaOH) and yields a yellow precipitate with characteristic smell. A and Y are respectively: **(2018)**

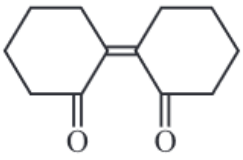
(a) 

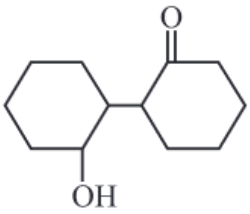
(b) 

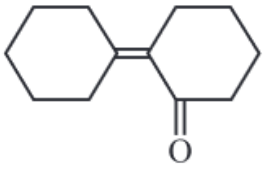
(c) 

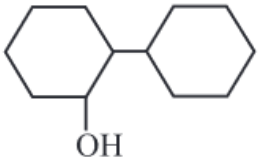
(d) 

27. Of the following which is the product formed when cyclohexanone undergoes aldol condensation followed by heating? **(2017-Delhi)**

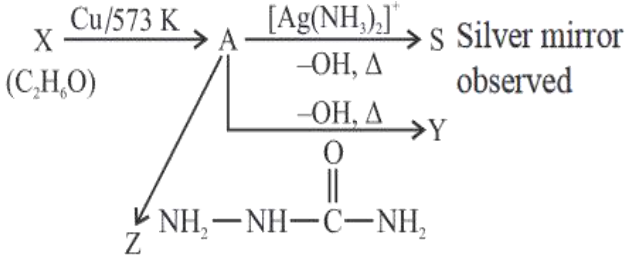
(a) 

(b) 

(c) 

(d) 

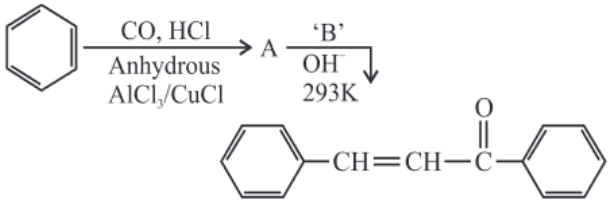
28. Consider the reactions: **(2017-Delhi)**



Identify A, X, Y and Z
(a) A-Ethanol, X-Acetaldehyde, Y-Butanone, Z-Hydrazone
(b) A-Methoxymethane, X-Ethanoic acid, Y-Acetate ion, Z-hydrazine

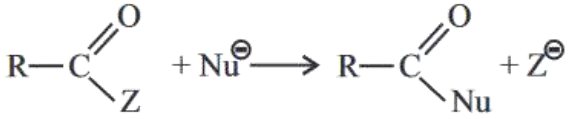
(c) A-Methoxymethane, X-Ethanol, Y-Ethanoic acid, Z-Semicarbazide
(d) A-Ethanal, X-Ethanol, Y-But-2-enal, Z-Semicarbazone

29. Consider the following sequence of reactions:



The substance 'B' is: **(2017-Gujarat)**
(a) Acetone
(b) Benzene
(c) Acetophenone
(d) Benzaldehyde

30. If the rate of the reaction: **(2017-Gujarat)**



is fastest, then Z is:
(a) $OCOCH_3$
(b) Cl
(c) NH_2
(d) OC_2H_5

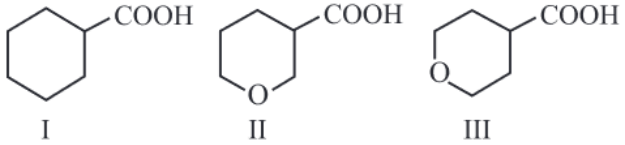
31. Among the following acids, the strongest acid is: **(2017-Gujarat)**
(a) Cl_3CCOOH
(b) $NCCH_2COOH$
(c) O_2NCH_2COOH
(d) F_3CCOOH

32. The product formed by the reaction of an aldehyde with a primary amine is: **(2016-I)**
(a) Aromatic acid
(b) Schiff base
(c) Ketone
(d) Carboxylic acid

33. Which of the following reagents would distinguish ciscyclopenta-1, 2-diol from the trans-isomer? **(2016-I)**
(a) MnO_2
(b) Aluminium isopropoxide
(c) Acetone
(d) Ozone

34. The correct statement regarding a carbonyl compound with a hydrogen atom on its alpha-carbon, is: **(2016-I)**
(a) A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as carbonylation
(b) A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as keto-enol tautomerism
(c) A carbonyl compound with a hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol
(d) A carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as aldehyde-ketone equilibration

35. The correct order of strengths of the carboxylic Acids is: **(2016-II)**



I II III

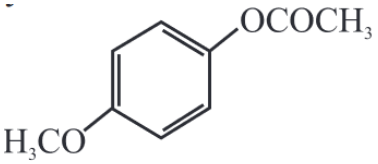
(a) III > II > I
(b) II > I > III
(c) I > II > III
(d) II > III > I

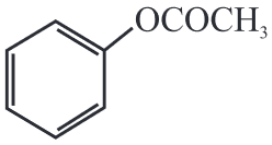
36. Reaction of carbonyl compound with one of the following reagents involves nucleophilic addition followed by elimination of water. The reagent is: **(2015 Re)**
(a) Sodium hydrogen sulphite
(b) A Grignard reagent
(c) Hydrazine in presence of feebly acidic solution
(d) Hydrocyanic acid

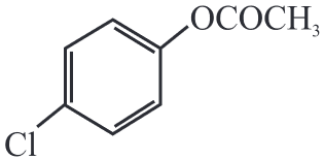
37. An organic compound 'X' having molecular formula $C_5H_{10}O$ yields phenyl hydrazone and gives negative response to the Iodoform test and Tollen's test. It produces n-pentane on reduction. 'X' could be: **(2015)**
(a) 2-pentanone
(b) 3-pentanone
(c) n-amyl alcohol
(d) Pentanal

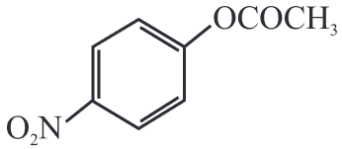
38. The oxidation of benzene by V_2O_5 in the presence of air produces: **(2015 Re)**
(a) Maleic anhydride
(b) Benzoic acid
(c) Benzaldehyde
(d) Benzoic anhydride

39. Which one of the following esters gets hydrolysed most easily under alkaline conditions? **(2015 Re)**

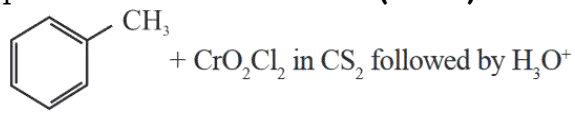
(a) 

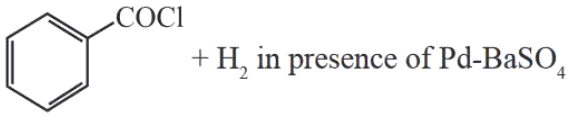
(b) 

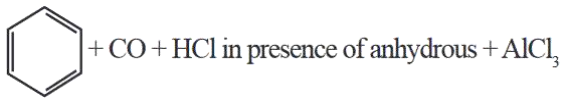
(c) 

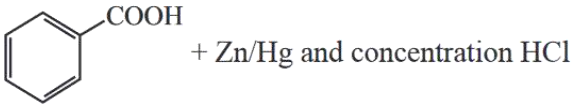
(d) 

40. Reaction by which Benzaldehyde cannot be prepared: **(2013)**

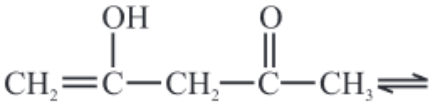
(a) 

(b) 

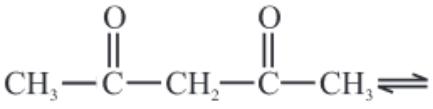
(c) 

(d) 

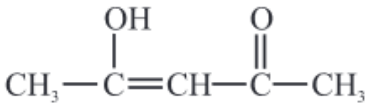
41. The order of stability of the following tautomeric compounds is: **(2013)**



(I)



(II)



(III)

(a) II > I > III
(b) II > III > I
(c) I > II > III
(d) III > II > I

Answer Key

S1. Ans. (d)

S2. Ans. (a)

S3. Ans. (d)

S4. Ans. (c)

S5. Ans. (a)

S6. Ans. (c)

S7. Ans. (b)

S8. Ans. (d)

S9. Ans. (b)

S10. Ans. (c)

S11. Ans. (a)

S12. Ans. (a)

S13. Ans. (a)

S14. Ans. (a)

S15. Ans. (d)

S16. Ans. (a)

S17. Ans. (b)

S18. Ans. (b)

S19. Ans. (c)

S20. Ans. (c)

S21. Ans. (b)

S22. Ans. (d)

S23. Ans. (d)

S24. Ans. (b)

S25. Ans. (c)

S26. Ans. (d)

S27. Ans. (c)

S28. Ans. (d)

S29. Ans. (c)

S30. Ans. (b)

S31. Ans. (d)

S32. Ans. (b)

S33. Ans. (c)

S34. Ans. (b)

S35. Ans. (d)

S36. Ans. (c)

S37. Ans. (b)

S38. Ans. (a)

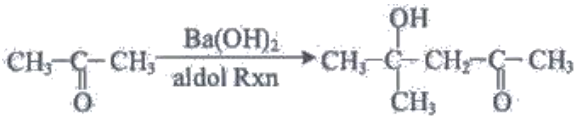
S39. Ans. (d)

S40. Ans. (d)

S41. Ans. (d)

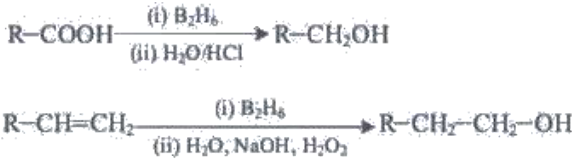
Solutions

S1. Ans. (d)



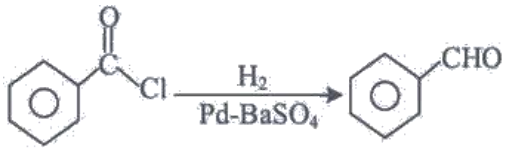
Functional groups present in product are alcohol and ketone.

S2. Ans. (a)

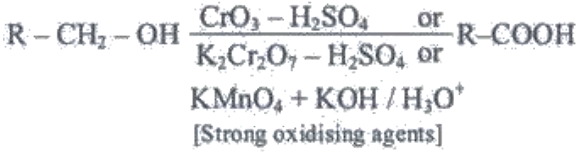


S3. Ans. (d)

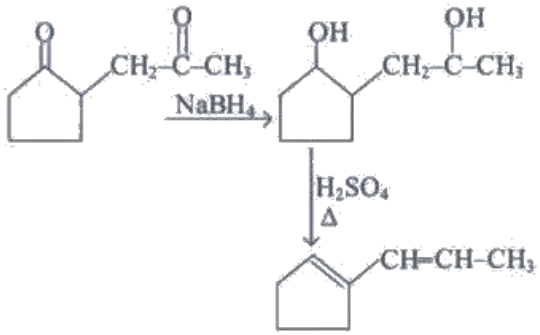
Resenmund reaction



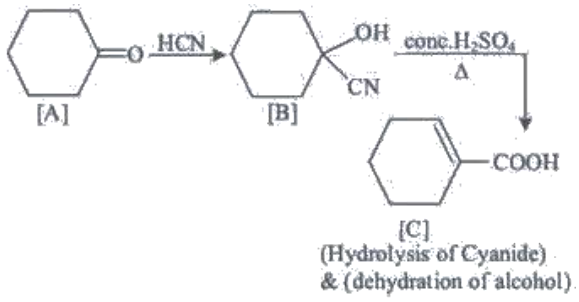
S4. Ans. (c)



S5. Ans. (a)



S6. Ans. (c)

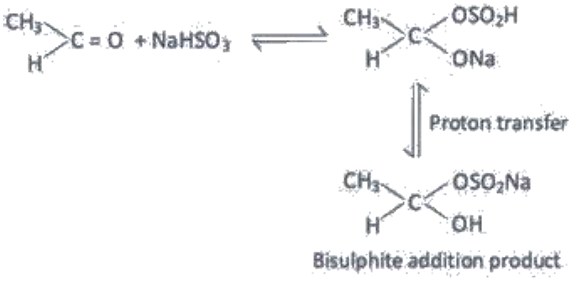


S7. Ans. (b)

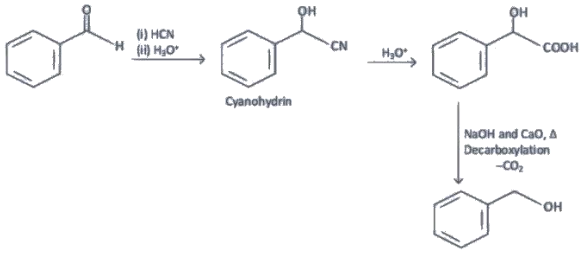
S8. Ans. (d)

S9. Ans. (b)

It is an example of nucleophilic addition reaction



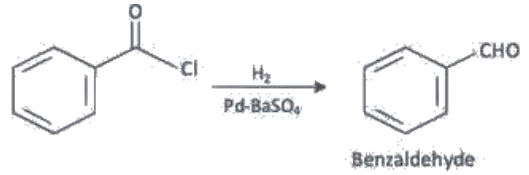
S10. Ans. (c)

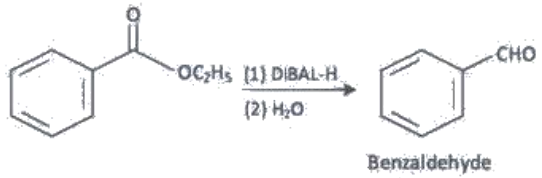


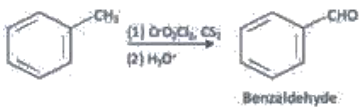
S11. Ans. (a)

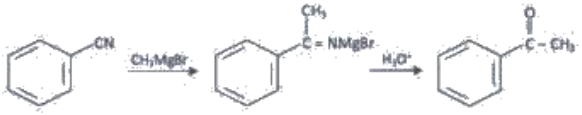
- Gabriel phthalimide synthesis is used for preparation of aliphatic primary amines.
- Kolbe synthesis with phenol gives salicylic acid.
- Williamson synthesis gives ether on reaction of alkyl halide and alcoxide.
- Etard reaction gives benzaldehyde from benzene.

S12. Ans. (a)





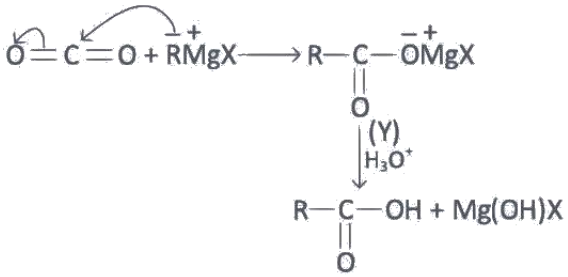




S13. Ans. (a)

- The boiling points of aldehydes and ketones are higher than hydrocarbons of comparable molecular masses due to weak molecular association in aldehydes and ketones arising out of the dipole-dipole interaction.
- Alcohol involved intermolecular hydrogen bonding, because of which the boiling point of aldehydes and ketones are lower than the alcohols of similar molecular masses.

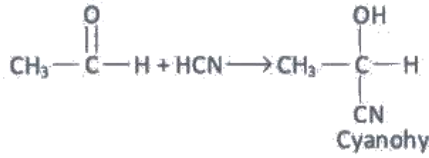
S14. Ans. (a)

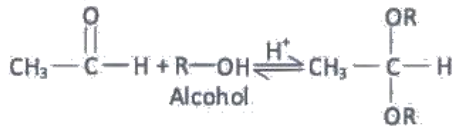


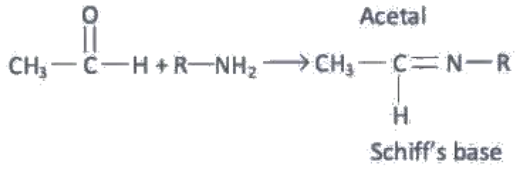
Here Y is $RC00^-Mg^+Y$

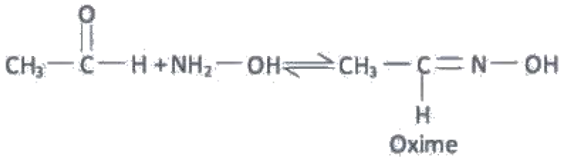
S15. Ans. (d)

A-4, B-3, C-2, D-1

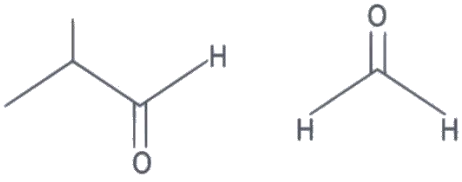




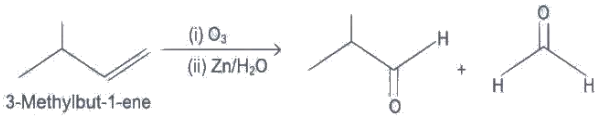




S16. Ans. (a)



The given reaction is the reductive ozonolysis of an alkene. The alkene will be



S17. Ans. (b)

Cross Aldol condensation reaction:

Both reactants contain α-Hydrogens, so multiple products are possible.

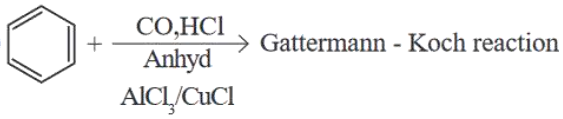
S18. Ans.(b)

$$CH_3 - CH_2COO\overset{+}{Na} \xrightarrow[\text{Heat}]{NaOH + CaO} CH_3 - CH_3 + Na_2CO_3$$

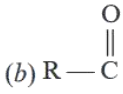
$$CH_3 - CH_2 - COONa \xrightarrow[\text{Heat}]{NaOH + CaO} CH_3 - CH_3 + Na_2CO_3$$

Decarboxylation takes place by Soda-lime (NaOH + CaO)

S19. Ans.(c)

(a) 

Gattermann - Koch reaction

(b)  + NaOX → Haloform reaction

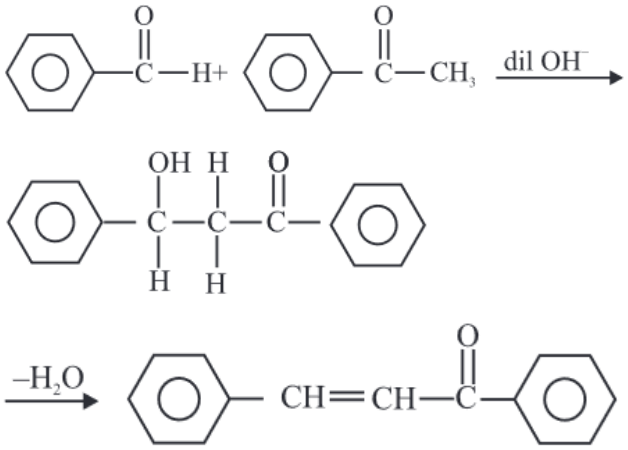
(c) $R-CH_2-OH + R'COOH \xrightarrow{Conc\ H_2SO_4}$ Esterification

(d) 

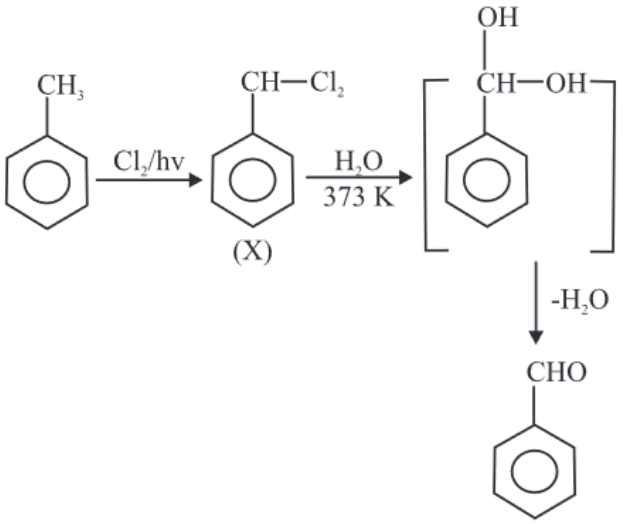
Hell-Volhard Zelinsky reaction

S20. Ans.(c)

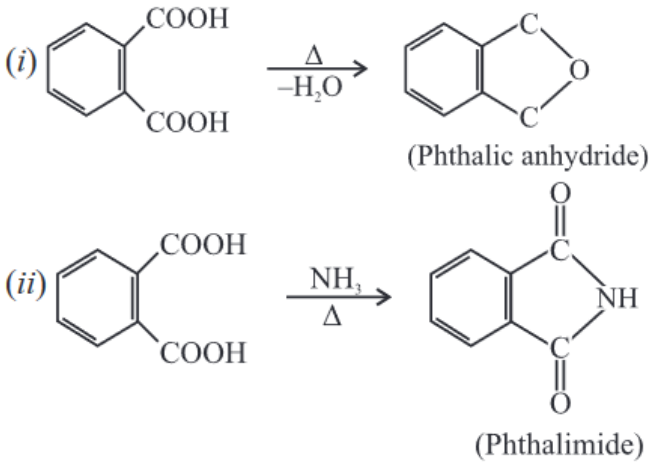
Reaction between benzaldehyde and acetophenone in presence of dilute NaOH is known as Cross Aldol condensation



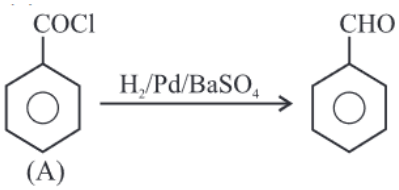
S21. Ans.(b)



S22. Ans.(d)



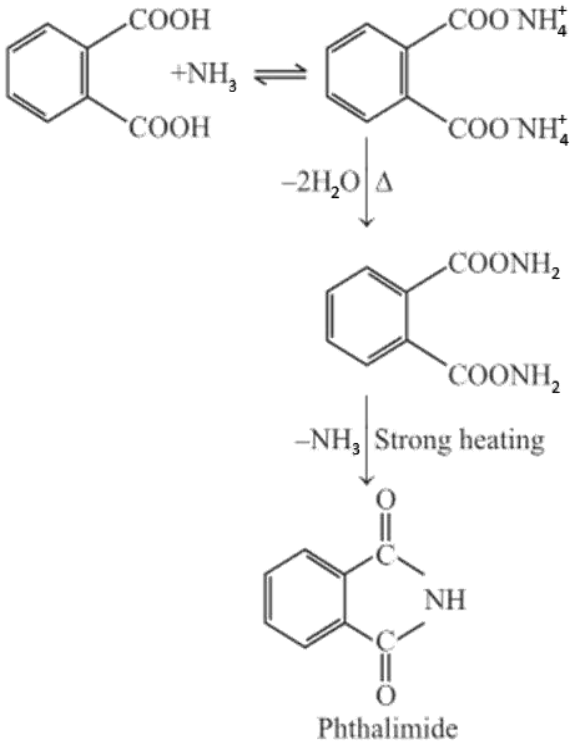
S23. Ans.(d)



The given reaction is Rosenmund reaction.

So 'A' is benzoyl chloride

S24. Ans.(b)

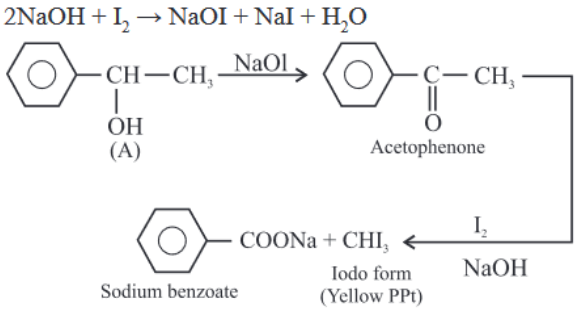


S25. Ans.(c)

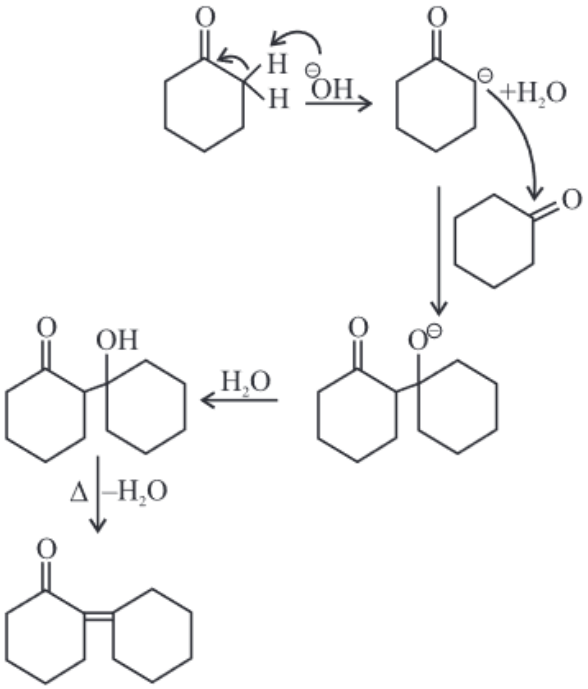
Due to formation of intermolecular H-bonding in carboxylic acid, association occurs. Hence boiling point increases and become more than the boiling point of aldehydes, ketones and alcohols of comparable molecular masses.

S26. Ans.(d)

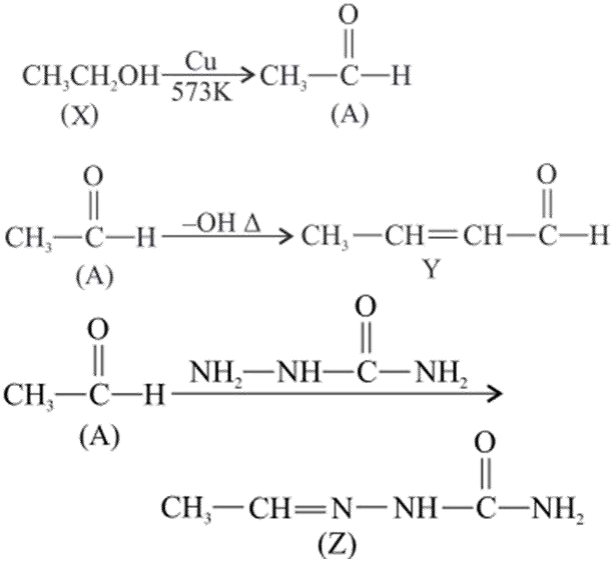
Option (d) is secondary alcohol which on oxidation gives phenylmethyl ketone (Acetophenone). This on reaction with I_2 and NaOH form iodoform and sodium benzoate.



S27. Ans.(c)

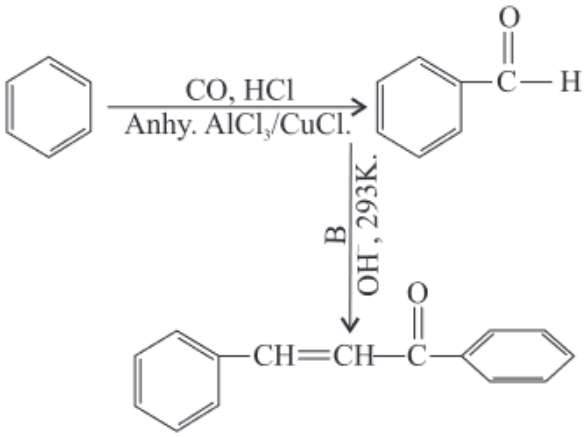


S28. Ans.(d)



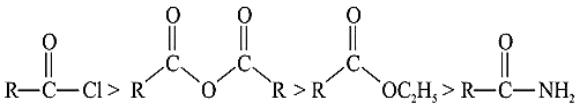
∴ It is a substitution reaction.

S29. Ans.(c)



S30. Ans.(b)

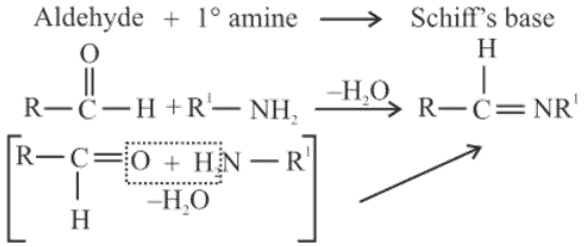
Because Cl^- is a better leaving group
Reactivity order during nucleophilic acyl substitution.



S31. Ans.(d)

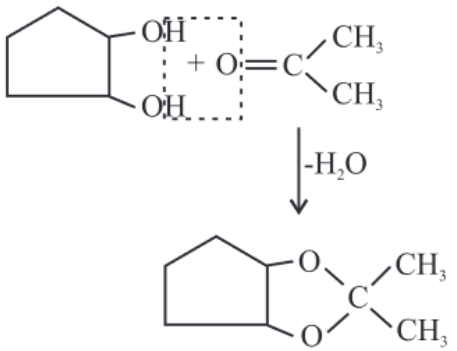
$-CF_3$ is the strongest withdrawing group. Therefore; F_3CCOOH is the strongest acid, among the given acid

S32. Ans.(b)



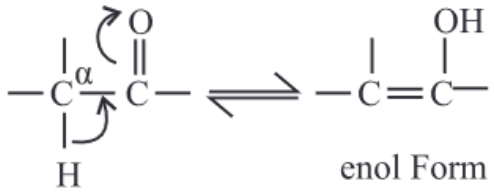
S33. Ans.(c)

Trans isomer does not react with acetone.



S34. Ans.(b)

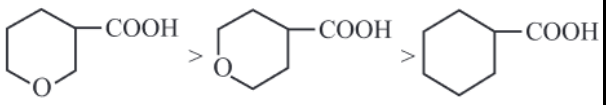
Keto - enol tautomerism:



Keto Form

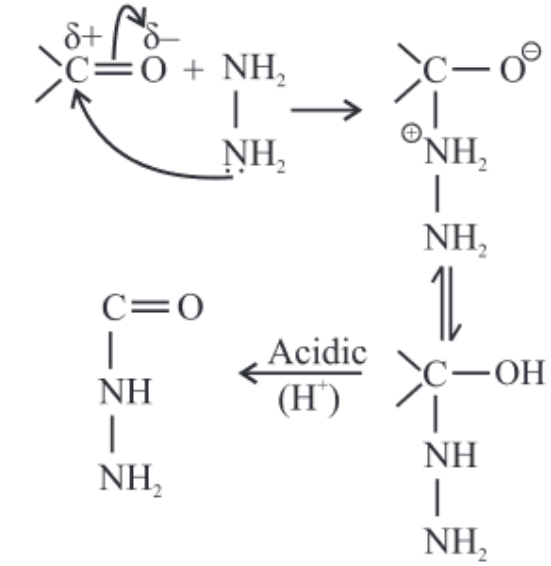
S35. Ans.(d)

R – O – R bond (ether) exhibits – I effect and order for increasing acidic character goes as:

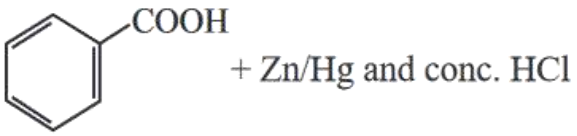


S36. Ans.(c)

Carbonyl compound + Hydrazine



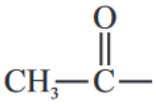
Options A, B & C are Etard's reaction, Rosenmund reaction, Gatterman-Koch reaction and forms benzaldehyde.

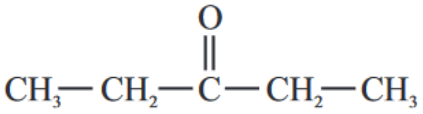


Clemmensen reduction, will not form benzaldehyde.

S37. Ans.(b)

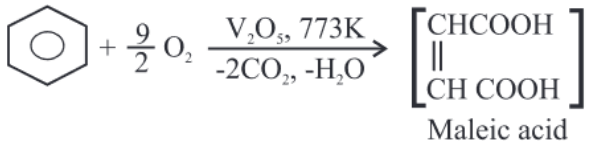
If negative response to iodoform test is observed,

Then  group is missing, among 4 options.

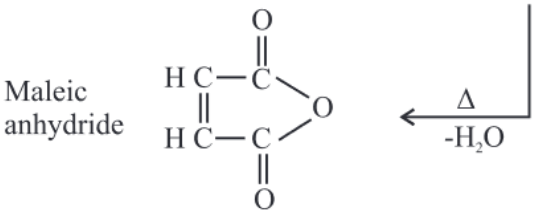


3 – Pentanone will not give iodoform test.

S38. Ans.(a)



Maleic acid

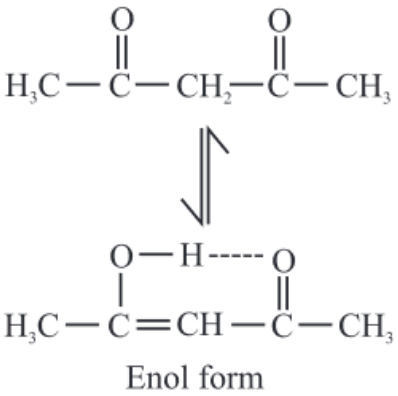


S39. Ans.(d)

Reactivity of nucleophilic substitution reaction ∝ Electron withdrawing Group. And – NO_2 is a strong electron withdrawing group

S40. Ans.(d)

S41. Ans.(d)



Enol form

Stable due to intermolecular H – Bonding.