ORGANIC CHEMISTRY

CARBONYL COMPOUND

1. In the following reactions, **P**, **Q**, **R**, and **S** are the major products. **[JEE(Advanced) 2023]**

$$CH_3CH_2CH(CH_3)CH_2CN \xrightarrow[(ii)\,PhMgBr,\,then\,H_2O]{(i)\,PhMgBr,\,then\,H_3O^{\oplus}} \mathbf{P}$$

$$Ph-H + CH_3\overset{\overset{O}{\|}}{C}Cl \xrightarrow[(ii)\,PhMgBr,\,then\,H_2O]{(i)\,anhyd.\ AlCl_3} \mathbf{Q}$$

$$CH_3CH_2\overset{\overset{O}{\|}}{C}Cl \xrightarrow[(ii)\,PhMgBr,\,then\,H_2O]{(i)\,\frac{1}{2}(PhCH_2)_2Cd} \mathbf{R}$$

$$PhCH_2CHO \xrightarrow[(iii)\,HCN\ (iv)\,H_2SO_4,\Delta]{(i)\,PhMgBr,\,then\,H_2O\ (ii)\,CrO_3,\,dil.\,H_2SO_4} \mathbf{S}$$

The correct statement(s) about **P**, **Q**, **R**, and **S** is(are)

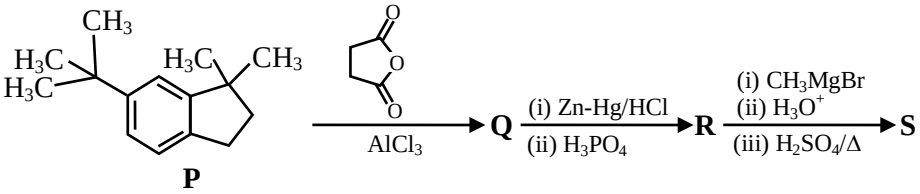
(A) Both **P** and **Q** have asymmetric carbon(s).

(B) Both **Q** and **R** have asymmetric carbon(s).

(C) Both **P** and **R** have asymmetric carbon(s).

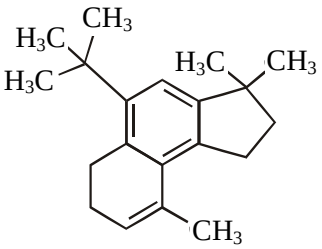
(D) **P** has asymmetric carbon(s), **S** does **not** have any asymmetric carbon.

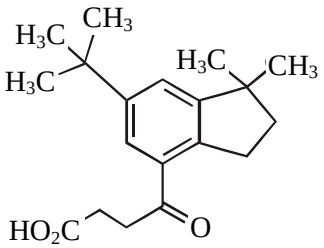
2. In the reaction scheme shown below **Q, R** and **S** are the major products. **[JEE(Advanced) 2020]**

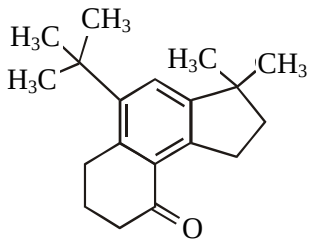


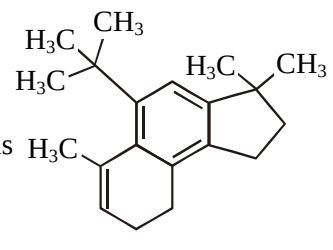
P

The correct structure of

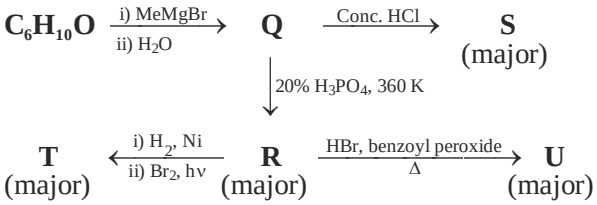
(A) **S** is 

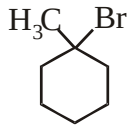
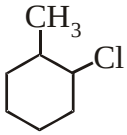
(B) **Q** is 

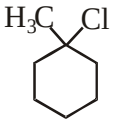
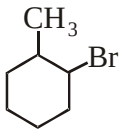
(C) **R** is 

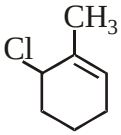
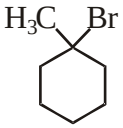
(D) **S** is 

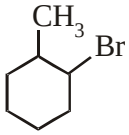
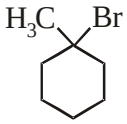
3. Choose the correct option(s) for the following set of reactions **[JEE(Advanced) 2019]**



(A)  **U**  **S**

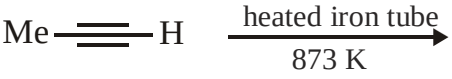
(B)  **S**  **U**

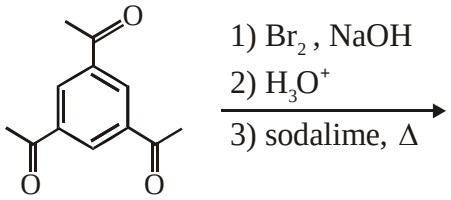
(C)  **S**  **T**

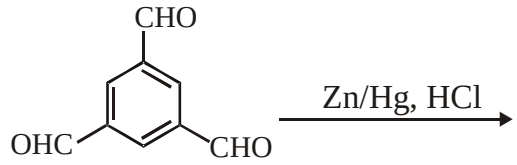
(D)  **U**  **T**

4. The reaction(s) leading to the formation of 1,3,5-trimethylbenzene is (are) **[JEE(Advanced) 2018]**

(A) 

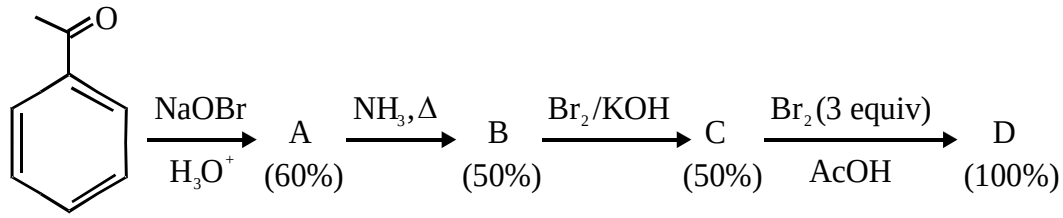
(B) 

(C) 

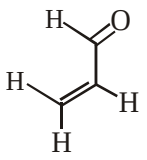
(D) 

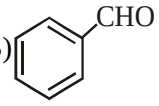
5. In the following reaction sequence, the amount of D (in g) formed from 10 moles of acetophenone is_____.

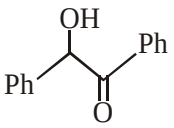
(Atomic weight in g mol^{-1}: H = 1, C = 12, N = 14, O = 16, Br = 80. The yield (%) corresponding to the product in each step is given in the parenthesis) **[JEE(Advanced) 2018]**

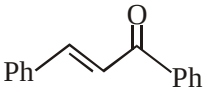


6. Positive Tollen's test is observed for **[JEE(Advanced) 2016]**

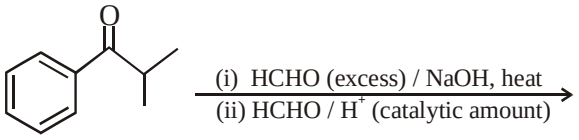
(A) 

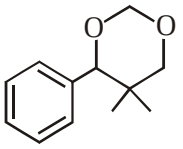
(B) 

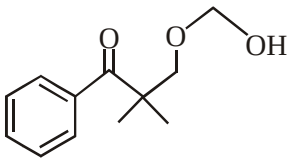
(C) 

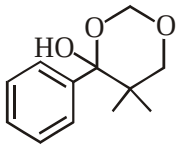
(D) 

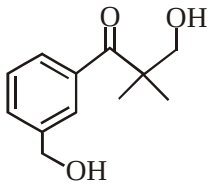
7. The major product of the following reaction sequence is : **[JEE(Advanced) 2016]**



(A) 

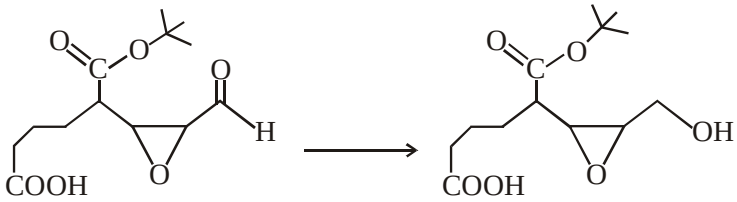
(B) 

(C) 

(D) 

8. Reagent(s) which can be used to bring about the following transformation is(are)

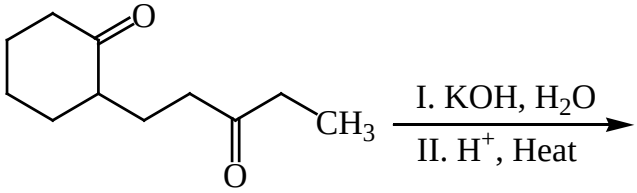
[JEE(Advanced) 2016]

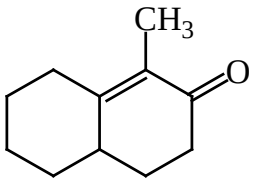


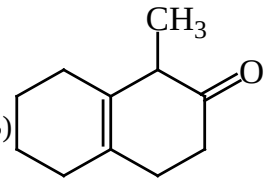
(A) $LiAlH_4$ in $(C_2H_5)_2O$ (B) BH_3 in THF

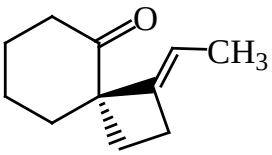
(C) $NaBH_4$ in C_2H_5OH (D) Raney Ni / H_2 in THF

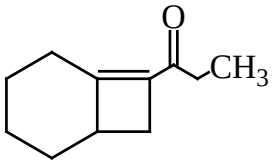
9. The major product of the following reaction is - **[JEE(Advanced) 2015]**



(A) 

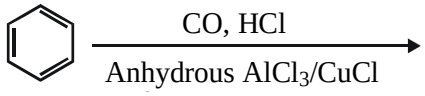
(B) 

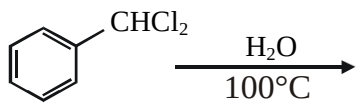
(C) 

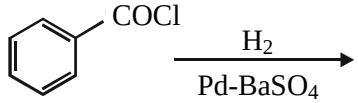
(D) 

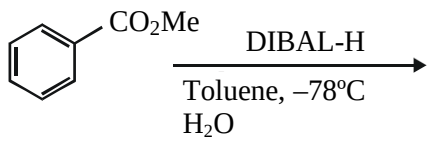
10. Among the following the number of reaction(s) that produce(s) benzaldehyde is –

[JEE(Advanced) 2015]

I. 

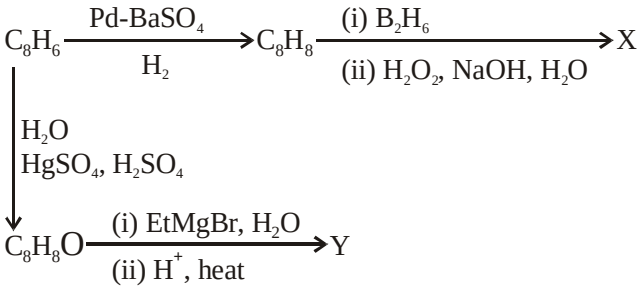
II. 

III. 

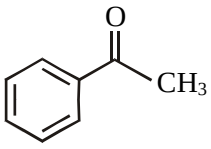
IV. 

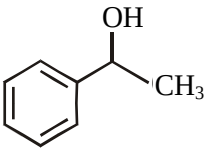
Paragraph For Questions No. 11 and 12

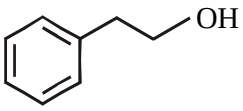
In the following reaction **[JEE(Advanced) 2015]**

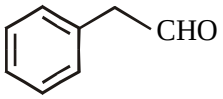


11. Compound X is :

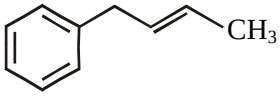
(A) 

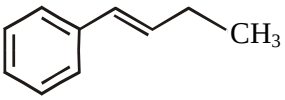
(B) 

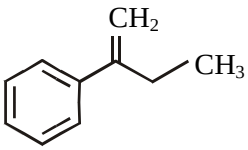
(C) 

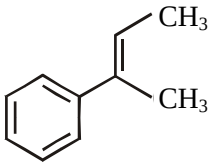
(D) 

12. The major compound Y is :

(A) 

(B) 

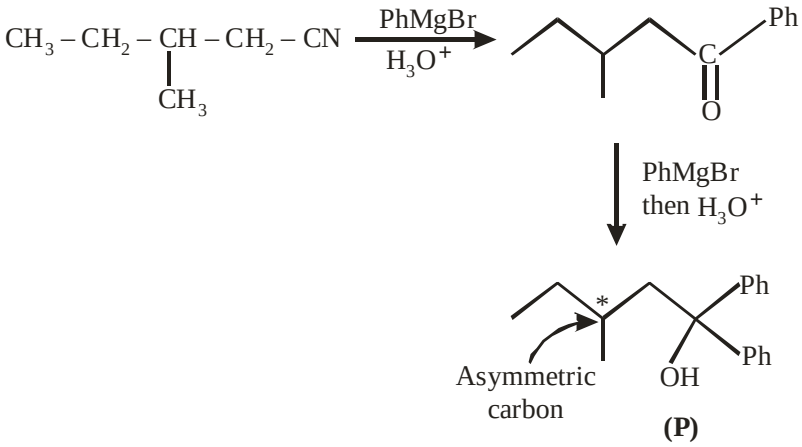
(C) 

(D) 

SOLUTIONS

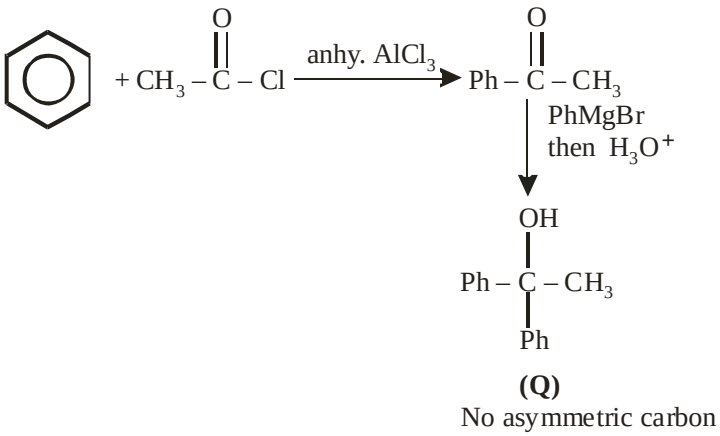
1. Ans. (C, D)

Sol. Formation of P



(P)

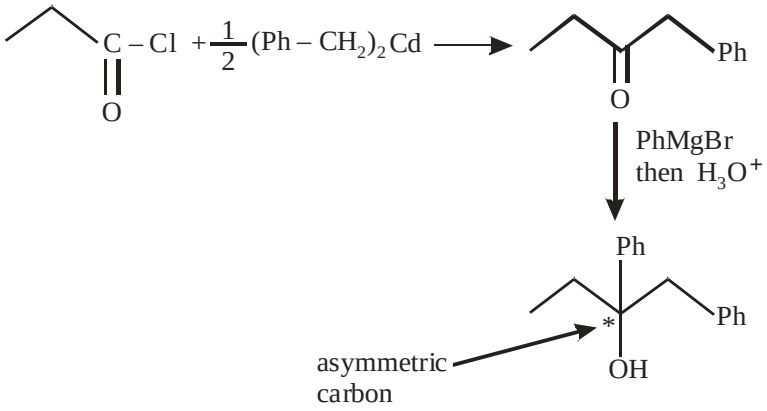
Formation of Q



(Q)

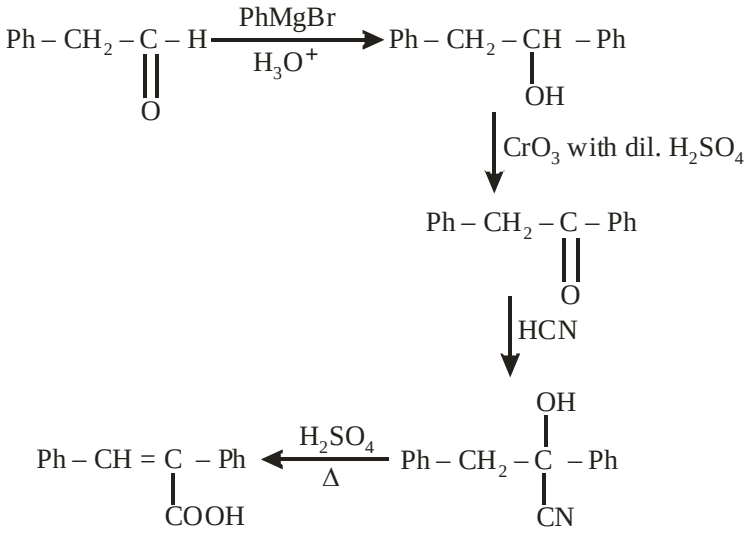
No asymmetric carbon

Formation of R



(R)

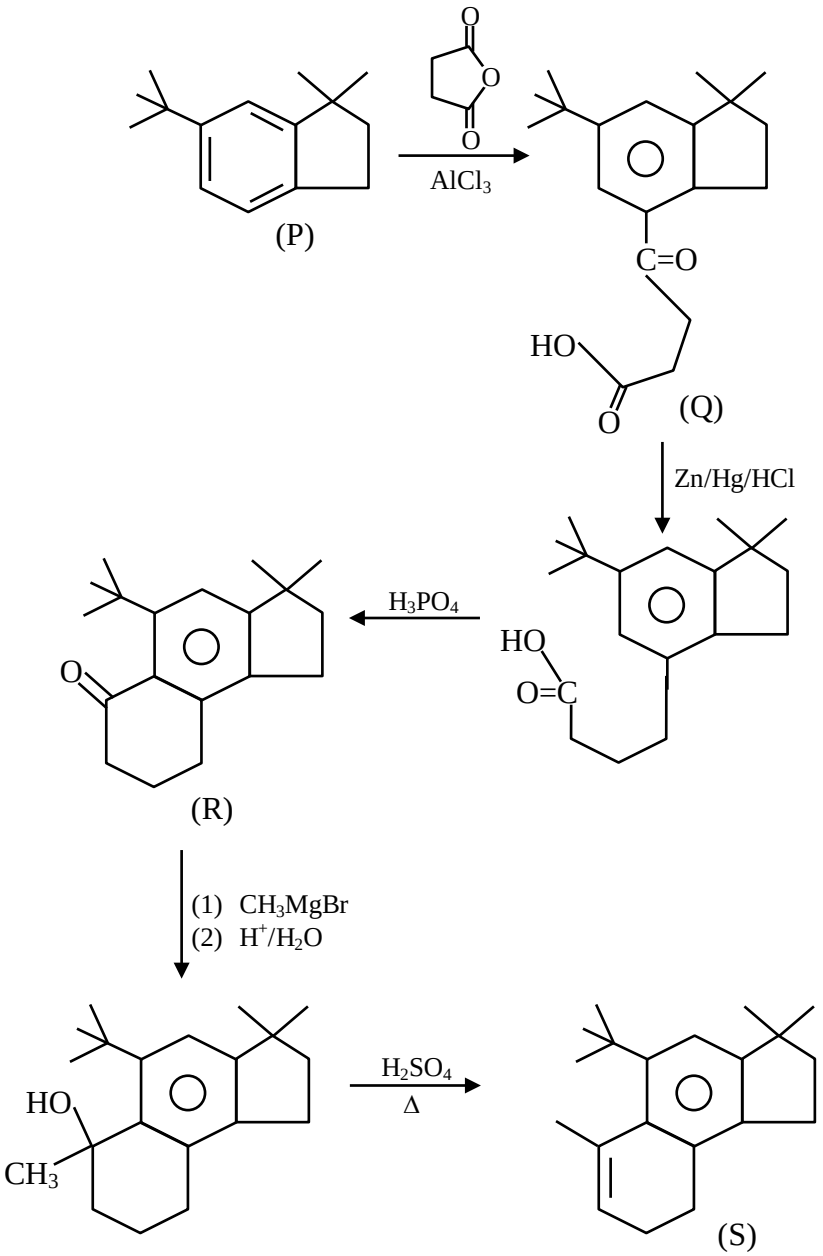
Formation of S



(S) No asymmetric carbon

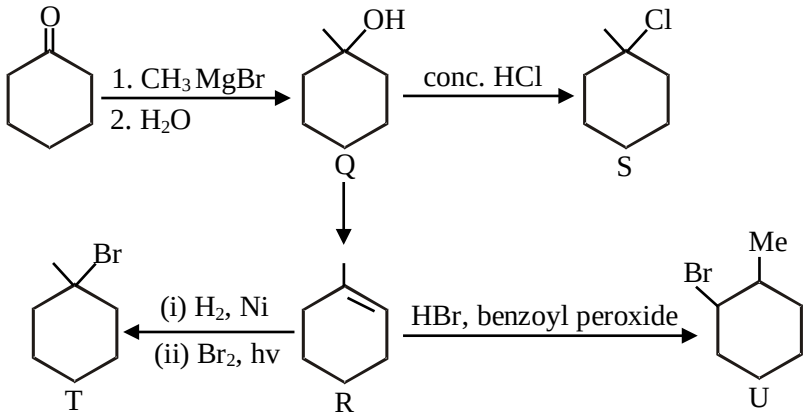
2. Ans. (B, D)

Sol.

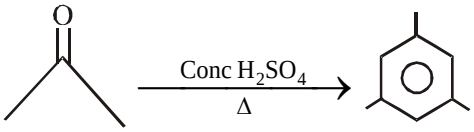


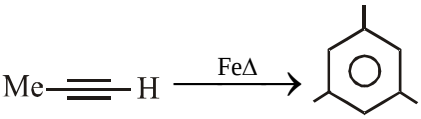
3. Ans. (B, D)

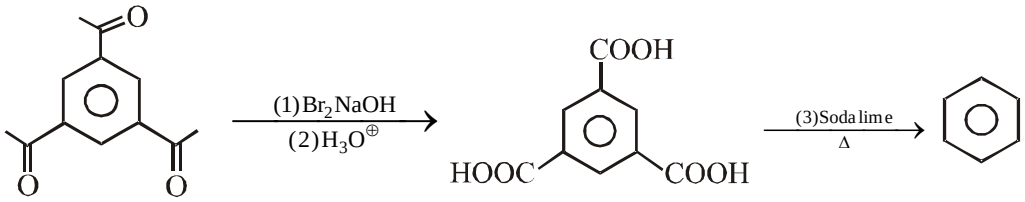
Sol.

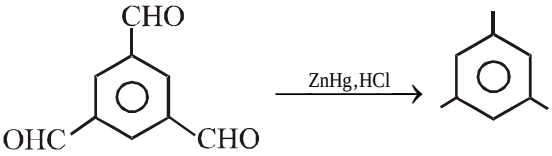


4. Ans. (A, B, D)

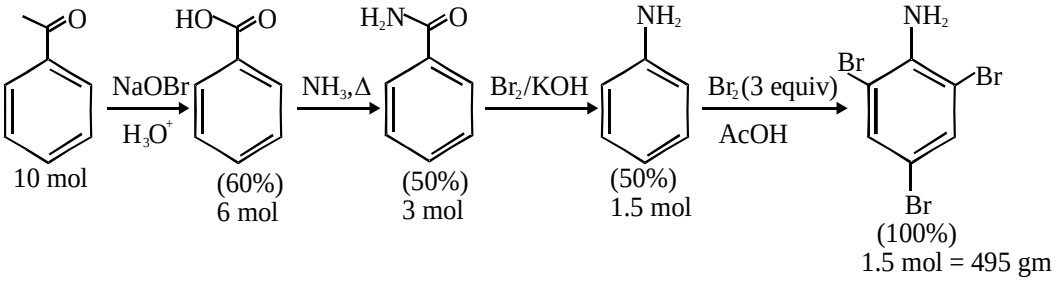
Sol. (A) 

(B) 

(C) 

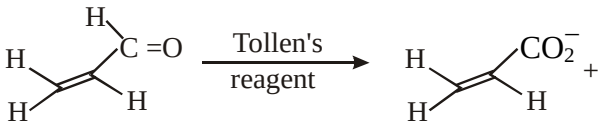
(D) 

5. Ans. (495)

Sol. 

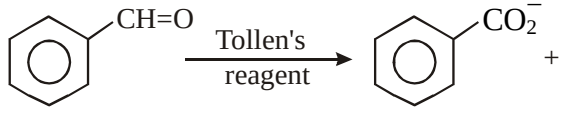
6. Ans. (A, B, C)

Sol. Tollens's test is given by compounds having aldehyde group. Also α-hydroxy carbonyl gives positive tollen's test.

(A) 

+ Ag mirror (+ve test)

Acraldehyde

(B) 

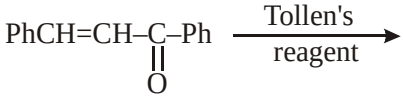
+ Ag mirror (+ve test)

Benzaldehyde

(C) 

+ Ag mirror (+ve test)

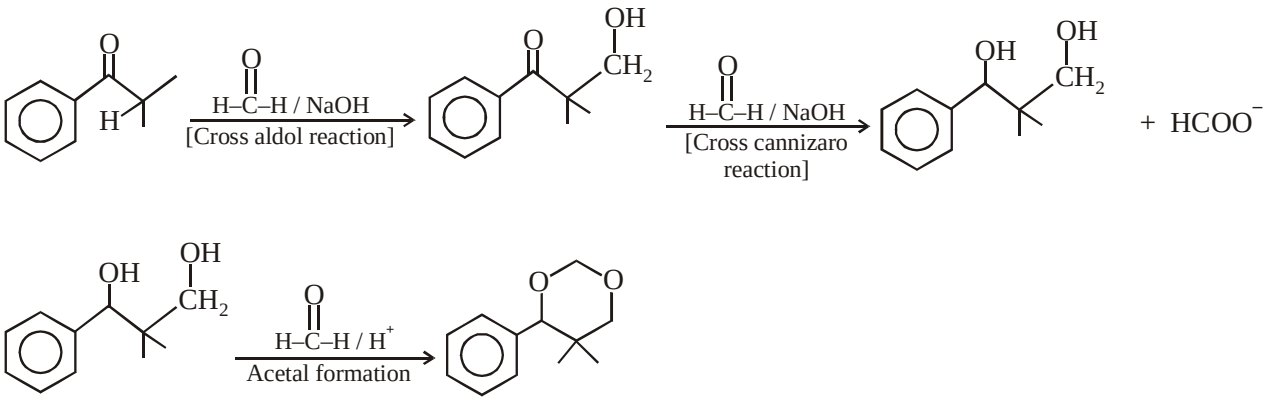
Benzoin

(D) 

(–ve test)

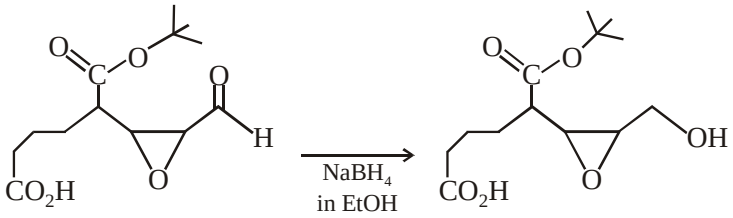
7. Ans. (A)

Sol.



8. Ans. (C, D)

Sol.

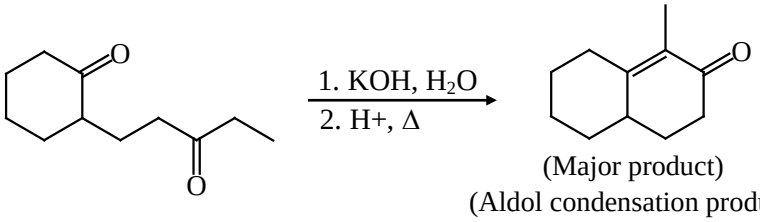


$LiAlH_4$ in $(C_2H_5)_2O$; BH_3 in (THF) ; Raney Ni (H_2) either can reduce all functional group or can reduce some of the functional group of the compound given above in reactant side.

But $NaBH_4$ is example of selective reducing agent. It can not reduce $-\overset{\overset{O}{\|}}{C}-O-$ (ester group) $-\overset{\overset{O}{\|}}{C}-OH$, (carboxylic acid group),  (epoxide group) , but reduces –CH=O (aldehyde group)into $-CH_2OH$ (1^o alcohol)

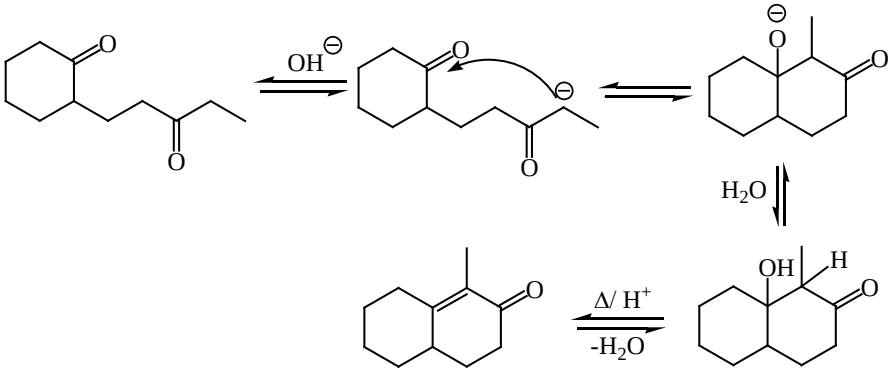
9. Ans. (A)

Sol.



(Major product)
(Aldol condensation product)

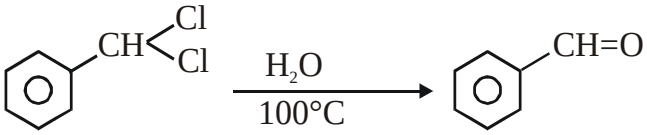
Mechanism :

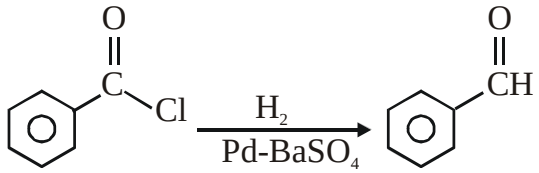


10. Ans. (4)

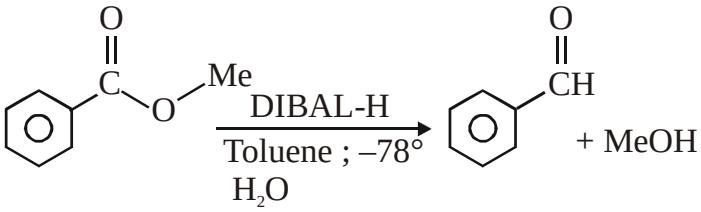
Sol. I. 

this reaction is called Gattermann koch synthesis

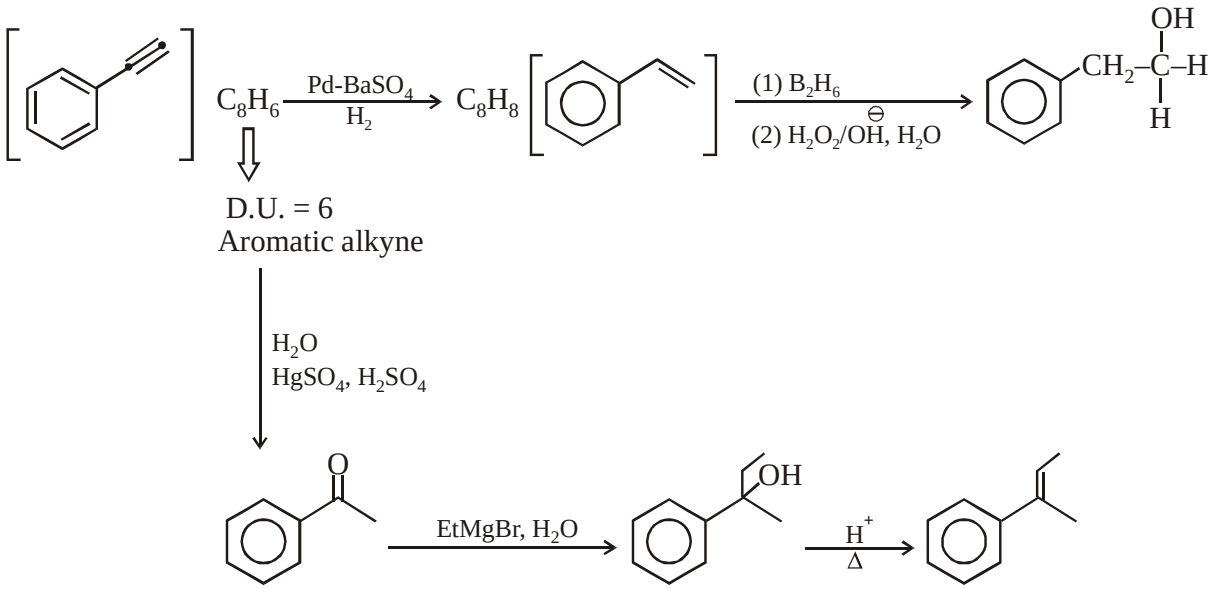
II. 

III. 

this reaction is called Rosenmund reduction

IV. 

11. Ans. (C)

Sol. 

12. Ans. (D)

Sol.