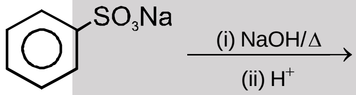
# Exercise-1

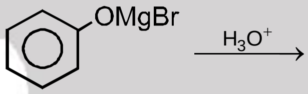
**Marked questions are recommended for Revision.**
**चिन्हित प्रश्न दोहराने योग्य प्रश्न है।**

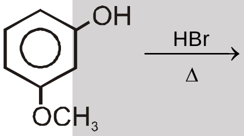
## PART - I : SUBJECTIVE QUESTIONS
## भाग - I : विषयात्मक प्रश्न (SUBJECTIVE QUESTIONS)

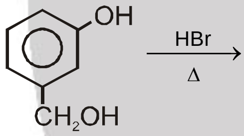
### Section (A) : Phenol
### खण्ड (A) : फिनॉल

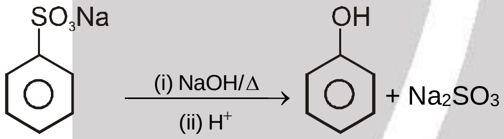
**A-1.** Write the products of the following reactions :
निम्न अभिक्रियाओं के उत्पाद लिखिए :

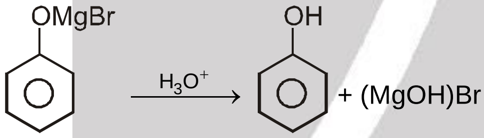
(a) 

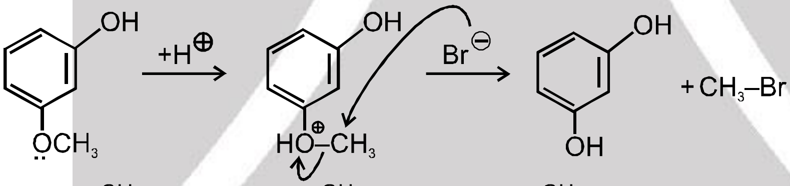
(b) 

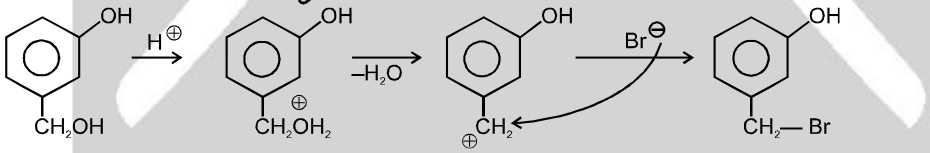
(c) 

(d) 

**Sol.** (a) 

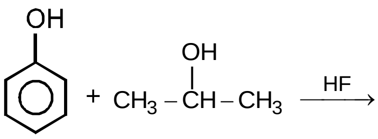
(b) 

(c) 

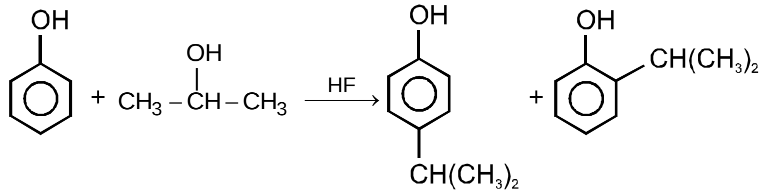
(d) 

**A-2.** Explain why nucleophilic substitution reactions are not very common in phenols.
फिनॉल में प्रायः नाभिकस्नेही प्रतिस्थापन अभिक्रियाऐं नही होती है, क्यों ?

**Sol.** In phenol, aromatic ring is highly electron rich due to +M of –OH group. So nucleophile does not easily attack on the ring.
फिनॉल में एरोमैटिक वलय –OH समूह के +M के कारण उच्च इलेक्ट्रॉन धनी होती है। इसलिए नाभिकस्नेही आसानी से वलय पर आक्रमण नही करते हैं।

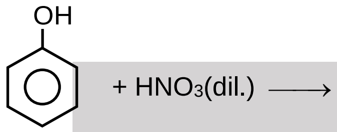
**A-3.** 

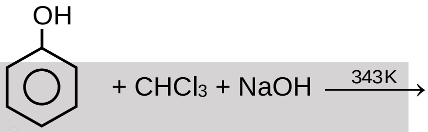
Give the products of the above reactions.
उपरोक्त अभिक्रिया में प्राप्त उत्पाद को पहचानिये।

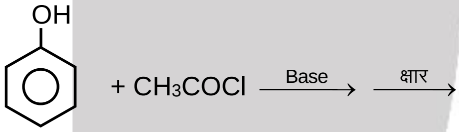
**Sol.** 

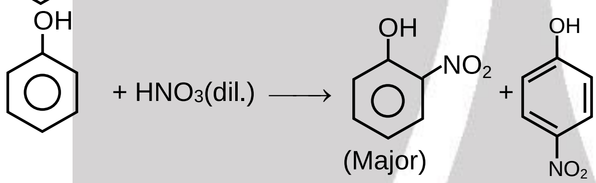
Phenols are highly reactive. Phenols are usually alkylated or acylated using relatively weak Friedel Crafts catalysts (such as HF) to avoid overalkylation.
फिनॉल अधिक क्रियाशील है। फिनॉल को एल्किलीकृत और एसिलीकृत तुलनात्मक रूप से दुर्बल फ्रिडल क्रॉफ्ट उत्प्रेरक (जैसे : HF) की उपस्थिति में करते है ताकि अनावश्यक एल्किलीकरण ना हो।

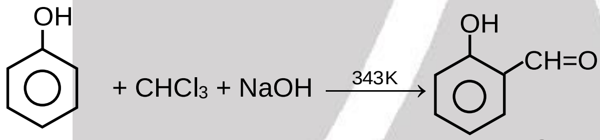
**A-4.** Complete the following (निम्न अभिक्रियाओं को पूर्ण कीजिए) :

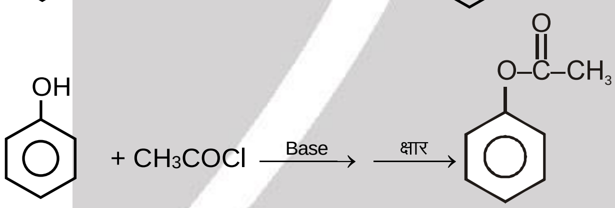
(a) 

(b) 

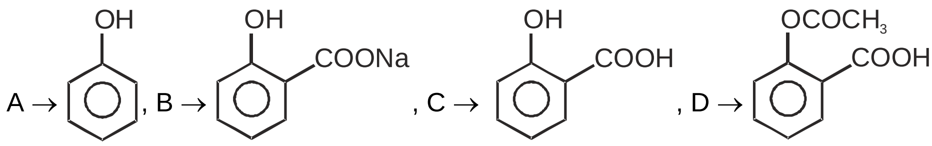
(c) 

**Sol.** (a) 

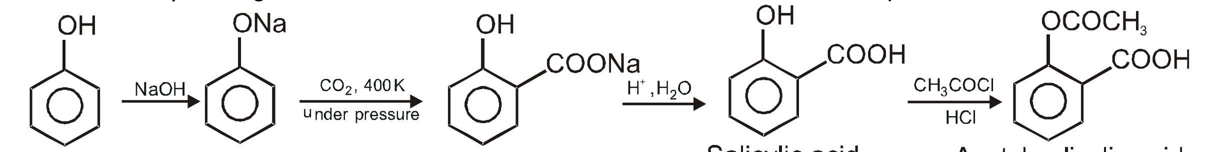
(b)  (Reimer-Tiemann reaction) (राइमर–टीमान अभिक्रिया)

(c)  (Phenyl acetate फेनिलऐसीटेट) + HCl

**A-5.** An organic compound 'A' having molecular formula $C_6H_6O$ gives a characteristic colour with aqueous $FeCl_3$ solution. When 'A' is treated with $CO_2$ and NaOH at 400 K under pressure, 'B' is obtained. B on acidification gives C when C treated with $CH_3COCl$ gives a popular pain killer D. Deduce the structures of A, B, C and D.
एक कार्बनिक यौगिक 'A' जिसका अणुसुत्र $C_6H_6O$ है, जलीय $FeCl_3$ विलयन के साथ एक विशिष्ठ रंग देता है। जब यौगिक 'A' की अभिक्रिया 400 K ताप एवम् दाब पर $CO_2$ तथा NaOH के साथ कराते है, तो यौगिक 'B' प्राप्त होता है। यौगिक B अम्लीकरण पर यौगिक C देता है जब यौगिक C की अभिक्रिया $CH_3COCl$ के साथ कराने पर एक सुप्रसिद्ध दर्दनिवारक D प्राप्त होता है। यौगिक A, B, C तथा D की संरचनाऐं बनाइयें।

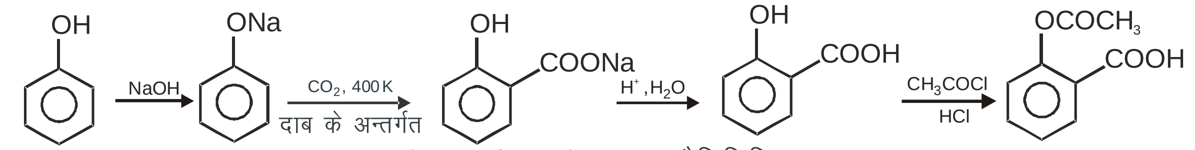
**Ans.** 

**Sol.** Since the compound gives characteristic colour with $FeCl_3$ solution, 'A' is a phenol. The reactions are :



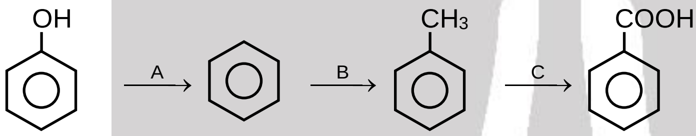
Phenol (A) — Sodium salicylate (B) — Salicylic acid (C) — Acetyl salicylic acid (D)

**Sol.** चूंकि उपरोक्त यौगिक $FeCl_3$ विलयन के साथ विशिष्ठ रंग देता है अतः 'A' फिनॉल है। अभिक्रियाऐं निम्न है :



फिनॉल (A) — सोडियम सैलिसिलेट (B) — सैलिसिलिक अम्ल (C) — एसिटिल सैलिसिलिक अम्ल (D)

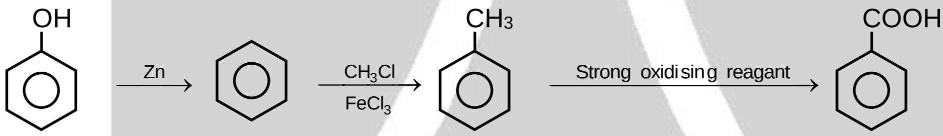
**A-6.**



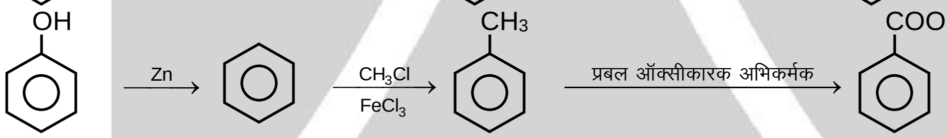
Identify A, B and C in above reaction ?
उपरोक्त अभिक्रिया में A, B तथा C है ?

**Ans.** A $\rightarrow$ Zn, B $\rightarrow$ $CH_3Cl$ / $FeCl_3$ and C $\rightarrow$ Strong oxidising reagent
A $\rightarrow$ Zn, B $\rightarrow$ $CH_3Cl$ / $FeCl_3$ और C $\rightarrow$ प्रबल ऑक्सीकारक अभिकर्मक

**Sol.**

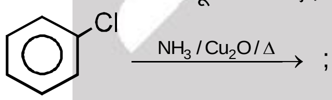
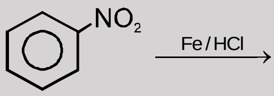


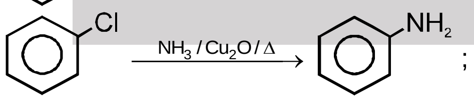
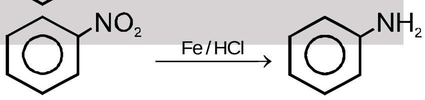
**Sol.**



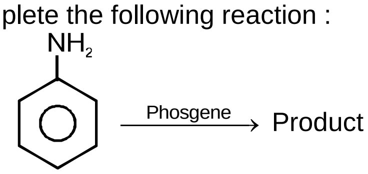
## Section (B) : Nitrogen containing compounds
## खण्ड (B) : नाइट्रोजन युक्त यौगिक

**B-1.** Complete the following reactions :
निम्न अभिक्रियाओं को पूर्ण कीजिए।

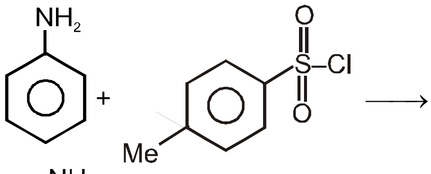
(a)  ; (b) 

**Sol.** (a)  ; (b) 

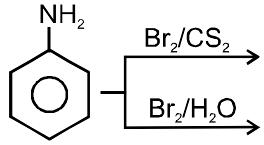
**B-2.** Complete the following reaction :

(a) 

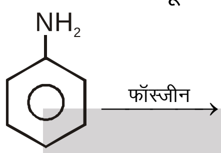
Excess

(b) 

Product

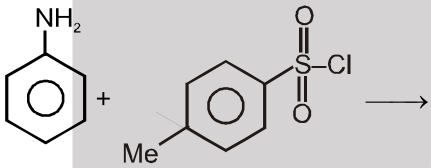
(c) 


निम्न अभिक्रियाओं को पूर्ण कीजिए।

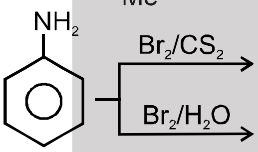
(a) 

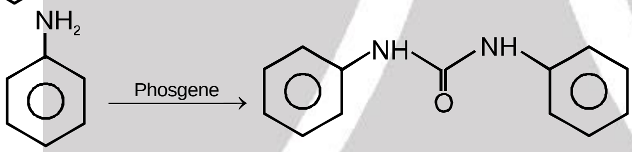
उत्पाद

आधिक्य

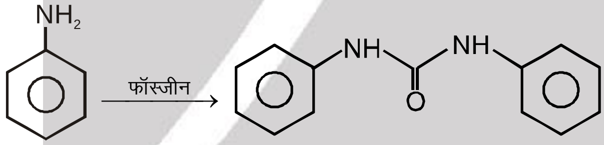
(b) 

उत्पाद

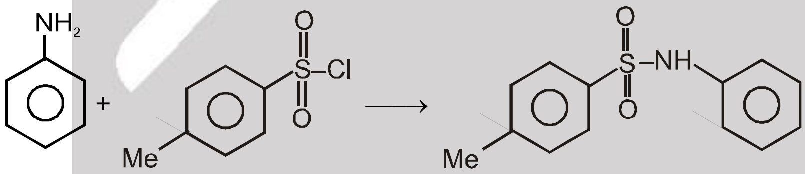
(c) 

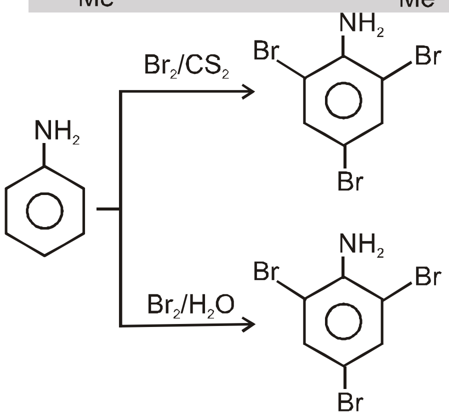

**Ans.** (a) 


Excess

(a) 

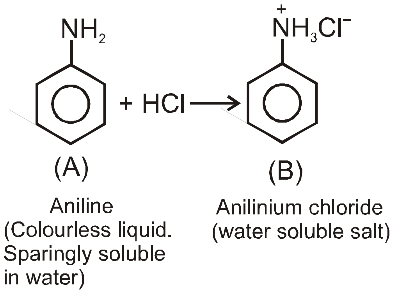

आधिक्य

(b) 

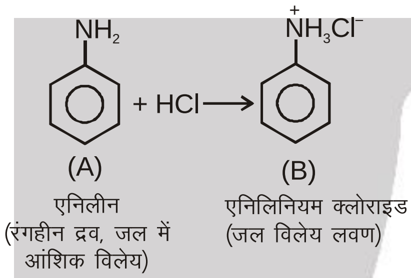

(c) 

**B-3.** Why does aniline soluble in aqueous HCl ?
एनिलीन, जलीय HCl में क्यों विलेय होती है ?

**Sol.** Aniline forms the salt anilinium chloride which is water soluble.

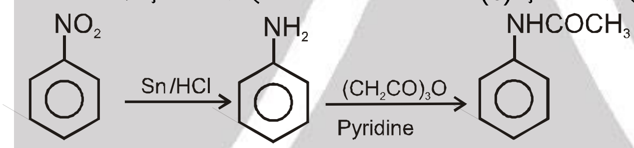



**Sol.** एनिलीन, एनिलिनियम क्लोराइड लवण बनाती है जो जल में विलेय होता है।

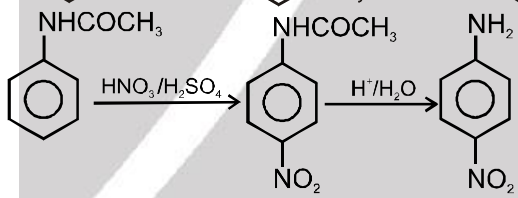



**B-4.** Write following conversions:
(a) nitrobenzene $\longrightarrow$ acetanilide (b) acetanilide $\longrightarrow$ *p*-nitroaniline
निम्न रूपान्तरण अभिक्रियाऐं लिखिए :
(a) नाइट्रोबेन्जीन $\longrightarrow$ एसीटेनिलाइड (b) एसीटेनिलाइड $\longrightarrow$ *p*-नाइट्रोएनिलीन

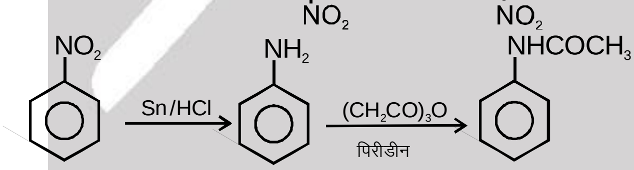
**Sol** (a)



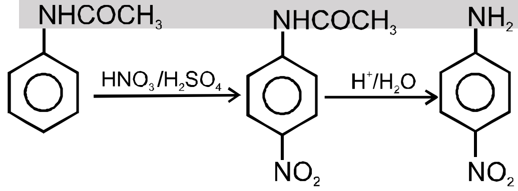

(b)




**हल.** (a)



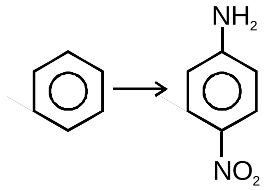

(b)



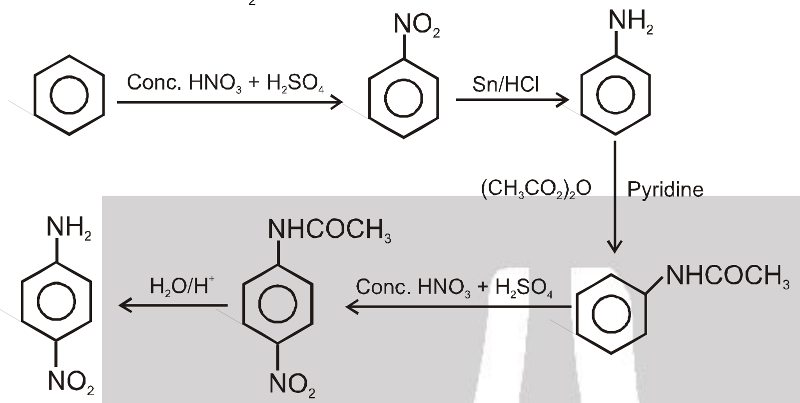

**B-5.** What is the product when $C_6H_5CH_2NH_2$ reacts with $HNO_2$ ?
$C_6H_5CH_2NH_2$ की $HNO_2$ के साथ क्रिया पर क्या उत्पाद बनता है ?

**Sol.** $C_6H_5CH_2NH_2 \xrightarrow{HNO_2} C_6H_5CH_2OH + N_2\uparrow$

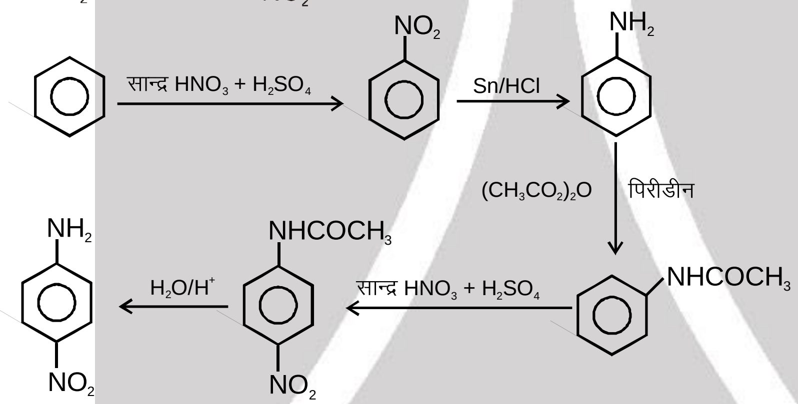
**B-6.** How will you carry out the following conversion ?
निम्न रूपान्तरण आप किस प्रकार प्राप्त करेगें ?




**Sol.**




**हल.**

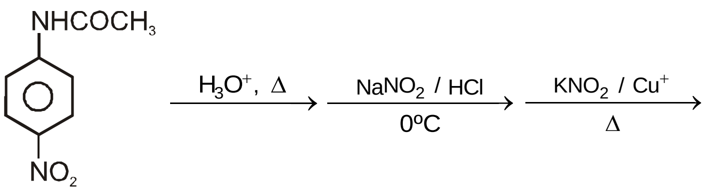



**B-7.** Give 3 methods to distinguish primary amine from secondary and tertiary.
प्राथमिक एमीन को द्वितीयक तथा तृतीयक एमीन से विभेदित करने के कोई तीन परीक्षण बताइयें।

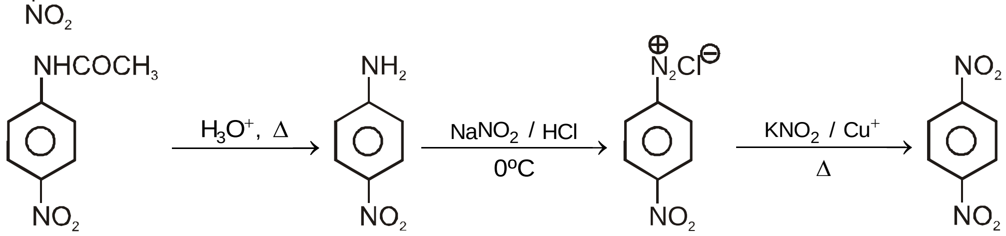
**Ans.** (i) Isocyanide test (ii) Hinsberg test (iii) $NaNO_2$ + HCl test
(i) आइसोसायनाइड परीक्षण (ii) हिन्सबर्ग परीक्षण (iii) $NaNO_2$ + HCl परीक्षण

## Section (C) : Benzene diazonium salt & its reaction
## खण्ड (C) : डाइएजोनियम लवण तथा इसकी अभिक्रियाएँ

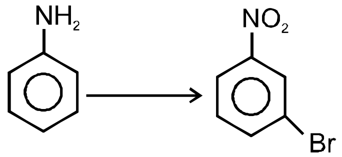
**C-1.** The final product of the following reaction is :
निम्नलिखित अभिक्रिया में प्राप्त अन्तिम उत्पाद होगा :



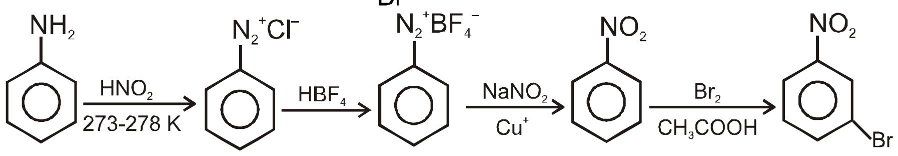

**Sol.**



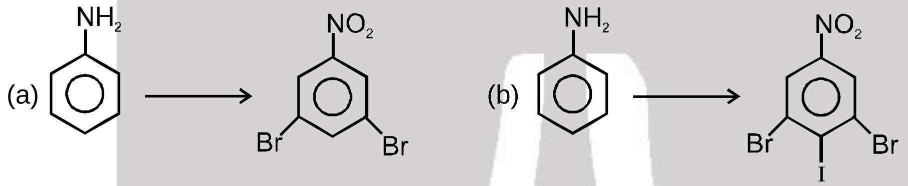
**C-2.** How will you carry out the following conversion ?
आप निम्न को कैसे रूपान्तरित करोगे ?



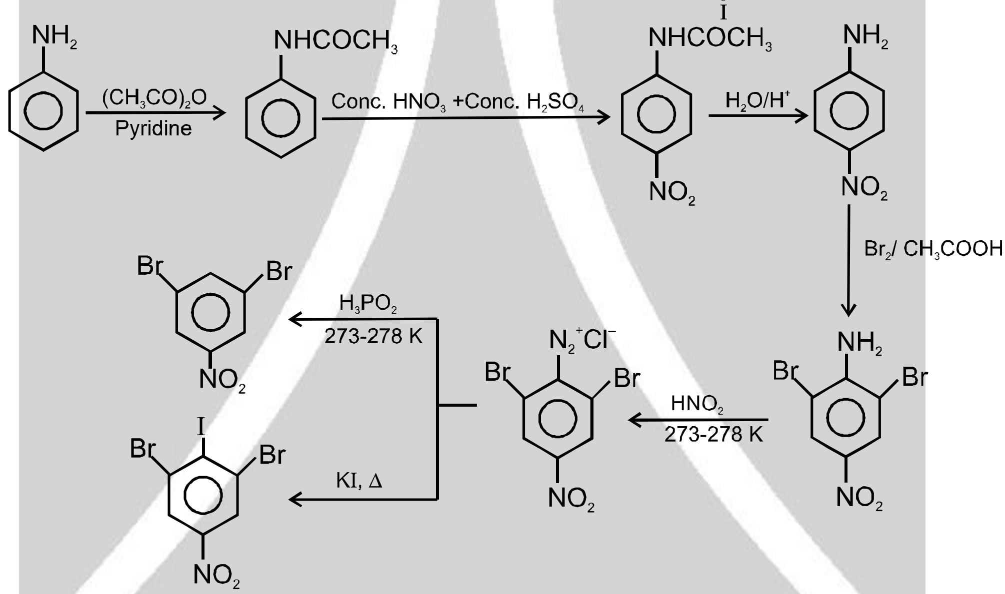
**Sol.**



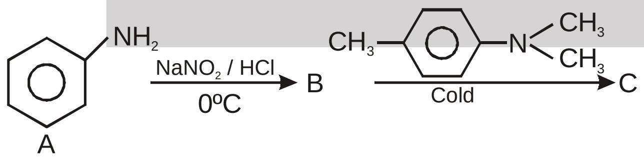
**C-3.** How will you carry out the following conversions?
आप निम्न को कैसे रूपान्तरित करोगे ?



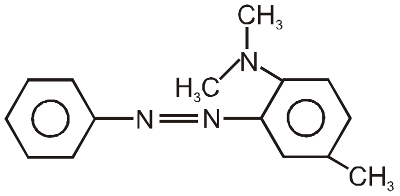
**Sol.** (a & b)

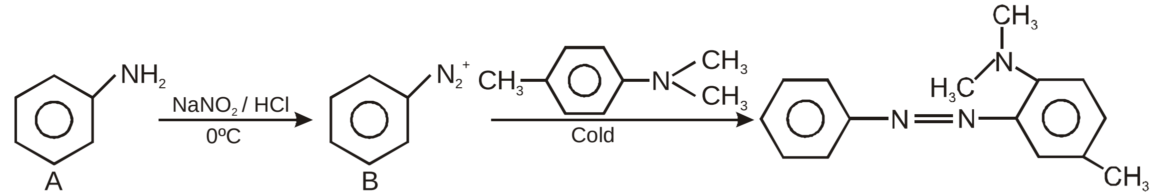


**C-4.** In the given reaction of aniline a coloured product C was obtained. The structure of C would be :
एनिलीन की अभिक्रिया में, एक रंगीन उत्पाद 'C' प्राप्त होता है। 'C' की संरचना होगी :



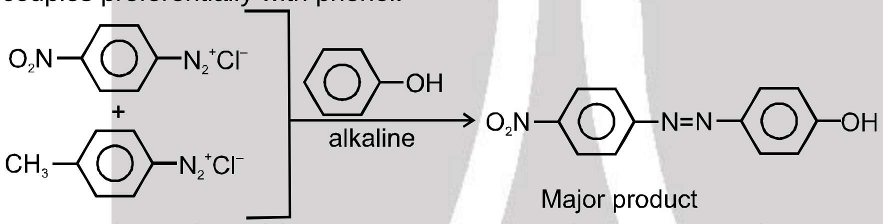
Ans.



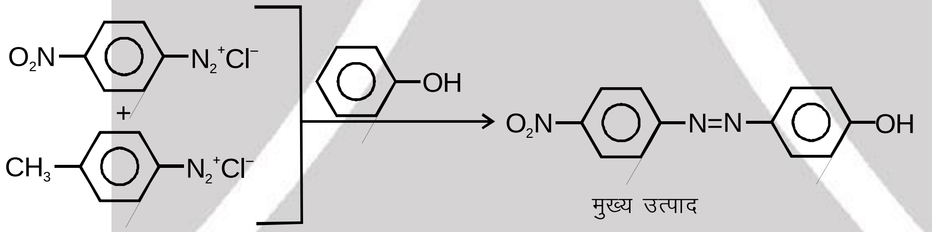
**Sol.** 

**C-5.** A solution contains 1 g mol. each of *p*-toluene diazonium chloride and *p*-nitrophenyl diazonium chloride. To this 1 g mol. of alkaline solution of phenol is added. Predict the major product. Explain your answer.
एक विलयन *p*-टालुईन डाइएजोनियम क्लोराइड तथा *p*-नाइट्रोफेनिल डाइएजोनियम क्लोराइड प्रत्येक के 1 ग्राम मोल युक्त है। इसमें फिनॉल के क्षारीय विलयन के 1 ग्राम मोल मिलाये जाते है। मुख्य उत्पाद बताइये तथा अपने उत्तर की व्याख्या कीजिए।

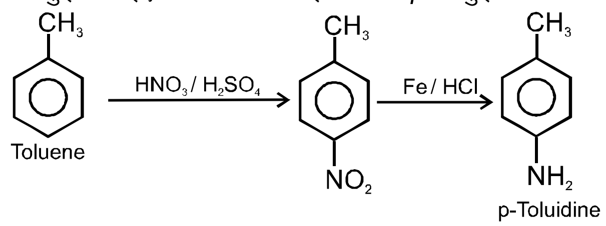
**Ans.** This reaction is an example of electrophilic aromatic substitution. In alkaline medium, phenol generates phenoxide ion which is more electron rich than phenol and hence more reactive for electrophilic attack. The electrophile in this reaction is aryldiazonium cation. Stronger the electrophile faster is the reaction. *p* Nitrophenyldiazonium cation is a stronger electrophile than *p*-toluene diazonium cation. Therefore, it couples preferentially with phenol.

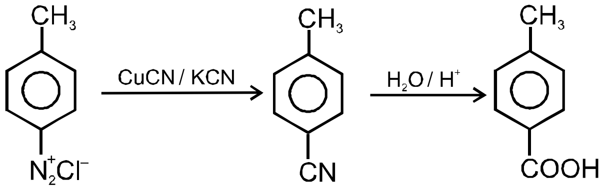


**Ans.** यह एक इलेक्ट्रॉनस्नेही एरोमैटिक प्रतिस्थापन अभिक्रिया है। क्षारीय माध्यम में फिनॉल, फिनॉक्साइड आयन देता है जो कि फिनॉल से अधिक इलेक्ट्रॉन धनी होते हैं। इस अभिक्रिया में इलेक्ट्रॉनस्नेही आक्रमण के लिए अधिक क्रियाशील होते है। इस अभिक्रिया में इलेक्ट्रॉनस्नेही एरिलडाइएजोनियम धनायन है। प्रबल इलेक्ट्रॉनस्नेही अभिक्रिया को तीव्र करता है। *p*-नाइट्रोफेनिलडाइएजोनियम धनायन, *p*-टॉलुईन डाइएजोनियम धनायन की तुलना में एक प्रबल इलेक्ट्रॉनस्नेही है। इसलिए यह फिनॉल से मुख्यतया युग्मित होता है।

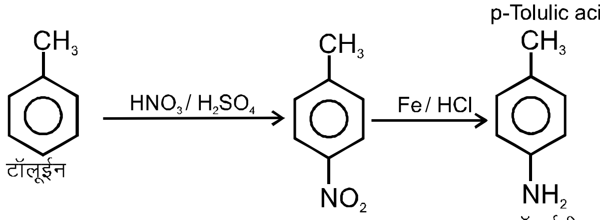


**C-6.** How will you carry out the following conversions ?
(a) toluene $\longrightarrow$ *p*-toluidine
(b) *p*-toluene diazonium chloride $\longrightarrow$ *p*-toluic acid
निम्न रूपान्तरण आप किस प्रकार प्राप्त करेगें ?
(a) टॉलुइन $\longrightarrow$ *p*-टॉलुइडीन
(b) *p*-टॉलुइन डाइएजोनियम क्लोराइड $\longrightarrow$ *p*-टॉलुईक अम्ल

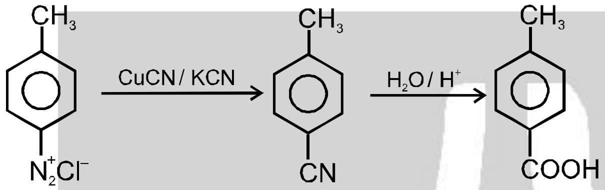
**Sol.** (a) 

(b) 

p-Tolulic acid

**Sol.** (a) 

टॉलूईन → p-टॉलूईडीन

(b) 

p-टॉलूईक अम्ल

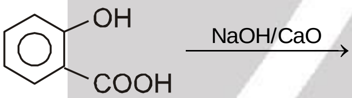
## PART - II : ONLY ONE OPTION CORRECT TYPE

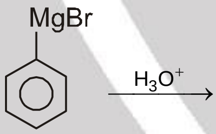
## भाग - II : केवल एक सही विकल्प प्रकार (ONLY ONE OPTION CORRECT TYPE)

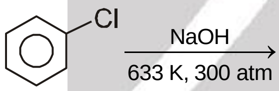
### Section (A) : Phenol

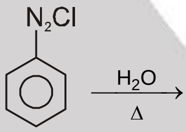
### खण्ड (A) : फिनॉल

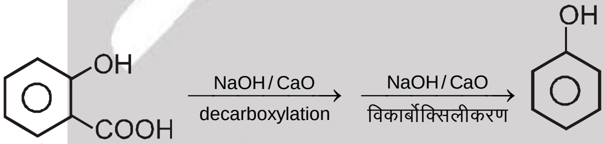
**A-1.** In which of the following reactions phenol is not obtained :
निम्न में से कौनसी अभिक्रिया से फिनॉल प्राप्त नहीं होता है ?

(A) 

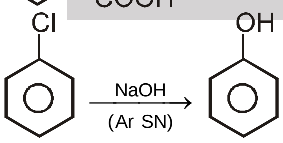
(B*) 

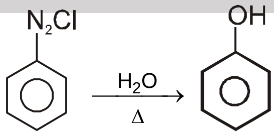
(C) 

(D) 

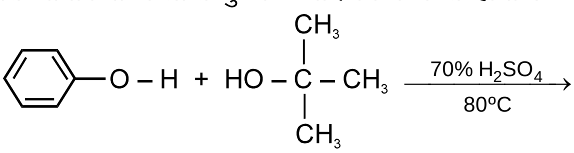
**Sol.** (A) 

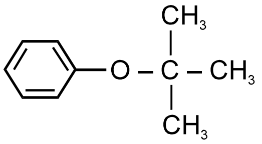
(B) $C_6H_5\,MgBr \xrightarrow{H_3O^+} C_6H_6 + Mg(Br)(OH)$

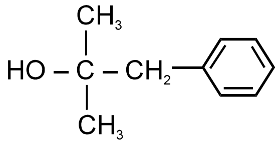
(C) 

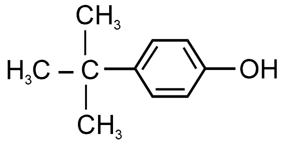
(D) 

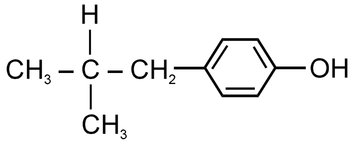
**A-2.** The major product of the following reaction is
निम्नलिखित अभिक्रिया में प्राप्त मुख्य उत्पाद निम्न में से होगा ?



(A) 

(B) 

(C*) 

(D) 

**Sol.** It is an example of alkylation of phenol.
यह फिनॉल के एल्कलीकरण का उदाहरण है।

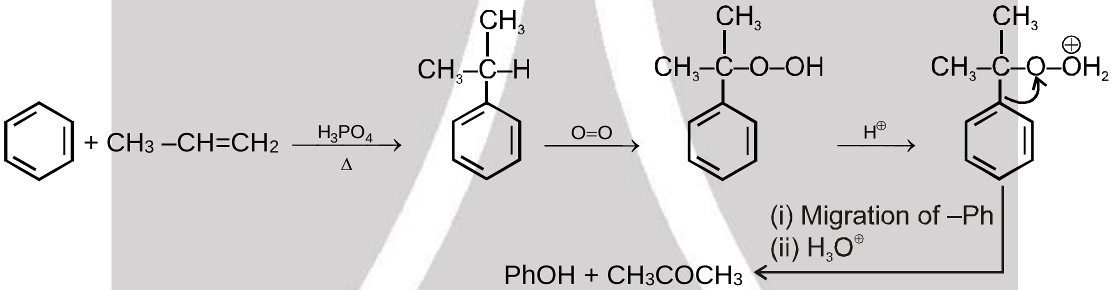
**A-3.** + $CH_3$–CH=$CH_2$ $\xrightarrow[\Delta]{H_3PO_4}$ A $\xrightarrow[(2)\ H_3O^+]{(1)\ O_2,\Delta}$ B + C

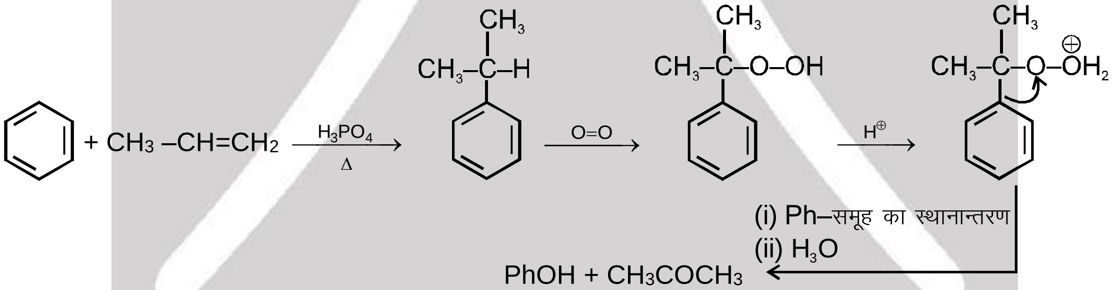
The products B & C are respectively :

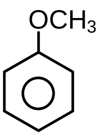
(A) Phenol & acetic acid
(B) Phenol & acetaldehyde
(C) Benzoic acid & acetone
(D*) Phenol & acetone

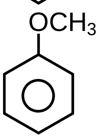
उत्पाद B तथा C क्रमशः होगे :

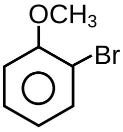
(A) फिनॉल तथा एसीटिक अम्ल
(B) फिनॉल तथा एसीटैल्डिहाइड
(C) बेन्जोइक अम्ल तथा एसीटोन
(D*) फिनॉल तथा एसीटोन

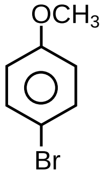
**Sol.** 

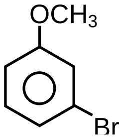

**Sol.** 

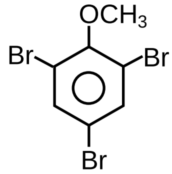

**A-4.**  $\xrightarrow[CH_3COOH]{Br_2}$ product. The major product obtained is

 $\xrightarrow[CH_3COOH]{Br_2}$ उत्पाद। अभिक्रिया से प्राप्त मुख्य उत्पाद है –

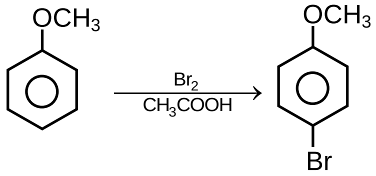
(A) 

(B*) 

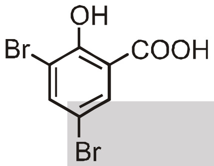
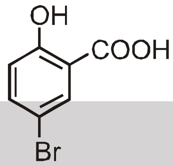
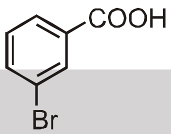
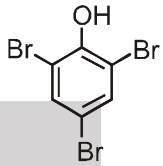
(C) 

(D) 

**Sol.** If bromine in acetic acid is used, bromination takes place without decarboxylation.
एसीटिक अम्ल में ब्रोमीन प्रयुक्त करने पर विकार्बोक्सिलीकरण के बिना ब्रोमीनीकरण होता है।

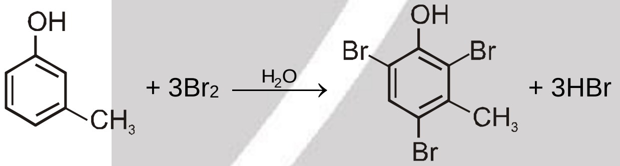


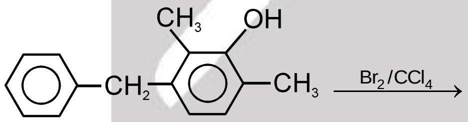
**A-5.** When 2-hydroxybenzoic acid (salicylic acid) is treated with bromine water, the product formed is
2-हाइड्रोक्सीबेन्जोइक अम्ल (सेलिसिलिक अम्ल) को ब्रोमीन जल के साथ क्रिया कराने पर उत्पाद बनता है।

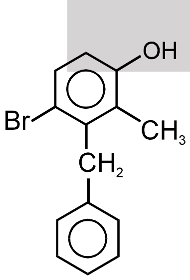
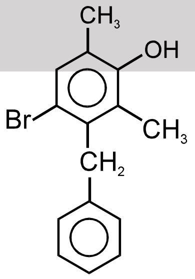
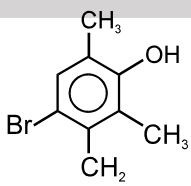
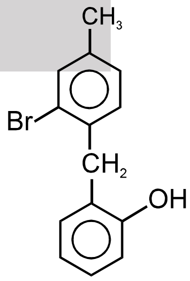
(A) 
(B) 
(C) 
(D*) 

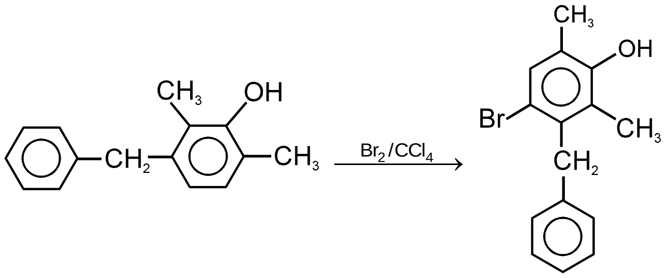
**Sol.** Salicylic acid undergoes decarboxylation with the formation of 2,4,6-tribromophenol when treated with bromine water. The displacement of carboxyl group occurs only when the reaction is carried out in aqueous solution.
सेलिसिलिक अम्ल ब्रोमीन जल के साथ विकार्बोक्सिलीकरण क्रिया द्वारा 2,4,6-ट्राइब्रोमोफिनॉल बनाता है। कार्बोक्सिल समूह का प्रतिस्थापन केवल जलीय विलयन में अभिक्रिया पर होता है।

**A-6.** An organic compound having the molecular formulaf $C_7H_8O$ is insoluble in $NaHCO_3$ solution but dissolves in aqueous NaOH. When treated with bromine water the compound rapidly forms a precipitate having the molecular formula $C_7H_5OBr_3$. The organic compound is
(A) o-cresol (B*) m-cresol (C) p-cresol (D) anisole
एक $C_7H_8O$ अणुसूत्र का कार्बनिक यौगिक $NaHCO_3$ विलयन में अविलेय होता है जबकि जलीय NaOH में घुल जाता है। इसकी ब्रोमीन जल के साथ क्रिया कराने पर शीघ्रता से $C_7H_5OBr_3$ अणुसूत्र का एक अवक्षेप बनाता है। वह कार्बनिक यौगिक है –
(A) o-क्रिसॉल (B*) m-क्रिसॉल (C) p-क्रिसॉल (D) एनिसॉल

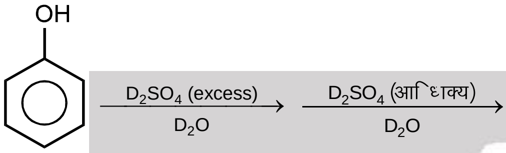
**Sol.** 

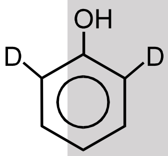
**A-7.**  , The product is : उत्पाद है :

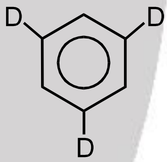
(A) 
(B*) 
(C) 
(D) 

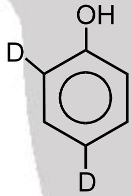
**Sol.** 

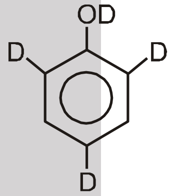

**A-8.** Identify the product in following reaction ?
निम्न अभिक्रिया का उत्पाद है :




(A) 

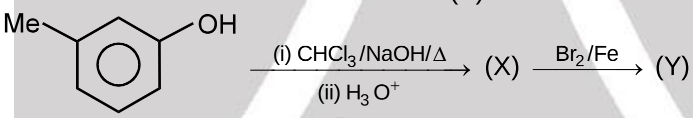
(B) 

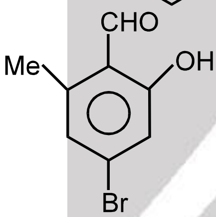
(C) 

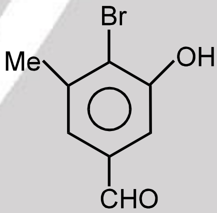
(D*) 

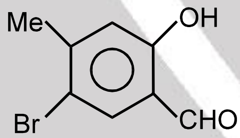

**Sol.** Electrophilic substitution reaction.
इलेक्ट्रॉनस्नेही प्रतिस्थापन अभिक्रिया।

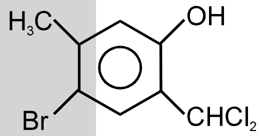
**A-9.** The product (Y) of the following sequence of reactions would be :
निम्नलिखित क्रमिक अभिक्रिया में प्राप्त अन्तिम उत्पाद (Y) निम्न में से होगा ?

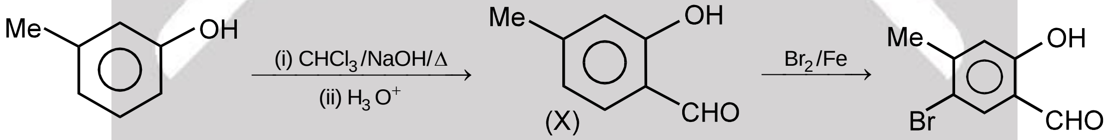



(A) 

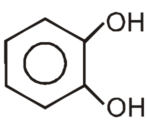
(B) 

(C*) 

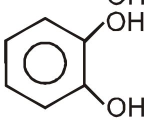
(D) 


**Sol.** 

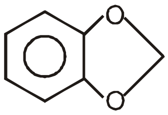
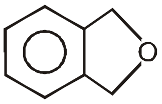
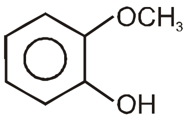
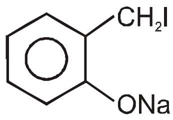

Attack will take place on the ring which is more electron rich. Benzene with –OH group attached is more elecron rich.
आक्रमण अधिक इलेक्ट्रॉन धनी वलय पर होता है। –OH समूह से जुड़ी हुई बेंजीन वलय अधिक इलेक्ट्रॉन धनी होती है।

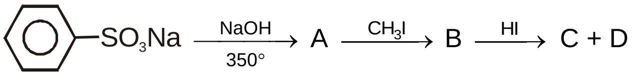
**A-10.** 

$+ CH_2I_2 + NaOH \longrightarrow$, the product is :



$+ CH_2I_2 + NaOH \longrightarrow$, उत्पाद है :

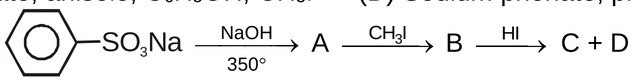
(A*)  (B)  (C)  (D) 

**A-11.** In the reaction sequence 

A, B, C and D are given by the set :

(A) Sodium phenate, anisole, $C_6H_5I$, $CH_3OH$ (B) Sodium phenate, phenitole, $C_2H_5I$, $C_6H_5OH$

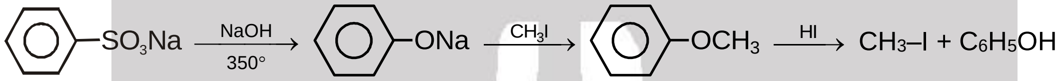
(C*) Sodium phenate, anisole, $C_6H_5OH$, $CH_3I$ (D) Sodium phenate, phenitole, $C_6H_5I$, $C_2H_5OH$

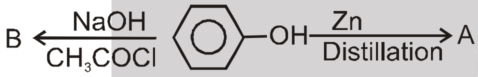
अभिक्रिया अनुक्रम में, 

यौगिक A, B, C तथा D क्रमशः है :

(A) सोडियम फेनेट, एनिसॉल, $C_6H_5I$, $CH_3OH$ (B) सोडियम फेनेट, फेनिटॉल, $C_2H_5I$, $C_6H_5OH$

(C*) सोडियम फेनेट, एनिसॉल, $C_6H_5OH$, $CH_3I$ (D) सोडियम फेनेट, फेनिटॉल, $C_6H_5I$, $C_2H_5OH$

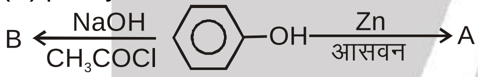
**Sol.** 

**A-12.** 

The compounds A and B in the above reaction sequence are :

(A) benzene, methyl benzoate (B*) benzene, phenyl acetate

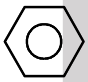
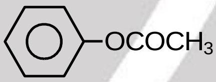
(C) phenyl acetate, benzene (D) benzene, phenylacetyl chloride



उपरोक्त अभिक्रिया अनुक्रम में यौगिक A तथा B है :

(A) बेन्जीन, मेथिल बेन्जोएट (B*) बेन्जीन, फेनिल एसीटैट

(C) फेनिल एसीटैट, बेन्जीन (D) बेन्जीन, फेनिलएसिटिल क्लोराइड

**Sol.** A =  ; B = 

## Section (B) : Nitrogen containing compounds
## खण्ड (B) : नाइट्रोजन युक्त यौगिक

**B-1.** Which of the following sequence is best suited to convert benzene to 3-chloro aniline ?

(A) nitration, reduction, chlorination

(B) chlorination, nitration, reduction

(C*) nitration, chlorination, reduction

(D) nitration, reduction, acetylation, chlorination, hydrolysis

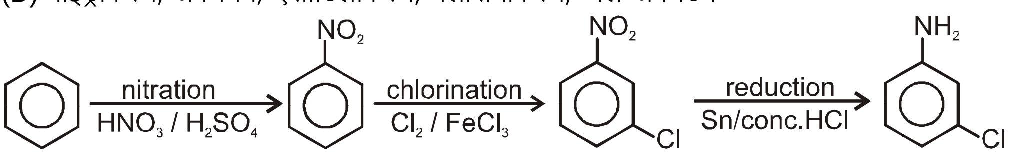
बेन्जीन से 3-क्लोरो एनिलीन के रूपान्तरण हेतु कौनसा क्रम उपयुक्त है ?

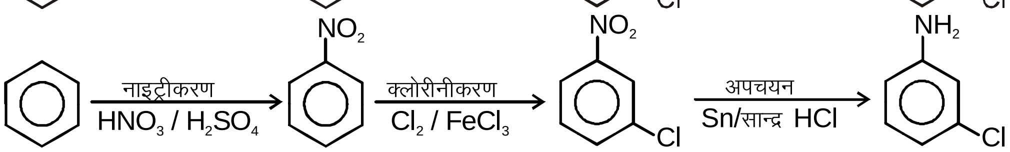
(A) नाइट्रीकरण, अपचयन, क्लोरीनीकरण

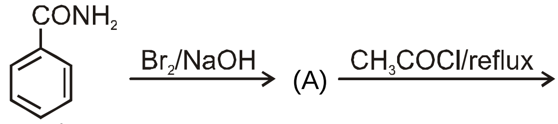
(B) क्लोरीनीकरण, नाइट्रीकरण, अपचयन

(C*) नाइट्रीकरण, क्लोरीनीकरण, अपचयन

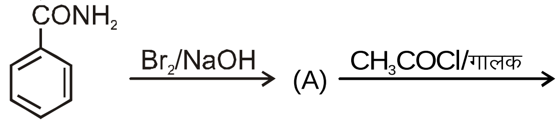
(D) नाइट्रीकरण, अपचयन, एसीटिलीकरण, क्लोरीनीकरण, जल अपघटन

**Sol.** 

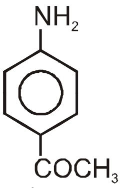
**Sol.** 

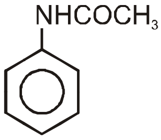
**B-2.** 

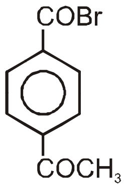
(B), Identify the major product (B).

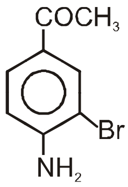


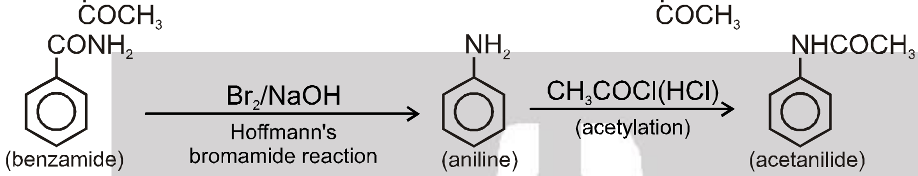
(B), मुख्य उत्पाद (B) पहचानिए।

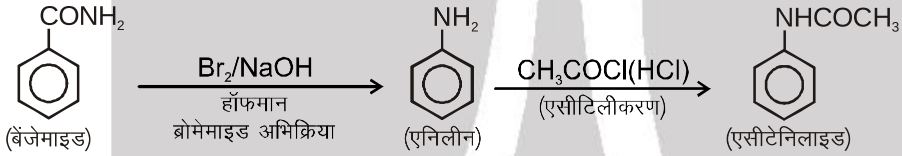
(A) 

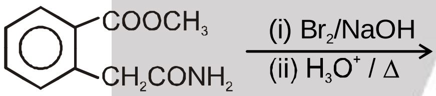
(B*) 

(C) 

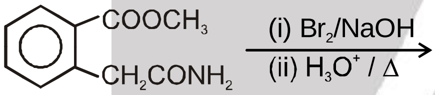
(D) 


**Sol.** 

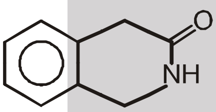

**Sol.** 

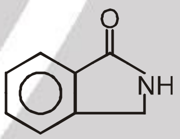

**B-3.** 

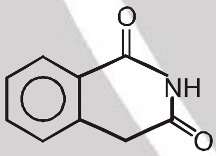
Product. The major product obtained is

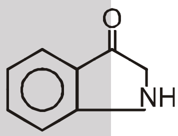


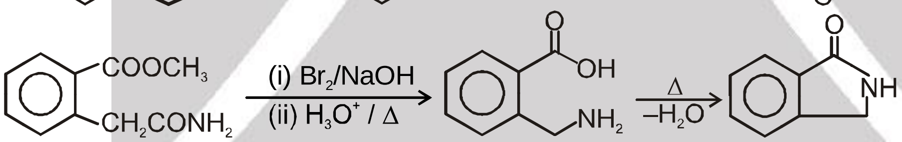
उत्पाद। प्राप्त मुख्य उत्पाद है –

(A) 

(B*) 

(C) 

(D) 

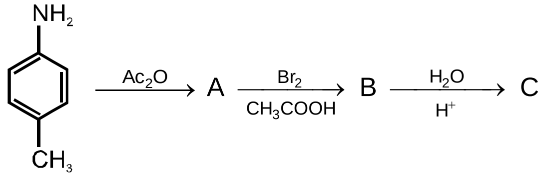

**Sol.** 

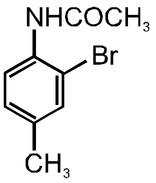
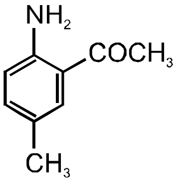
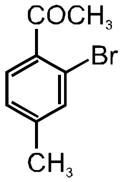
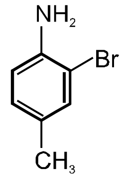

**B-4.** Aniline when treated with acetyl chloride in presence of alkali, the product formed is :
(A*) acetanilide (B) benzoyl chloride (C) acetophenone (D) aniline hydrochloride
एनिलीन जब क्षार की उपस्थिति में एसीटिल क्लोराइड के साथ अभिक्रिया करता है, तब निर्मित उत्पाद है :
(A*) एसीटेनिलाइड (B) बेंजॉयल क्लोराइड (C) एसीटोफीनोन (D) एनिलीन हाइड्रोक्लोराइड

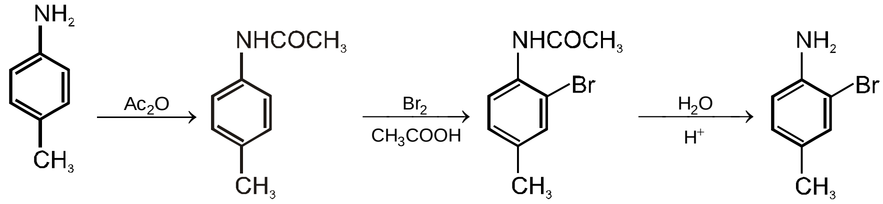
**Sol.** $Ph–NH_2 + CH_3COCl \xrightarrow{\text{Pyridine}} Ph–NH–COCH_3$ (acetanilide)

**Sol.** $Ph–NH_2 + CH_3COCl \xrightarrow{\text{पिरीडीन}} Ph–NH–COCH_3$ (एसीटेनिलाइड)

**B-5.** The final product C, obtained in this reaction
इस अभिक्रिया में प्राप्त अन्तिम उत्पाद C है :



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

**Sol.** 


**B-6.** Chloroform when treated with aniline and alcoholic KOH, the product formed is ?
(A) Phenyl cyanide (B*) Phenyl isocyanide
(C) Chlorobenzene (D) Phenol
जब क्लोरोफार्म की अभिक्रिया एनिलीन तथा एल्कोहॉलिक KOH के साथ कराते है, तो निम्न में से कौनसा उत्पाद प्राप्त होता है?
(A) फेनिल सायनाइड (B*) फेनिल आइसोसायनाइड
(C) क्लोरोबेन्जीन (D) फिनॉल

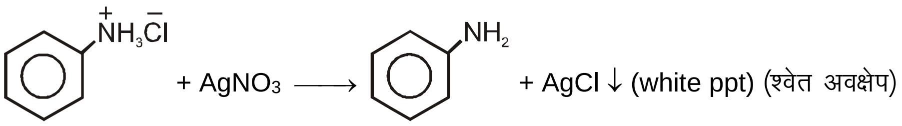
**Sol.** It is carbylamine reaction.

**B-7.** An aromatic amine (X) was treated with alcoholic potash and another compound (Y) then foul smelling gas $C_6H_5NC$ is formed. The compound (Y) was formed by reacting compound (Z) with $Cl_2$ in the presence of slaked lime. The compound (Z) is :
एक ऐरोमैटिक एमीन (X) एल्कोहॉलिक पोटाश तथा एक अन्य यौगिक (Y) के साथ अभिक्रिया कर दुर्गन्ध युक्त गैस $C_6H_5NC$ बनाता है। यौगिक (Y) बुझे हुये चूने की उपस्थिति में यौगिक (Z) की $Cl_2$ के साथ अभिक्रिया द्वारा निर्मित होता है। यौगिक (Z) है:
(A) $CHCl_3$ (B*) $CH_3COCH_3$ (C) $CH_3OH$ (D) $C_6H_5NH_2$

**Sol.** $\underset{(X)}{Ph-NH_2} \xrightarrow[CHCl_3\ (Y)]{KOH} Ph-N \equiv C$

$\underset{(Z)}{CH_3COCH_3} \xrightarrow{Cl_2/Ca(OH)_2} (CH_3COO)_2Ca + CHCl_3$

**B-8.** p-Chloro aniline and anilinium chloride can be distinguished by
(A) Sandmayer reaction (B) Carbyl amine reaction
(C) Hinsberg's reaction (D*) $AgNO_3$
p-क्लोरो एनिलीन तथा एनिलीनियम क्लोराइड को किसके द्वारा विभेदित कर सकते है :
(A) सेण्डमेयर अभिक्रिया द्वारा (B) कार्बिल एमीन अभिक्रिया द्वारा
(C) हिंसबर्ग अभिक्रिया द्वारा (D*) $AgNO_3$

**Sol.** 


**B-9.** The best reagent for converting 2–phenylpropanamide into 2-phenylpropanamine is _____.
(A) excess $H_2$ (B) $Br_2$ in aqueous NaOH
(C) iodine in the presence of red phosphorus (D*) $LiAlH_4$ in ether
2–फेनिलप्रोपेनएमाइड से 2-फेनिलप्रोपेनएमीन मे रूपान्तरण हेतु अच्छा अभिकर्मक है –
(A) $H_2$ आधिक्य (B) जलीय NaOH में $Br_2$
(C) लाल फॉस्फोरस की उपस्थिति में आयोडीन (D*) ईथर में $LiAlH_4$

**Sol.** $CH_3-\underset{\displaystyle Ph}{\underset{|}{C}H}-\overset{\displaystyle O}{\overset{\|}{C}}-NH_2 \xrightarrow[\text{Ether}]{LiAlH_4} CH_3-\underset{\displaystyle Ph}{\underset{|}{C}H}-CH_2-NH_2$

**B-10.** Hoffmann bromamide degradation reaction is shown by __________.
हॉफमान–ब्रोमामाइड निम्नीकरण अभिक्रिया निम्न से कौन प्रदर्शित करता है –
(A) $ArNH_2$ (B*) $ArCONH_2$ (C) $ArNO_2$ (D) $ArCH_2NH_2$

**Sol.** 1º amides give Hoffmann bromamide reaction.
1º एमाइड हॉफमान ब्रोमाइड अभिक्रिया देते है।

**B-11.** The best reagent for converting, 2-phenylpropanamide into 1- phenylethanamine is ____.
(A) excess $H_2/Pt$ (B*) $NaOH/Br_2$ (C) $NaBH_4$/methanol (D) $LiAlH_4$/ether
2-फेनिल प्रोपेनएमाइड से 1-फेनिलएथेनएमीन मे रूपान्तरण हेतु अच्छा अभिकर्मक है –
(A) आधिक्य $H_2/Pt$ (B*) $NaOH/Br_2$ (C) $NaBH_4$/मेथेनॉल (D) $LiAlH_4$/ईथर

**Sol.** $CH_3-\underset{\displaystyle Ph}{\underset{|}{C}H}-\overset{\displaystyle O}{\overset{\|}{C}}-NH_2 \xrightarrow{NaOH\ +\ Br_2} CH_3-\underset{\displaystyle Ph}{\underset{|}{C}H}-NH_2$

It is Hoffmann bromamide reaction. यह हॉफमान ब्रोमाइड अपचयन है।

**B-12.** In order to prepare a 1º amine from an alkyl halide with simultaneous addition of one $CH_2$ group in the carbon chain, the reagent used as source of nitrogen is ___________.
(A) Sodium amide, $NaNH_2$ (B) Sodium azide, $NaN_3$
(C*) Potassium cyanide, KCN (D) Potassium phthalimide, $C_6H_4(CO)_2N^-K^+$
कार्बन श्रृंखला मे एक $CH_2$ समूह के नियमित योग के साथ एल्किल हैलाइड से 1º एमीन के निर्माण के क्रम में नाइट्रोजन के स्त्रोत के रूप मे प्रयुक्त अभिकर्मक है –
(A) सोडियम एमाइड, $NaNH_2$ (B) सोडियम एजाइड, $NaN_3$
(C*) पौटेशियम सायनाइड, KCN (D) पोटेशियम थैलिमाइड, $C_6H_4(CO)_2N^-K^+$

**Sol.** $R-X \xrightarrow{KCN} R-CN \xrightarrow{[H]} \underset{1^\circ\ \text{Amine}}{R-CH_2-NH_2}$

**B-13.** Best method for preparing primary amines from alkyl halides without changing the number of carbon atoms in the chain is
(A) Hoffmann Bromamide reaction (B*) Gabriel phthalimide synthesis
(C) Sandmeyer reaction (D) Reaction with $NH_3$
श्रृंखला में कार्बन परमाणुओं की संख्या बिना परिवर्तित हुए एल्किल हैलाइड से प्राथमिक एमीन बनाने की सर्वाधिक उपयुक्त विधि है –
(A) हॉफमान ब्रोमेमाइड अभिक्रिया (B*) गेब्रियल थैलिमाइड संश्लेषण
(C) सेण्डमेयर अभिक्रिया (D) $NH_3$ के साथ अभिक्रिया

**Sol.** Gabriel phthalimide synthesis is best method for preparing primary amines from alkyl halides without changing the number of carbon atoms in the chain.
गेब्रियल थैलिमाइड संश्लेषण श्रृंखला में कार्बन परमाणुओं की संख्या बिना परिवर्तित हुए एल्किल हैलाइड से प्राथमिक एमीन बनाने की सर्वाधिक उपयुक्त विधि है।

**B-14.** The product formed by the reaction of acetamide with $Br_2$ in presence of NaOH is :
एसीटामाइड एवं ब्रोमीन की NaOH की उपस्थिति में क्रिया कराने पर प्राप्त होता है :
(A) $CH_3CN$ (B) $CH_3CHO$ (C) $CH_3CH_2OH$ (D*) $CH_3NH_2$

**Sol.** $CH_3-CONH_2 + Br_2 + NaOH \xrightarrow{\Delta} CH_3NH_2 + Na_2CO_3$ [Hofmann bromide reaction]

## Section (C) : Benzene diazonium salt & its reactions
## खण्ड (C) : डाइएजोनियम लवण तथा इसकी अभिक्रियाएँ

**C-1.** In the reaction, the product (C) is :

$$C_6H_5NH_2 \xrightarrow[0-5^\circ C]{NaNO_2 + HCl} (A) \xrightarrow[KCN]{CuCN} (B) \xrightarrow{H^+/H_2O} (C)$$

(A) $C_6H_5CH_2NH_2$ (B*) $C_6H_5COOH$ (C) $C_6H_5OH$ (D) none of these

निम्न अभिक्रिया में उत्पाद (C) है।

$$C_6H_5NH_2 \xrightarrow[0-5^\circ C]{NaNO_2 + HCl} (A) \xrightarrow[KCN]{CuCN} (B) \xrightarrow{H^+/H_2O} (C)$$

(A) $C_6H_5CH_2NH_2$ (B*) $C_6H_5COOH$ (C) $C_6H_5OH$ (D) इनमें से कोई नहीं

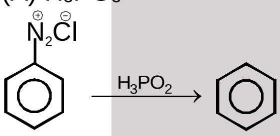
**Sol.** $C_6H_5NH_2 \xrightarrow[0-5^\circ C]{NaNO_2 + HCl} C_6H_5\overset{\oplus}{N_2}\overset{\ominus}{Cl} \xrightarrow[KCN]{CuCN} C_6H_5CN \xrightarrow{H^+/H_2O} C_6H_5COOH$

**C-2.** Benzenediazonium chloride can be converted into benzene on treatement with :

बेंजीनडाइएजोनियम क्लोराइड किसके साथ अभिक्रिया कर बेंजीन में रूपान्तरित हो जाता है :

(A) $H_3PO_3$ (B) $H_3PO_4$ (C*) $H_3PO_2$ (D) $HPO_3$

**Sol.**




**C-3.** $C_6H_5\,NH_2 \xrightarrow[0-5^\circ C]{NaNO_2+HCl} X \xrightarrow[\Delta]{H_2O} Y$, the product Y is :

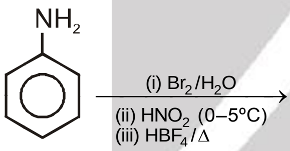
(A) Benzenediazonium chloride (B) Nitrobenzene
(C*) Phenol (D) Cresol

$C_6H_5\,NH_2 \xrightarrow[0-5^\circ C]{NaNO_2+HCl} X \xrightarrow[\Delta]{H_2O} Y$, उत्पाद Y है :

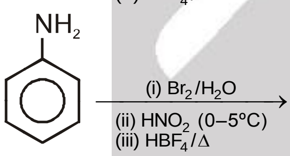
(A) बेंजीनडाइएजोनियम क्लोराइड (B) नाइट्रोबेंजीन
(C*) फिनॉल (D) क्रिसॉल

**Sol.** $C_6H_5\,NH_2 \xrightarrow[0-5^\circ C]{NaNO_2+HCl} C_6H_5N_2Cl \xrightarrow[\Delta]{H_2O} C_6H_5OH$

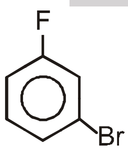
**C-4.**

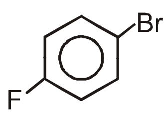


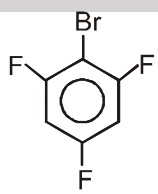

(A). The major product (A) is

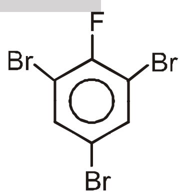



(A). मुख्य उत्पाद (A) है –

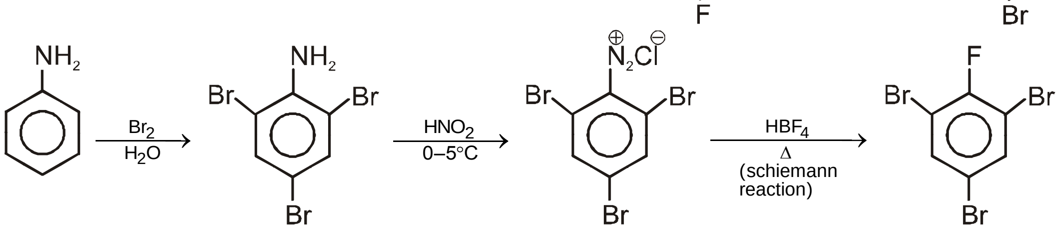
(A) 

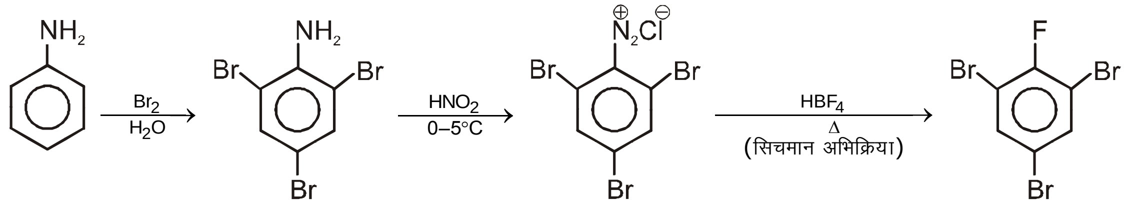

(B) 

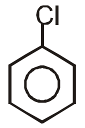

(C) 


(D*) 

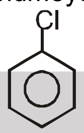

**Sol.**



**Sol.** 

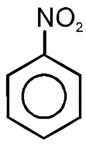

**C-5.** Diazonium salt + Cu + HCl →  ; the reaction is known as

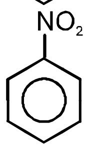
(A) Chlorination (B) Sandmeyer's reaction (C) Perkin reaction (D*) Gattermann reaction

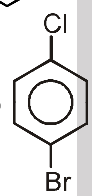
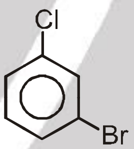
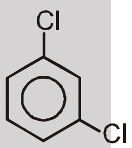
डाइएजोनियम लवण + Cu+ HCl →  ; यह अभिक्रिया कहलाती है

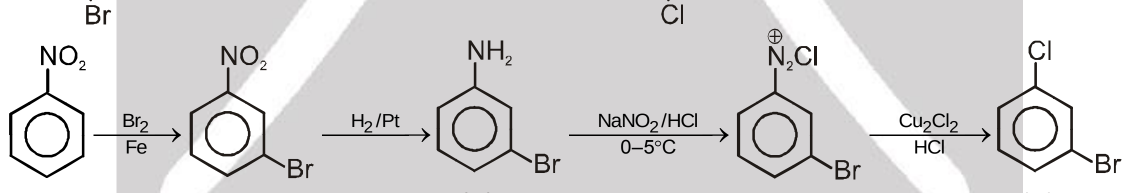
(A) क्लोरीनीकरण (B) सेन्डमेयर अभिक्रिया (C) पर्किन अभिक्रिया (D*) गाटरमान अभिक्रिया

**Sol.** This reaction is called Gattermann reaction. यह अभिक्रिया गाटरमान अभिक्रिया कहलाती है।

**C-6.**  $\xrightarrow[\text{(ii) } H_2/Pt]{\text{(i) } Br_2/Fe}$ (A) $\xrightarrow[\text{(ii) } Cu_2Cl_2/HCl]{\text{(i) } NaNO_2/HCl\ 0-5°C}$ (B). The product (B) is

 $\xrightarrow[\text{(ii) } H_2/Pt]{\text{(i) } Br_2/Fe}$ (A) $\xrightarrow[\text{(ii) } Cu_2Cl_2/HCl]{\text{(i) } NaNO_2/HCl\ 0-5°C}$ (B). उत्पाद (B) है –

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

**Sol.** 


(A) (B)

**C-7.** Which of the following compound will not undergo azo coupling reaction with benzene diazonium chloride.

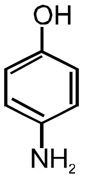
(A) Aniline (B) Phenol (C) Anisole (D*) Nitrobenzene

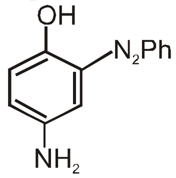
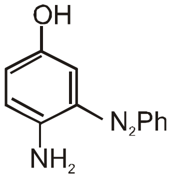
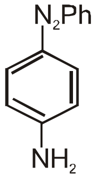
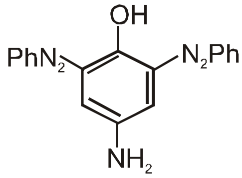
निम्न में से कौनसा यौगिक बेन्जीनडाइएजोनियम क्लोराइड के साथ युग्मन अभिक्रिया नही देता है ?

(A) एनिलीन (B) फिनॉल (C) एनिसॉल (D*) नाइट्रोबेन्जीन

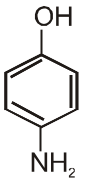
**Sol.** Benzene ring which is attached with strong activating group shows are coupling reaction with benzene diazonium chloride.

बेन्जीन वलय जो प्रबल सक्रियणकारी समूह से जुडी होती है जो बेन्जीनडाईएजोनियम क्लोराइड के साथ युग्मन अभिक्रिया देता है।

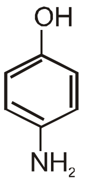
**C-8.**  $+ Ph-\overset{+}{N}_2 \xrightarrow{pH\,=\,4-6}$ X (major product) X will be - (मुख्य उत्पाद) X होगा :

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

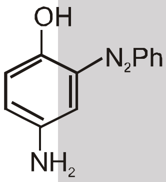
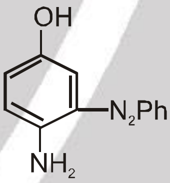
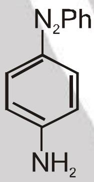
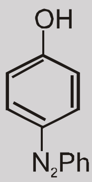
**Sol.** Aniline prefer coupling in slightly acidic medium .
एनिलीन अल्प अम्लीय माध्यम में युग्मन क्रिया को प्राथमिकता देता है।

**C-9.**  $+ Ph-\overset{+}{N}_2 \xrightarrow{(pH=9-11)}$ X (major product)

X - will be :

 $+ Ph-\overset{+}{N}_2 \xrightarrow{(pH=9-11)}$ X (मुख्य उत्पाद)

X - होगा :

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

**Sol.** Phenol prefer coupling in sligtly basic medium.
फिनॉल अल्प क्षारीय माध्यम में युग्मन को प्राथमिकता देता है।

## PART - III : MATCH THE COLUMN

## भाग - III : कॉलम को सुमेलित कीजिए (MATCH THE COLUMN )

**1.** Match the column:

| | Column-I | | Column-II |
|---|---|---|---|
| (A) | $RNH_2 + CHCl_3 + KOH$ (alc) $\xrightarrow{\Delta}$ | (p) | Schotten-Baumann reaction |
| (B) | $C_6H_5N_2Cl \xrightarrow[\Delta]{CuBr/HBr}$ | (q) | Coupling reaction |
| (C) | $C_6H_5NH_2 + C_6H_5COCl \xrightarrow{NaOH(aq.)}$ | (r) | Carbylamine reaction |
| (D) | $C_6H_5N_2Cl + C_6H_5OH \xrightarrow{pH\,9-10}$ | (s) | Sandmeyer reaction |

**निम्न को सुमेलित कीजिए।**

| | स्तम्भ-I | | स्तम्भ-II |
|---|---|---|---|
| (A) | $RNH_2 + CHCl_3 + KOH$ (एल्को.) $\xrightarrow{\Delta}$ | (p) | शॉट्न–बॉमन अभिक्रिया |
| (B) | $C_6H_5N_2Cl \xrightarrow[\Delta]{CuBr/HBr}$ | (q) | युग्मन अभिक्रिया |
| (C) | $C_6H_5NH_2 + C_6H_5COCl \xrightarrow{NaOH(aq.)}$ | (r) | कार्बिलएमीन अभिक्रिया |
| (D) | $C_6H_5N_2Cl + C_6H_5OH \xrightarrow{pH\,9-10}$ | (s) | सेण्डमेयर अभिक्रिया |

**Ans.** (A - r) ; (B - s) ; (C - p) ; (D - q)

**2.** Match the reactions given in Column I with the statements given in Column II.

| | Column-I | | Column-II |
|---|---|---|---|
| (A) | Ammonolysis | (p) | Amine with lesser number of carbon atoms |
| (B) | Gabriel phthalimide synthesis | (q) | Detection test for primary amines. |
| (C) | Hoffmann Bromamide reaction | (r) | Reaction of phthalimide with KOH and R—X |
| (D) | Carbylamine reaction | (s) | Reaction of alkylhalides with $NH_3$ |

स्तम्भ-I की अभिक्रियाओं को स्तम्भ-II मे दिये गये कथन से मिलान कीजिए।

| | स्तम्भ-I | | स्तम्भ-II |
|---|---|---|---|
| (A) | अमोनिया अपघटन | (p) | कार्बन परमाणुओं की कम संख्या युक्त एमीन |
| (B) | गेब्रियल थैलिमाइड संश्लेषण | (q) | प्राथमिक एमीन के लिए परीक्षण |
| (C) | हॉफमान ब्रोमेमाइड अभिक्रिया | (r) | KOH तथा R—X के साथ थैलिमाइड अभिक्रिया |
| (D) | कार्बिल एमीन अभिक्रिया | (s) | $NH_3$ के साथ एल्किल हैलाइडों की अभिक्रिया |

**Sol.** (A - s) ; (B - r) ; (C - p) ; (D - q)

**3.✍** Match the compounds given in Column-I with the items given in Column-II.

| | Column-I | | Column-II |
|---|---|---|---|
| (A) | $C_6H_6 + CH_3CH(Cl)–CH_3 \xrightarrow{\text{anhydrous } AlCl_3}$ | (p) | Diazocoupling reaction. |
| (B) | $C_6H_5NH_2 + C_6H_5N_2Cl \xrightarrow{\text{dil.HCl}}$ | (q) | Friedel-Craft reaction |
| (C) | $C_6H_6 + C_6H_5COCl \xrightarrow{\text{anhydrous } AlCl_3}$ | (r) | Reimer-Tiemann reaction |
| (D) | $C_6H_5OH \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } CCl_4 / NaOH}$ | (s) | Product is Isopropyl benzene |
| | | (t) | Electrophilic substitution reaction |

स्तम्भ-I के यौगिक को स्तम्भ-II के पदों से मिलान कीजिए।

| | स्तम्भ-I | | स्तम्भ-II |
|---|---|---|---|
| (A) | $C_6H_6 + CH_3CH(Cl)–CH_3 \xrightarrow{\text{निर्जलीय } AlCl_3}$ | (p) | डाईऐजोयुग्मन अभिक्रिया |
| (B) | $C_6H_5NH_2 + C_6H_5N_2Cl \xrightarrow{\text{dil.HCl}}$ | (q) | फ्रिडल–क्राफ्ट अभिक्रिया |
| (C) | $C_6H_6 + C_6H_5COCl \xrightarrow{\text{निर्जलीय } AlCl_3}$ | (r) | राइमर–टीमान अभिक्रिया |
| (D) | $C_6H_5OH \xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } CCl_4 / NaOH}$ | (s) | उत्पाद आइसोप्रोपिल बेन्जीन है। |
| | | (t) | इलेक्ट्रॉनस्नेही प्रतिस्थापन अभिक्रिया |

**Sol.** (A - q,s,t) ; (B - p, t) ; (C - q,t) ; (D - r,t)

# Exercise-2

✍ **Marked questions are recommended for Revision.**

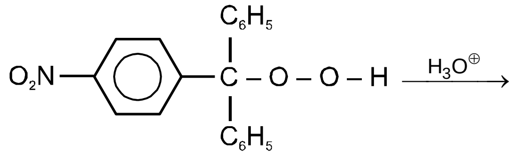
✍ **चिन्हित प्रश्न दोहराने योग्य प्रश्न है।**

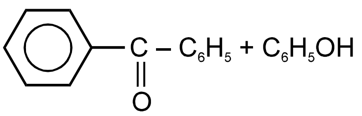
## PART - I : ONLY ONE OPTION CORRECT TYPE

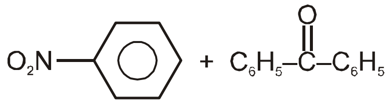
## भाग-I : केवल एक सही विकल्प प्रकार (ONLY ONE OPTION CORRECT TYPE)

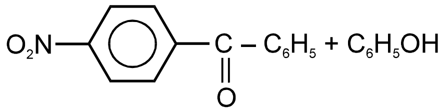
**1.** Identify the product in the following reaction.

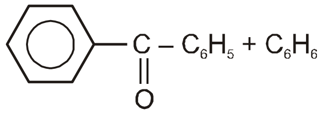
निम्न अभिक्रिया में उत्पाद पहचानों।

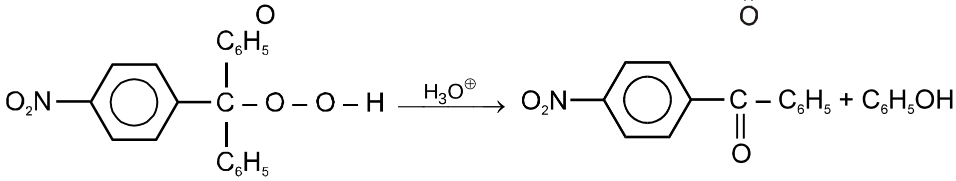


(A) 

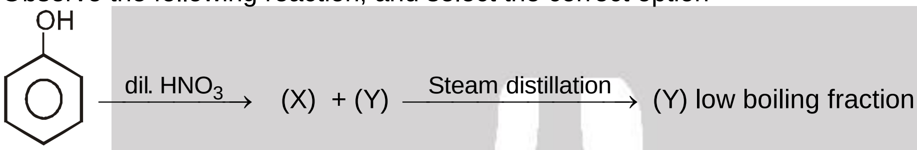

(B) 


(C*) 


(D) 

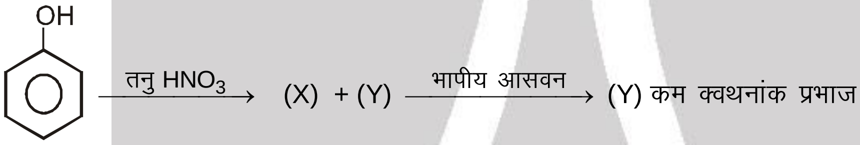

**Sol.** 


**2.** Observe the following reaction, and select the correct option

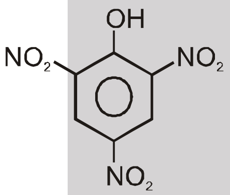


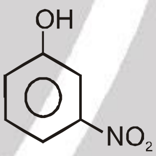

'Y' is :

निम्न अभिक्रिया का प्रेक्षण कर सही विकल्प का चयन करो

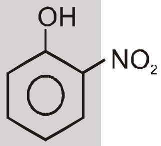


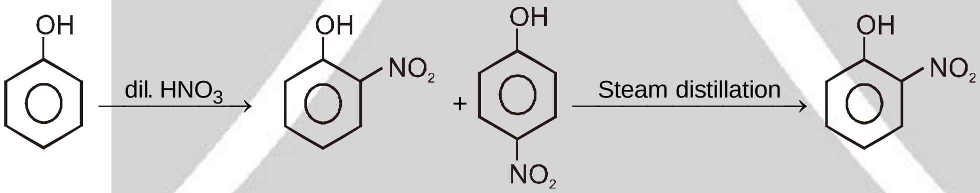

'Y' होगा

(A) 

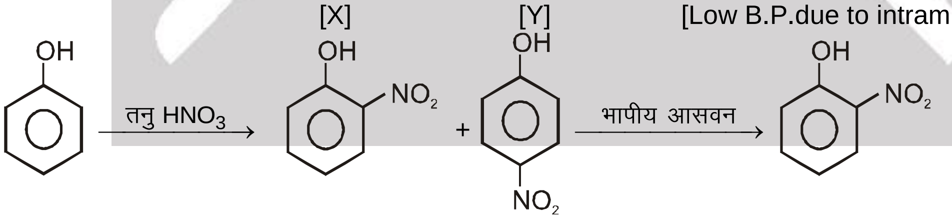

(B) 


(C)

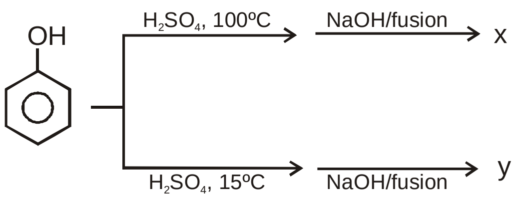

(D*) 

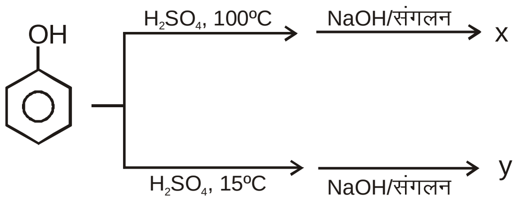

**Sol.** 

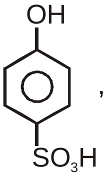

[X] [Y] [Low B.P.due to intramolecular H–Bonding]

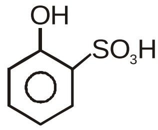
**Sol.** 

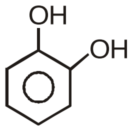

[X] [Y] [अन्तः आण्विक H–बंध के कारण निम्न क्वथनांक]

**3.** 

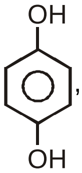



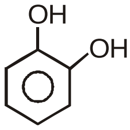
(A) x = 

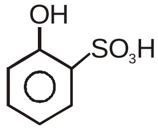
, y = 

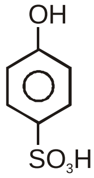

(B) x = 

, y =

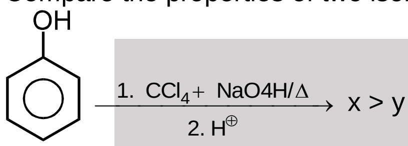

(C*) x = 

, y = 


(D) x = 

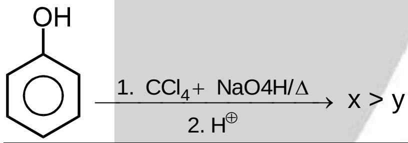
, y = 


**4.** Compare the properties of two isomeric products x and y formed in the following reaction.



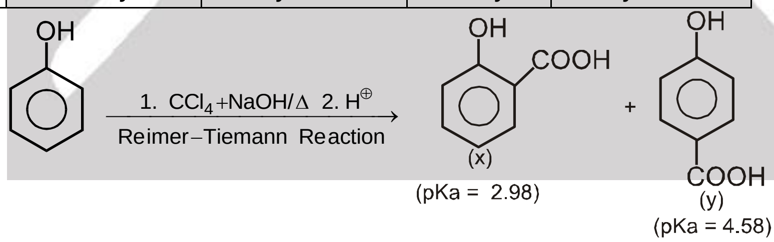

| Option | Acid Strength | $H_2O$ Solubility | Volatility | Melting Point |
|---|---|---|---|---|
| (A) | y > x | y > x | x > y | y > x |
| (B) | x > y | x > y | y > x | x > y |
| (C) | y > x | x > y | y > x | y > x |
| (D*) | x > y | y > x | x > y | y > x |

निम्न अभिक्रिया में बने दो समावयवी उत्पादो x व y के गुणों की तुलना करो।



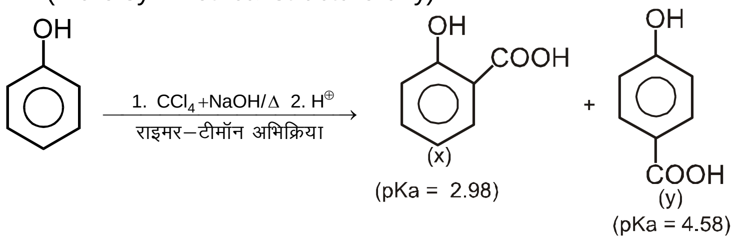

| विकल्प | अम्लीय सामर्थ्य | जल विलेयता | वाष्शीलता | गलनांक बिन्दु |
|---|---|---|---|---|
| (A) | y > x | y > x | x > y | y > x |
| (B) | x > y | x > y | y > x | x > y |
| (C) | y > x | x > y | y > x | y > x |
| (D) | x > y | y > x | x > y | y > x |

**Sol.** (D)



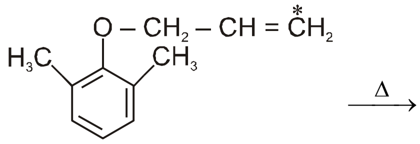

(Ka) = x > y (Carboxylate anion stabilized By H-bonding)
(Sol.) = y > x (Intermolecular H-bonding in y)
(Vol.) = x > y (Intramolecular H-bonding in x)
(MP) = y > x (More symmetrical structure of y)

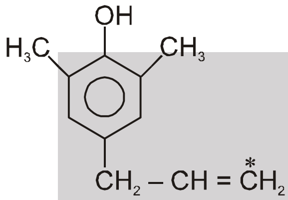
**Sol.** (D)

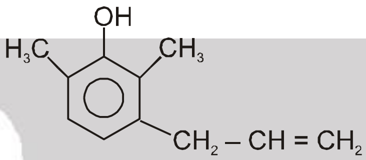


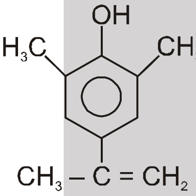
(Ka) = x > y (कार्बोक्सिलेट ऋणायन H-बंध के द्वारा स्थायी होता है।)
(Sol.) = y > x (y में अन्तर–आण्विक H-बंध पाया जाता है।)
(Vol.) = x > y (x में अन्तरा–आण्विक H-बंध पाया जाता है।)
(MP) = y > x (y की अधिक सममित संरचना)

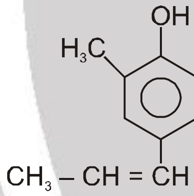
**5.** Give the product of the following reactions :
निम्न अभिक्रिया का उत्पाद होगा :

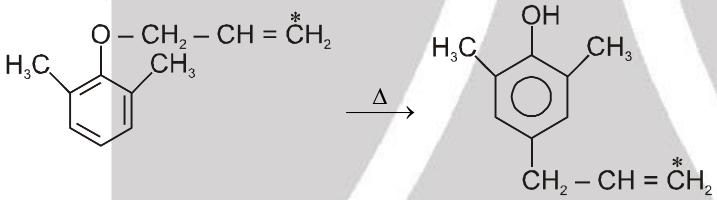


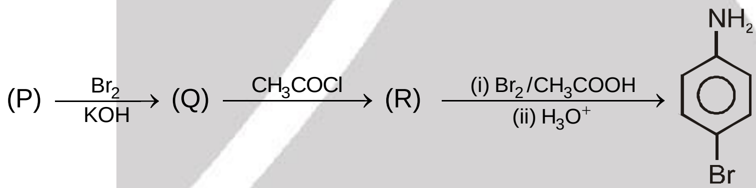
(A*) 

(B) 

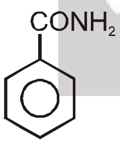
(C) 

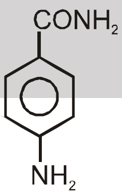
(D) 

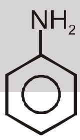
**Sol.** 

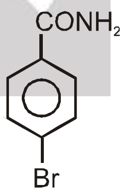
**6.** 

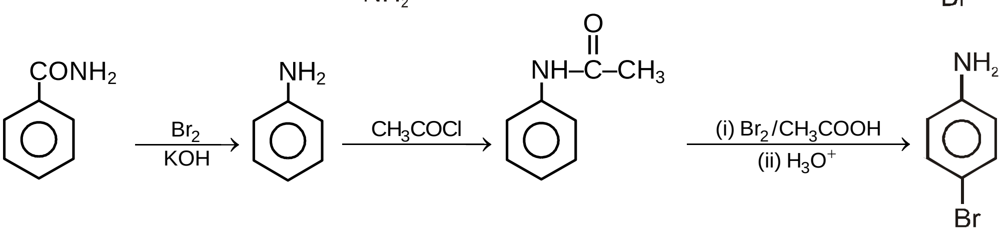
The reactant (P) is :
अभिकारक (P) है :

(A*) 

(B) 

(C) 

(D) 

Sol. 

**7.** Which of the following reduction reaction does not give an amine as product ?

(A) $R{-}NO_2 \xrightarrow[\text{Raney Ni}]{H_2}$ (B) $R{-}NO_2 \xrightarrow[\text{ether}]{LiAlH_4}$ (C) $R{-}NO_2 \xrightarrow{Sn/HCl}$ (D*) $R{-}NO_2 \xrightarrow[\Delta]{Zn/NH_4Cl}$

निम्न में से कौनसी अपचयन अभिक्रिया उत्पाद के रूप में एक एमीन नहीं देती है ?

(A) $R{-}NO_2 \xrightarrow[\text{रेने Ni}]{H_2}$ (B) $R{-}NO_2 \xrightarrow[\text{ईथर}]{LiAlH_4}$ (C) $R{-}NO_2 \xrightarrow{Sn/HCl}$ (D*) $R{-}NO_2 \xrightarrow[\Delta]{Zn/NH_4Cl}$

**Sol.** $R{-}NO_2 \xrightarrow[\Delta]{Zn/NH_4Cl} R{-}NH{-}OH$

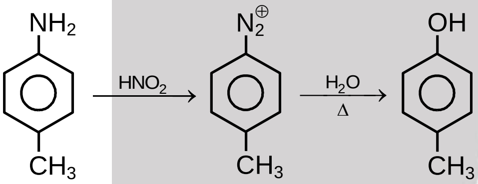
**8.** Para toluidine is treated with $HNO_2$ at ice cold conditions and then boiled with water. The final product obtained is :

(A) anthranilic acid (B*) p-cresol (C) toluic acid (D) phenol

पैरा–टॉलुईडीन को बर्फ समान ठण्डी परिस्थिति में $HNO_2$ के साथ उपचारित करते है तथा इसके पश्चात् जल के साथ उबालते है। अन्तिम उत्पाद प्राप्त होता है –

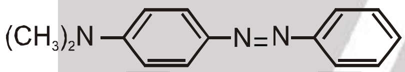
(A) एन्थ्रानिलिक अम्ल (B*) p-क्रिसॉल (C) टॉलुईक अम्ल (D) फिनॉल

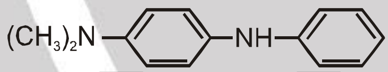
**Sol.**

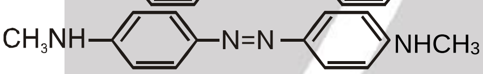


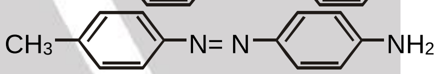

**9.** Aniline when diazotized in cold and then treated with dimethyl aniline gives a coloured product. Its structure would be :

एनिलीन कम ताप पर डाइएजोनिकरण के पश्चात् डाइमेथिल एनिलीन के साथ रंगीन उत्पाद देता है। इसकी संरचना होगी:

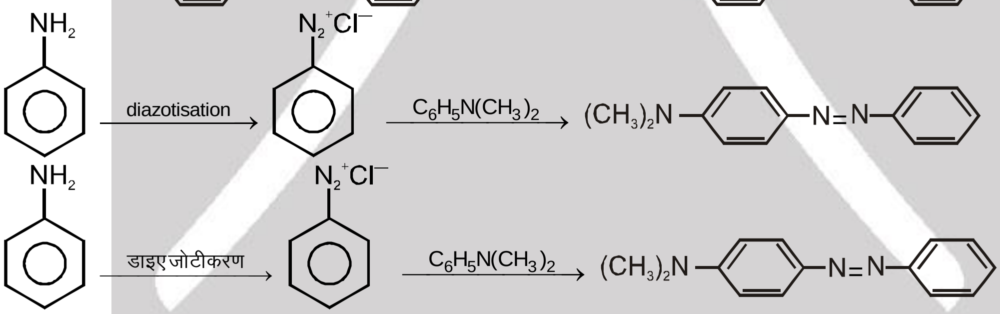
(A*) 


(B) 


(C) 


(D) 


**Sol.**




**10.** In the diazotisation of aniline with sodium nitrite and hydrochloric acid, an excess of hydrochloric acid is used primarily to :

(A*) suppress the concentration of free aniline available for coupling
(B) suppress hydrolysis of phenol
(C) insure a stoichiometric amount of nitrous acid
(D) neutralize the base liberated

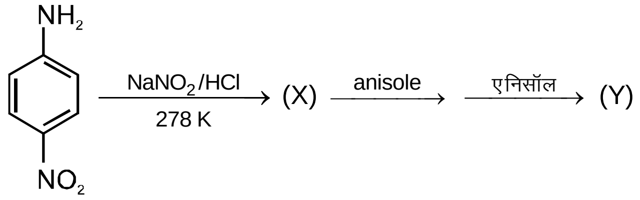
सोडियम नाइट्राइट तथा हाइड्रोक्लोरिक अम्ल के साथ एनिलीन के डाइएजोनीकरण (diazotisation) में, प्रारम्भ में हाइड्रोक्लोरिक अम्ल का आधिक्य प्रयोग करते है, क्योकि :

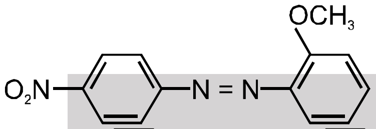
(A*) युग्मन के लिए उपलब्ध मुक्त एनिलीन की सान्द्रता कम करने के लिए।
(B) फीनॉल का जलअपघटन कम करने के लिए।
(C) नाइट्रस अम्ल की रससमीकरणमितिय मात्रा निश्चित करने के लिए।
(D) निष्कासित क्षार को उदासीन करने के लिए।

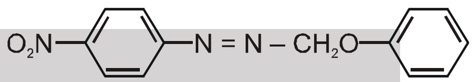
**Sol.** In the diazotisation of aniline with sodium nitrite and hydrochloric acid, an excess of hydrochloric acid is used primarily to suppress the concentration of free aniline available for coupling.

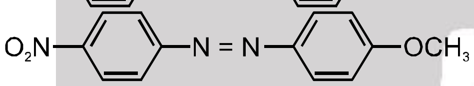
सोडियम नाइट्राइट तथा हाइड्रोक्लोरिक अम्ल के साथ एनिलीन के डाइएजोनीकरण (diazotisation) में, प्रारम्भ में हाइड्रोक्लोरिक अम्ल का आधिक्य प्रयोग करते है, ताकि युग्मन के लिए उपलब्ध मुक्त एनिलीन की सान्द्रता कम हो जाये।

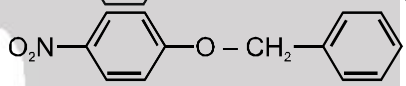
**11.** The structure of the final product (Y) formed in the following reaction sequence is :
निम्न अभिक्रिया क्रम में अन्तिम उत्पाद (Y) बनता है –

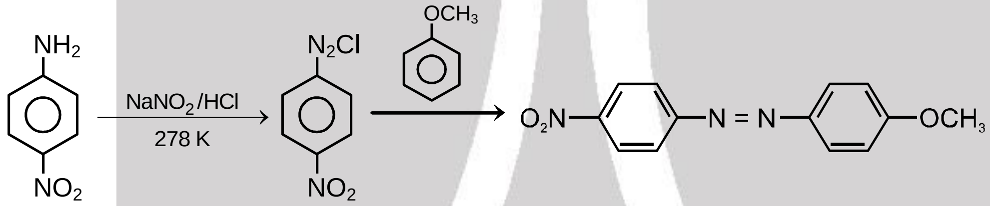



(A) 


(B) 


(C*) 


(D) 

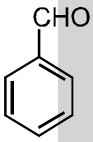

**Sol.** 

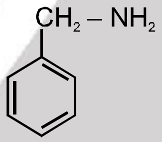

**12.** The major product Y in the following sequence of reaction is :

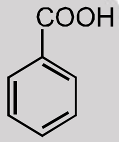
Aniline $\xrightarrow[\text{(ii) CuCN/KCN}]{\text{(i) NaNO}_2\text{/HCl, 273 K}}$ (X) $\xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) DIBAL–H}}$ (Y)

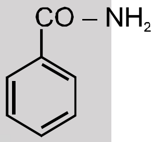
निम्न अभिक्रिया क्रम में मुख्य उत्पाद Y है –

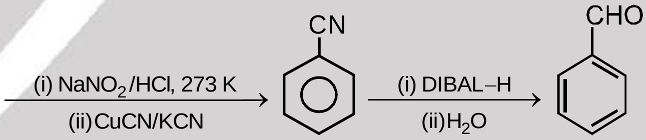
एनिलीन $\xrightarrow[\text{(ii) CuCN/KCN}]{\text{(i) NaNO}_2\text{/HCl, 273 K}}$ (X) $\xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) DIBAL–H}}$ (Y)

(A*) 


(B) 


(C) 

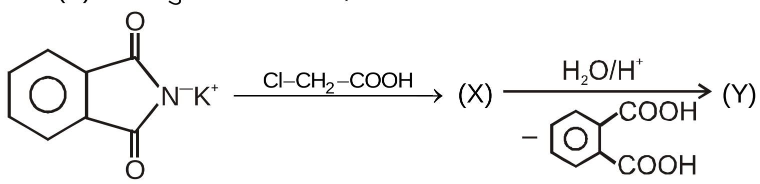

(D) 


**Sol.** Aniline एनिलीन 

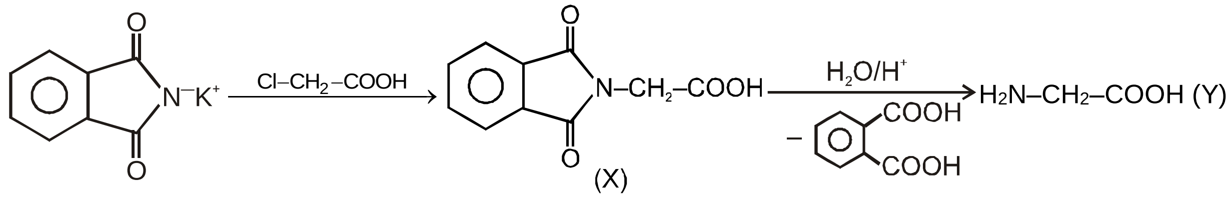

## PART - II : SINGLE OR DOUBLE INTEGER TYPE

## भाग - II : एकल या द्वि–पूर्णांक मान प्रकार (SINGLE OR DOUBLE INTEGER TYPE)

**1.** Identify molecular weight of final product (Y)
अन्तिम उत्पाद (Y) का अणुभार ज्ञात कीजिए।




**Ans.** 75

**Sol.** 

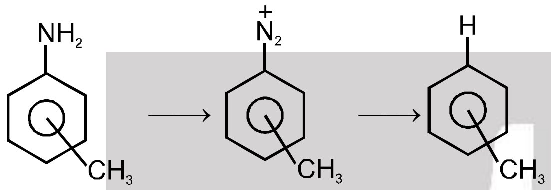
Molecular weight of Y = 75

Y का अणुभार = 75

**2.** How many toluidines on reaction with $NaNO_2/HCl$ followed by $H_3PO_2$ treatment gives Toluene.

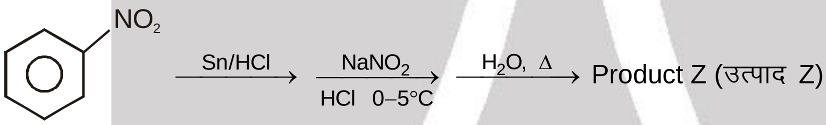
कितनी टॉलुईडीन, $NaNO_2/HCl$ के साथ अभिक्रिया के पश्चात $H_3PO_2$ के साथ उपचारित होने पर टॉलुईन देती है ?

**Ans.** 03

**Sol.** 

*o*, *m*, *p* isomer of toluidines will give toluene with $NaNO_2/HCl$ followed by $H_3PO_2$ treatment.

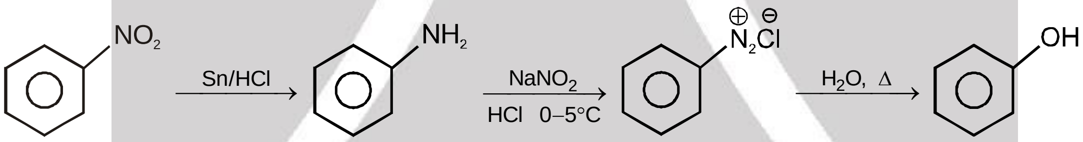
टॉलुईडीन के *o*, *m*, *p* समावयवी $NaNO_2/HCl$ के साथ अभिक्रिया के पश्चात $H_3PO_2$ से उपचारित होने पर टॉलुईन देते है।

**3.** 

Find the molecular weight of Z.

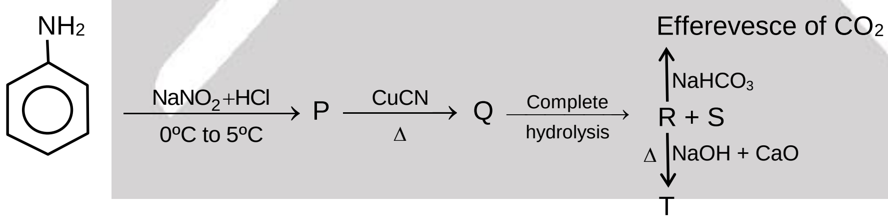
Z का अणुभार ज्ञात कीजिए।

**Ans.** 94

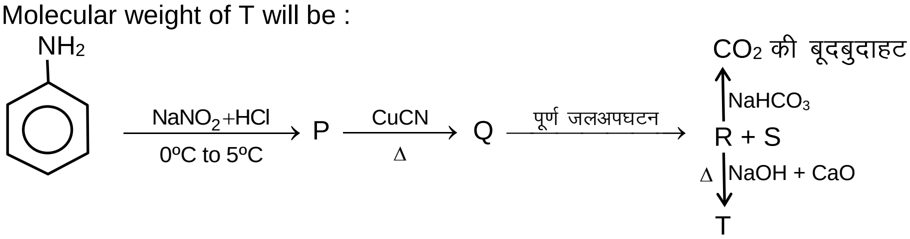
**Sol.** 

molecular weight of Z = 94

Z का अणुभार = 94

**4.** 

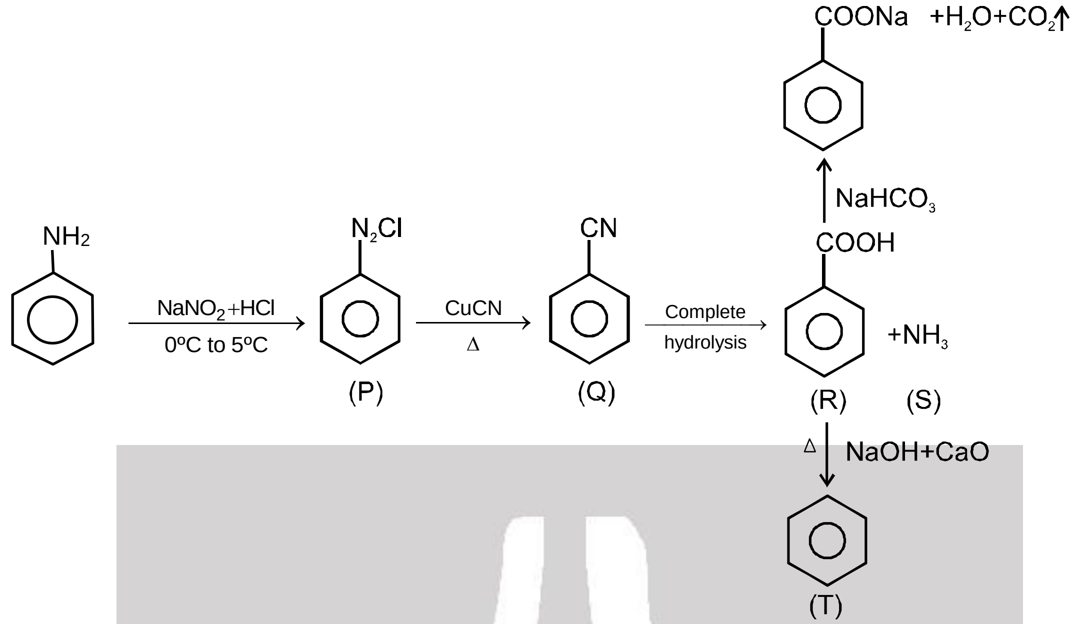
Molecular weight of T will be :



T का अणुभार होगा –

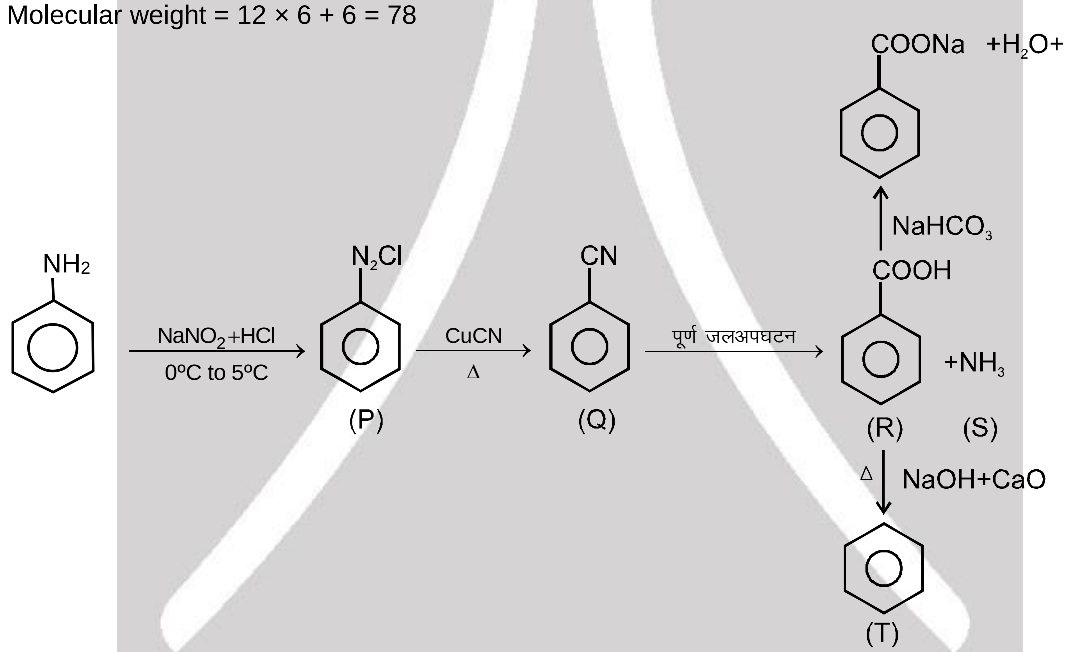
**Ans.** 78

**Sol.**



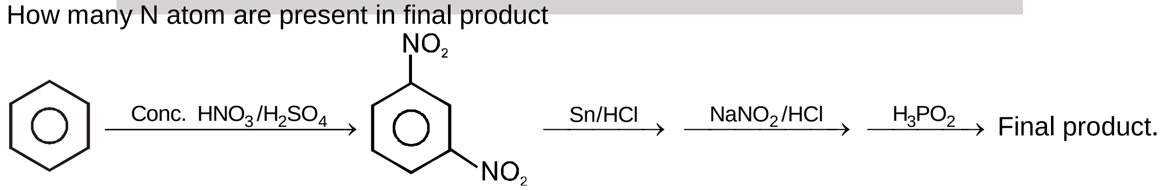

Molecular weight = 12 × 6 + 6 = 78

**Sol.**

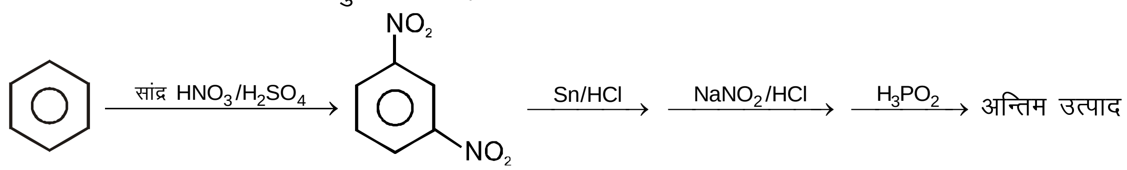



Molecular weight (अणुभार) = 12 × 6 + 6 = 78

**5.** How many N atom are present in final product

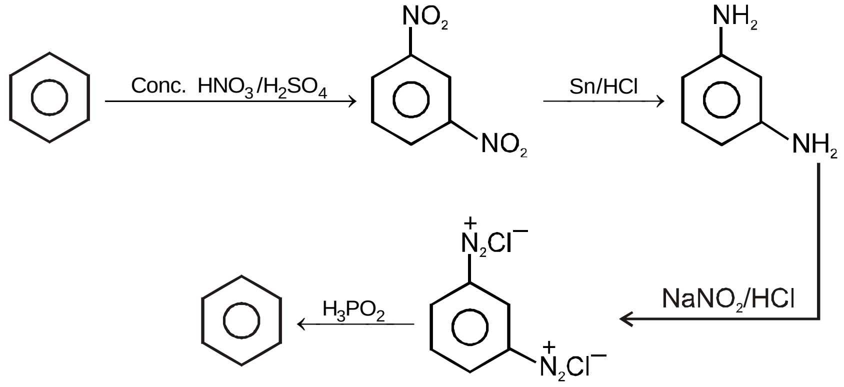



अन्तिम उत्पाद में कितने N परमाणु उपस्थित है –




**Ans.** Zero (0).

**Sol.**




**6.** Ph-$NO_2$ $\xrightarrow{Sn/HCl}$ $\xrightarrow[HCl,\ 0°C-5°C]{NaNO_2}$ $\xrightarrow[Ph-OH]{Basic\ medium}$ Product Y

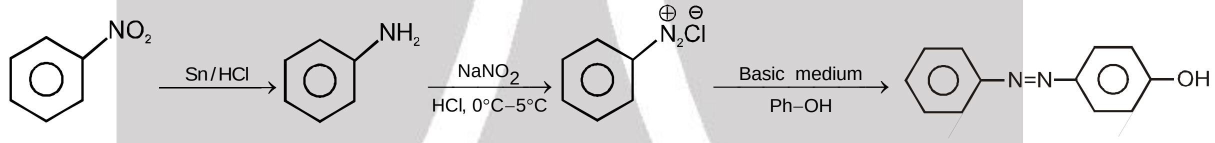
Find the molecular weight of Y report your answer as $\frac{\text{Molecular weight}}{2}$.

Ph-$NO_2$ $\xrightarrow{Sn/HCl}$ $\xrightarrow[HCl,\ 0°C-5°C]{NaNO_2}$ $\xrightarrow[Ph-OH]{\text{क्षारीय माध्यम}}$ उत्पाद Y

Y का अणुभार ज्ञात कीजिए, अपना उत्तर $\frac{\text{अणुभार}}{2}$ के रूप में दीजिए।

**Ans.** 99

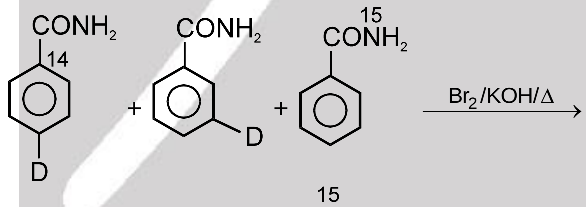
**Sol.**

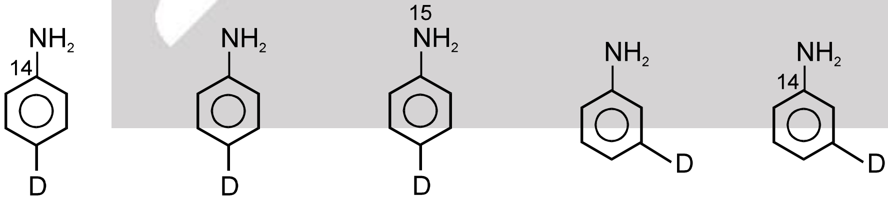



Molecular weight (अणुभार) = 198

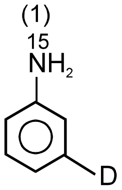
$\frac{198}{2} = 99$

**7.** In the given reaction how many of the following products (1 – 9) can be formed.
दी गई अभिक्रिया में निम्न उत्पाद (1 – 9) में से कितने उत्पाद बनेगें।




(1) (2) (3) (4) (5)




(6) (7) (8) (9)

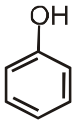
**Ans.** 3 (1, 4, 9)

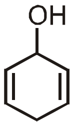
**Sol.** Three products can be formed namely 1, 4, 9. In Hofmann bromamide reaction there is intramolecular migration of alkyl or aryl groups so cross products are not formed.

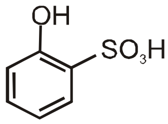
**हल.** तीन उत्पाद 1, 4, 9 निर्मित हो सकते है। यहाँ एल्किल या एरिल समूह का हॉफमान ब्रोमाइड अभिक्रिया में अन्तरा आण्विक विस्थापन है। इसलिए सह उत्पाद निर्मित नहीं होते हैं।

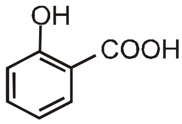
## PART - III : ONE OR MORE THAN ONE OPTION CORRECT TYPE
## भाग - III : एक या एक से अधिक सही विकल्प प्रकार

**1.** Which of the following can decolourise bromine water solution?
निम्न में से कौन ब्रोमीन जल विलयन को रंगहीन करता है?

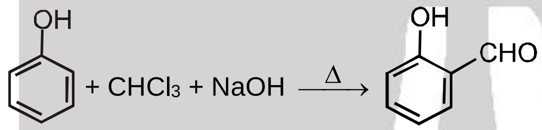
(A*) 

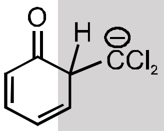
(B*) 

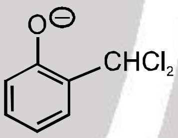
(C*) 

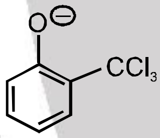
(D*) 

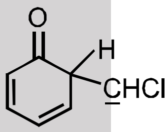

**2.** Identify the intermediates of the following reaction.
निम्न अभिक्रिया में मध्यवर्ती बताइये।

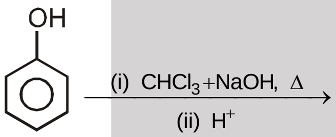



(A*) 

(B*) 

(C) 

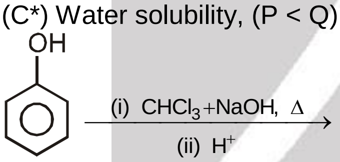
(D) 


**3.** 

(P > Q) % yield

Select the correct options :

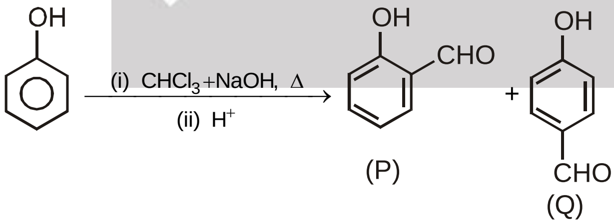
(A) Boiling point, (P > Q)
(B*) Melting point, (Q > P)
(C*) Water solubility, (P < Q)
(D) Acid Strength, (Q < P)



(P > Q) % लब्धि है :

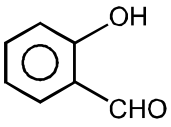
सही विकल्प को चुनिये :

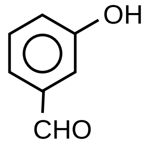
(A) क्वथनांक , (P > Q)
(B*) गलनांक , (Q > P)
(C*) जल में विलेयता , (P < Q)
(D) अम्लीय सामर्थ्य , (Q < P)

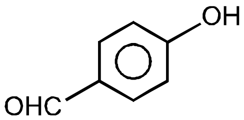
**Sol.** 

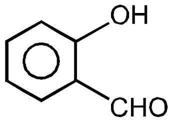

**4.** Correct options for the given below reaction :
नीचे दी गई अभिक्रिया के लिए सही उत्पाद का चयन कीजिए–

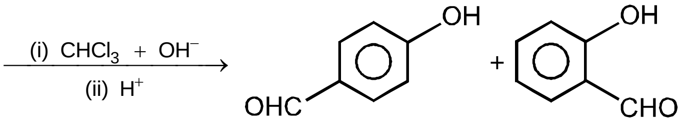
$$Ph\text{–}OH \xrightarrow[(ii)\ H^+]{(i)\ CHCl_3\ +\ OH^-} \text{Products उत्पाद}$$

(A*)  (Major मुख्य)

(B)  (Major मुख्य)

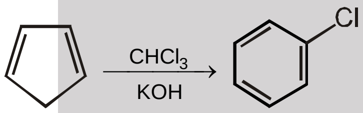
(C*)  (Minor न्यून)

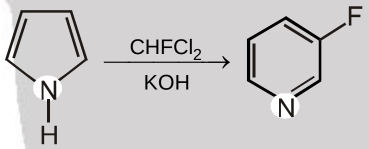
(D)  (Minor न्यून)

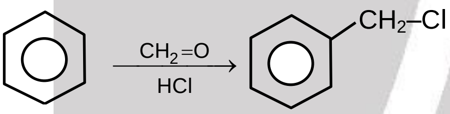
**Sol.** Ph–OH 

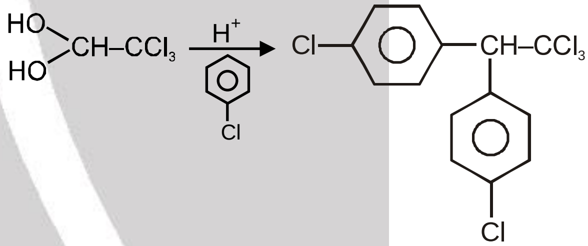
(Minor न्यून) (Major मुख्य)

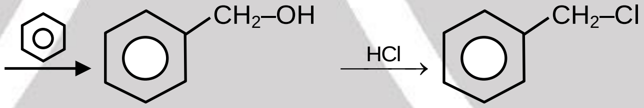
**5.** Which of the following reaction is/are correct
निम्न में से कौनसी अभिक्रियाऐं सही हैं –

(A*) 

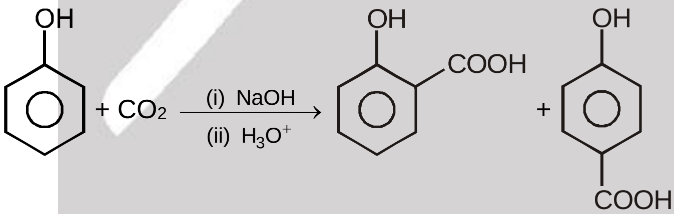
(B*) 

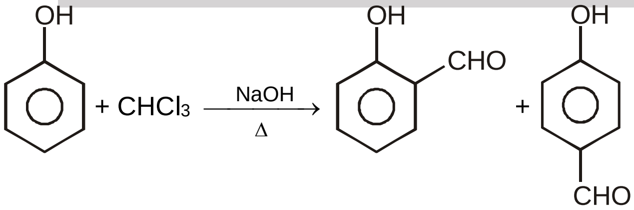
(C*) 

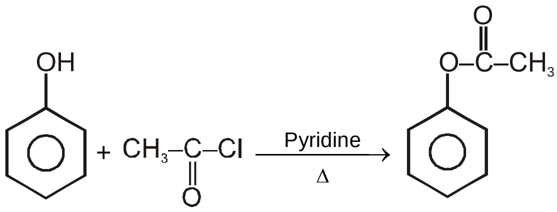
(D*) 

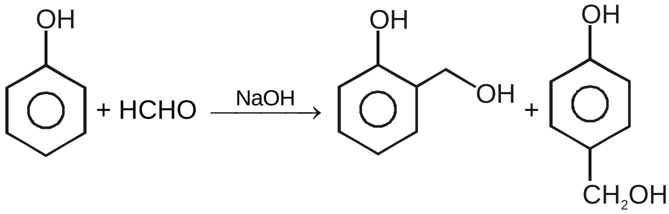
**Sol.** $CH_2=O + HCl \longrightarrow \overset{+}{C}H_2OH$ 

**6.** Which of the following reaction is/are correct :
निम्न में से कौनसी अभिक्रियाऐं सही है/हैं :

(A*) 

(B*) 

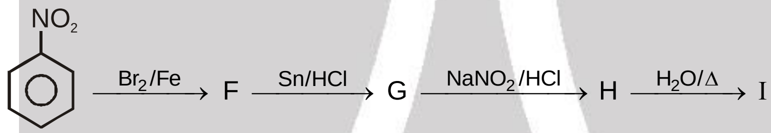
(C*) 

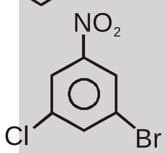
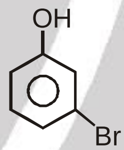
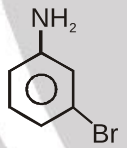
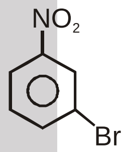
(D*) 

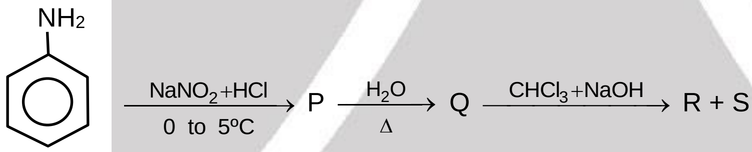
**Sol.** All above reactions are correct. Reaction A is Koble Schmidt, B is Reimer-Tiemann reaction, C protection of phenolic group at Phenol and D is Laderer-Manase reaction.

**Sol.** सभी अभिक्रियाऐं सही हैं। अभिक्रिया A कोल्बे श्मिट, B राइमर टीमन, C फिनॉल पर फिनॉलिक समूह का परिरक्षण तथा D लेडरर–मनासे अभिक्रिया है।

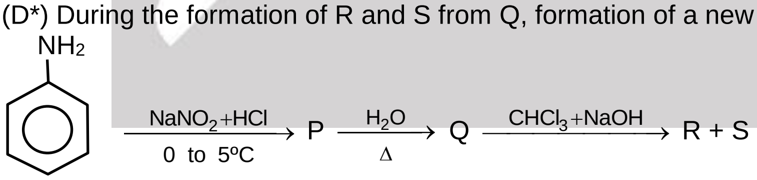
**7.** The products of following sequence of reactions are
निम्न अभिक्रिया क्रम के उत्पाद हैं :



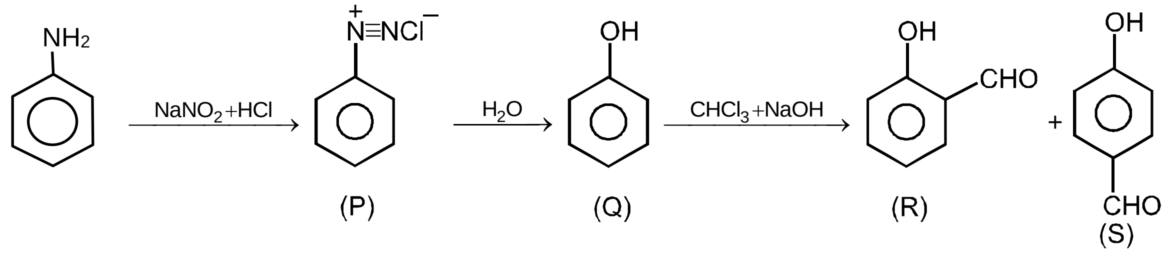
(A) H = 
(B*) I = 
(C*) G = 
(D*) F = 

**8.** 

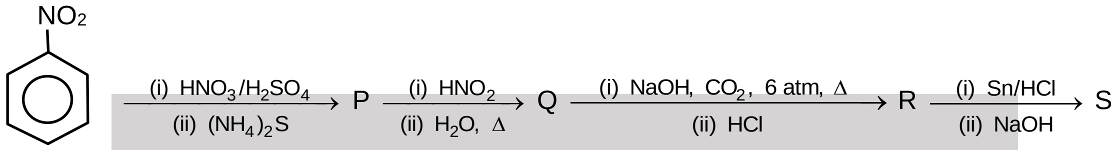
Which of the following statement is/are correct :
(A*) P is benzene diazonioum chloride
(B) Q can not give bromine water test
(C*) R and S are position isomers
(D*) During the formation of R and S from Q, formation of a new C–C bond will takes place.



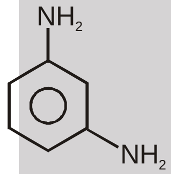
निम्न में से सही कथन है/हैं –
(A*) P, बेन्जीन डाइएजोनियम क्लोराइड है।
(B) Q, ब्रोमीन जल परीक्षण नहीं देता है।
(C*) R तथा S स्थिति समावयवी है।
(D*) Q से R तथा S निर्माण के दौरान एक नए C–C बंध का निर्माण होता है।

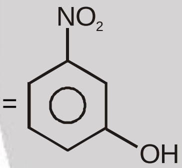
**Sol.** 

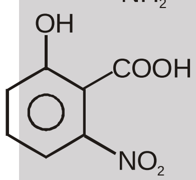
Phenol (Q) gives positive test with $Br_2$ water.
फिनॉल (Q), $Br_2$ जल के साथ धनात्मक परीक्षण देता है।

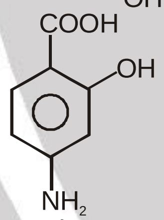
**9.** 

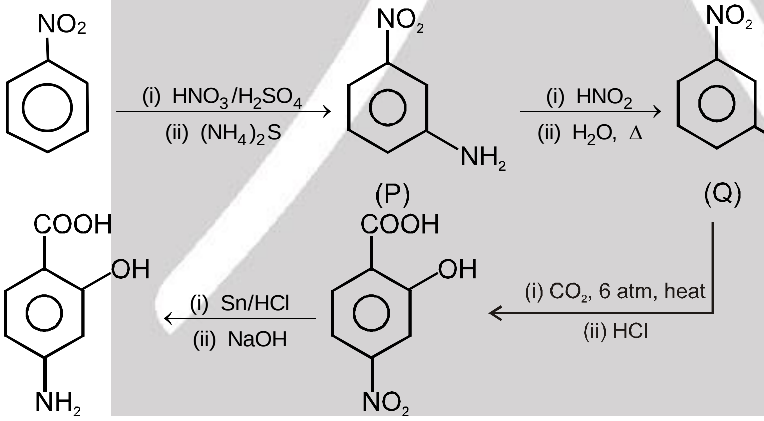
Which of the following statement(s) for the above sequence of reactions is/are correct
उपरोक्त अभिक्रिया क्रम के लिए सही कथन है/हैं –

(A) P = 

(B*) Q = 

(C) R = 

(D*) S = 

**Sol.** 

**10.** Coupling reaction takes place when benzene diazonium chloride is treated with :
(A) Benzaldehyde
(B*) $\alpha$-naphthol
(C*) N,N-dimethyl aniline
(D*) Phenol
निम्न में से किसके साथ बेन्जीन डाईएजोनियम क्लोराइड को क्रिया कराने पर युग्मन अभिक्रिया होती है :
(A) बेन्जेल्डिहाइड (B*) $\alpha$-नैफ्थॉल (C*) N,N-डाइमेथिल एनिलीन (D*) फिनॉल

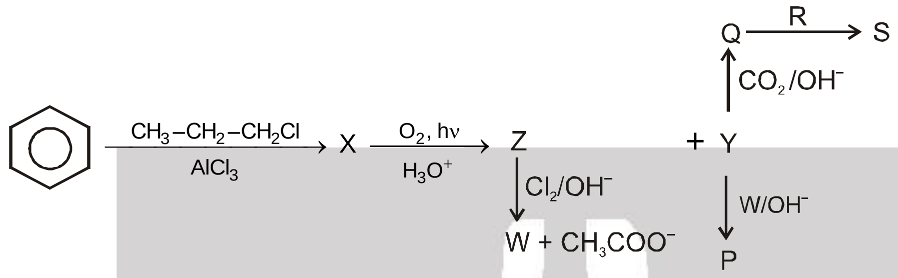
**Sol.** Coupling reaction is shown by benzene diazonium chloride with more activated ring containining compounds. Benzaldehyde having deactivated ring.
बेन्जीन डाइएजोनियम क्लोराइड की अधिक सक्रियकारी वलय युक्त यौगिक से क्रिया कराने पर युग्मन अभिक्रिया प्रदर्शित होती है। बेन्जीन एल्डिहाइड विसक्रीयकारी वलय है।

# PART - IV : COMPREHENSION

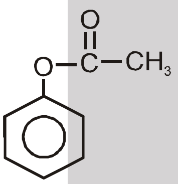
## भाग - IV : अनुच्छेद (COMPREHENSION)

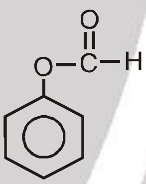
**Read the following passage carefully and answer the questions.**
**निम्न अनुच्छेद को ध्यानपूर्वक पढ़िये तथा प्रश्नों के उत्तर दीजिए ।**

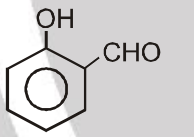
**Comprehension # 1**
**अनुच्छेद # 1**

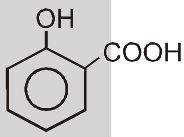



**1.** Which of the following compound is 'P' ?
निम्न में से कौनसा यौगिक 'P' है ?

(A) 


(B) 


(C*) 


(D) 

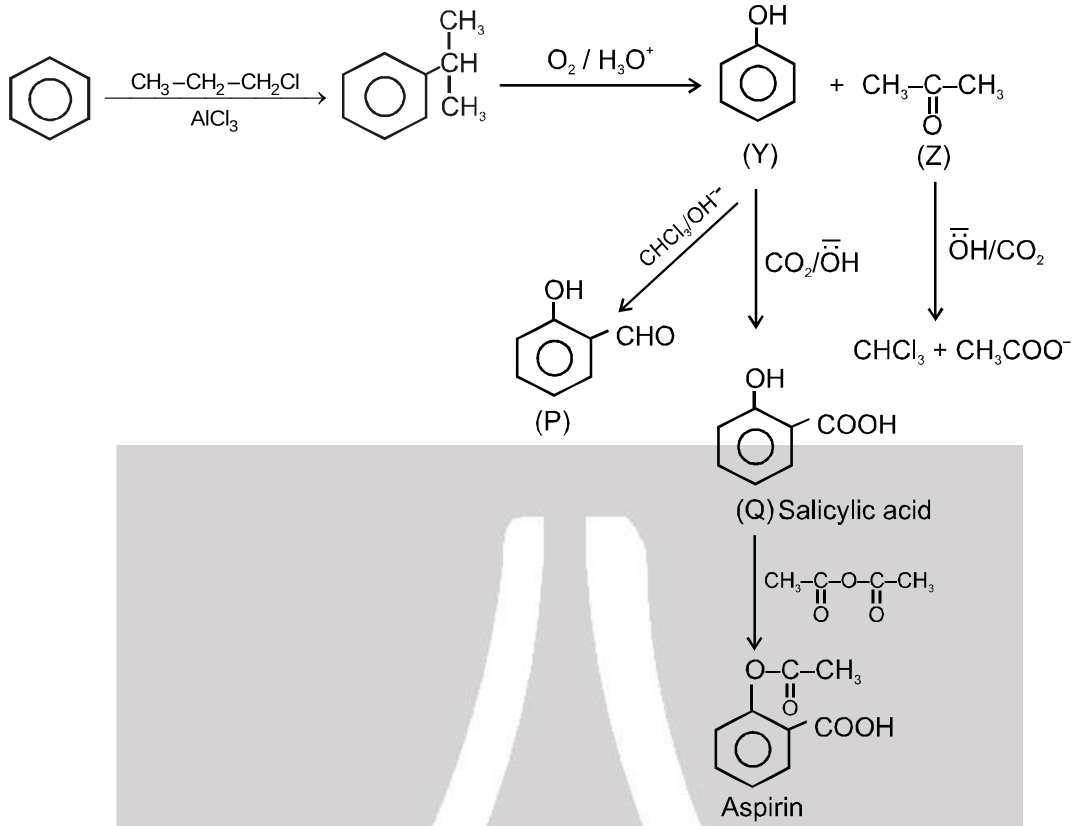

**2.** S is a well known pain killer which of the following is 'R' ?
S एक बहुचर्चित दर्द निवारक है तो निम्न में से 'R' है ?

(A) $CH_3-\overset{O}{\overset{||}{C}}-NH_2$ (B*) $CH_3-\overset{O}{\overset{||}{C}}-O-\overset{O}{\overset{||}{C}}-CH_3$ (C) $CH_3-\overset{O}{\overset{||}{C}}-H$ (D) $CH_3-\overset{O}{\overset{||}{C}}-CH_3$

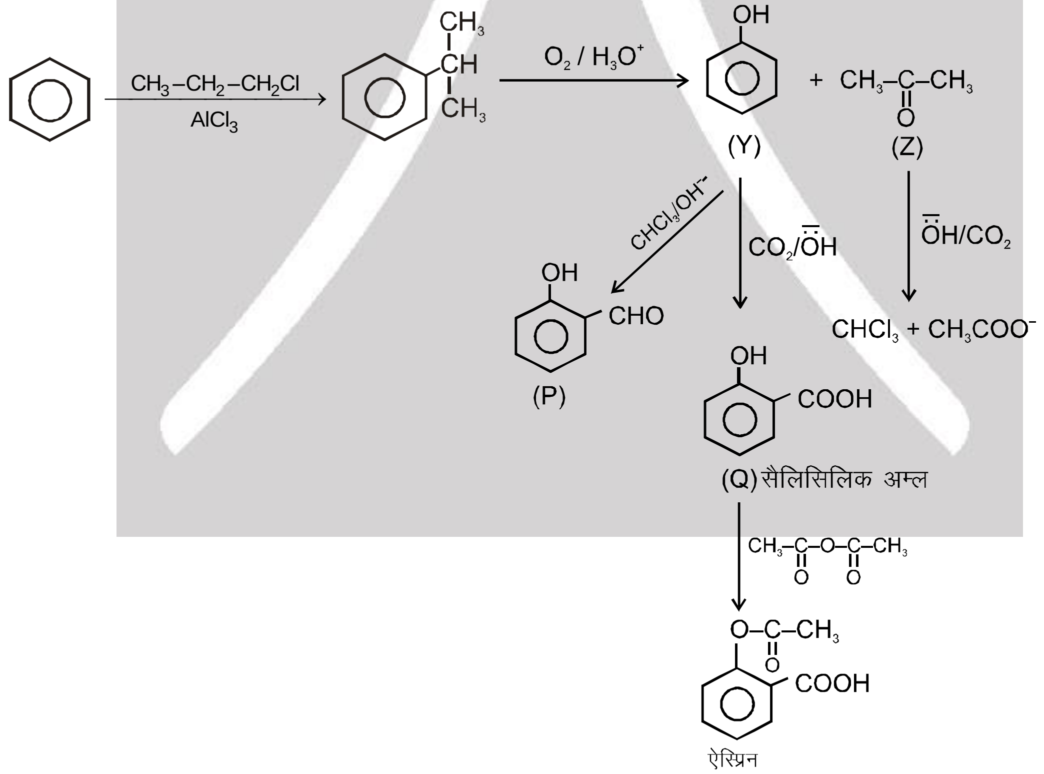
**3.** Which of the following is attacking species in conversion Y to P ?
यौगिक Y से P में परिवर्तन करने के लिये आक्रमणकारी स्पीशीज है ?

(A*) $:CCl_2$ (B) $:CHCl$ (C) $:CH_2$ (D) $CH_2Cl$

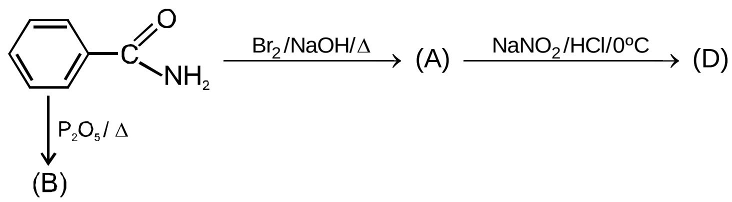
**Sol.**


CH3–CH2–CH2Cl
AlCl3
O2 / H3O+
(Y)
(Z)
CHCl3/OH–
CO2/OH
OH/CO2
CHCl3 + CH3COO–
(P)
(Q) Salicylic acid
Aspirin

**Sol.**


CH3–CH2–CH2Cl
AlCl3
O2 / H3O+
(Y)
(Z)
CHCl3/OH–
CO2/OH
OH/CO2
CHCl3 + CH3COO–
(P)
(Q) सैलिसिलिक अम्ल
ऐस्प्रिन

**Comprehension # 2**
**अनुच्छेद # 2**



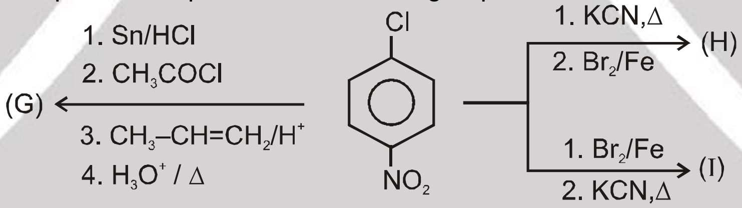

**4.** The intermediates which are involved in the conversion from benzamide to (A) are :
(A*) N-bromamide (B) carbocation (C) carbene (D) isocyanide
बेन्जेमाइड से (A) में रूपान्तरण के लिए लिया गया मध्यवर्ती है –
(A*) N-ब्रोमेमाइड (B) कार्बधनायन (C) कार्बीन (D) आइसोसाइनाड

**5.** (B) on treatment with Zn/HCl gives :
(A) aniline (B*) benzylamine (C) phenylisocyanide (D) N-methylaniline
(B) को Zn/HCl के साथ क्रिया कराने पर देता है –
(A) एनिलीन (B*) बेन्जिलएमीन
(C) फेनिल आइसोसाइनाइड (D) N-मेथिल एनिलीन

**6.** (D) on reaction with phenol under alkaline conditions gives :
(A) diazobenzene (B) hydrazobenzene
(C) benzidine (D*) para hydroxy azobenzene
(D) की क्षारीय परिस्थितियों में फिनॉल के साथ क्रिया कराने पर देता है –
(A) डाइएजोबेन्जीन (B) हाइड्रेजोबेन्जीन (C) बेन्जिडीन (D*) पैरा हाइड्रॉक्सी एजोबेन्जीन

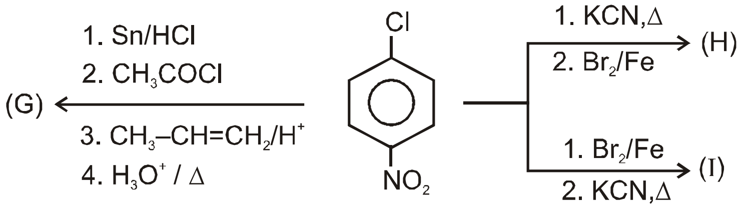
**Comprehension # 3**

The $-NO_2$ group in an aromatic ring deactivates the ortho and para positions for an electrophilic attack. When $-NO_2$ group is present at ortho or para positions of a leaving group (Nucleofuge) it activates the ring for nucleophilic attack. The reduction of $-NO_2$ group by metal in acid causes its reduction to $-NH_2$ group and then the ring becomes strongly activated for a electrophilic attack. The strong activation of $-NH_2$ group is moderated by its acylation with $CH_3COCl$ to –NHAc group. Deacylation is carried out by hydrolysis with $H_3O^+$ or $OH^-$. The ring alkylation by using $RX/AlX_3$ is not possible in presence of $-NO_2$ or $-NH_2$ group but is possible in presence of –NHAc group.

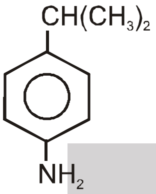


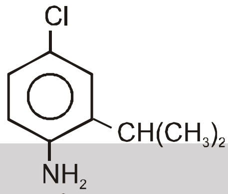

**अनुच्छेद # 3**

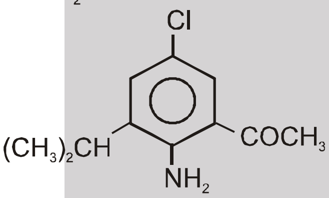
ऐरोमैटिक वलय में $-NO_2$ समूह ऑर्थो और पैरा स्थिति को इलेक्ट्रोनस्नेही के आक्रमण के लिए निष्क्रिय कर देता है। जब $-NO_2$ समूह निष्कासित समूह (न्यूक्लियोफ्यूज) की आर्थो और पैरा स्थिति पर उपस्थित होता है तो यह वलय को नाभिकस्नेही के आक्रमण के लिए सक्रिय कर देता है। $-NO_2$ समूह का धातु अम्ल द्वारा $-NH_2$ समूह में अपचयन हो जाता है, तथा वलय इलेक्ट्रॉनस्नेही के आक्रमण के लिए अत्यधिक सक्रियकारी हो जाती है। $-NH_2$ समूह का प्रबल सक्रियकारी प्रभाव $CH_3COCl$ के एसिलीकरण द्वारा –NHAc में परिवर्तित करके कम किया जाता है। विएसिलीकरण $H_3O^+/OH^-$ के जलअपघटन द्वारा सम्पन्न होता है। $-NO_2$ या $-NH_2$ समूह की उपस्थिति में $RX/AlX_3$ द्वारा वलय का एल्किलीकरण सम्भव नही है लेकिन –NHAc की उपस्थिति में सम्भव है।

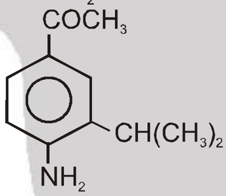



**7.** The product (G) is :
उत्पाद (G) है :

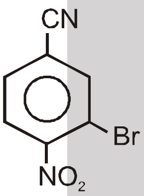
(A) 

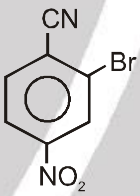

(B*) 

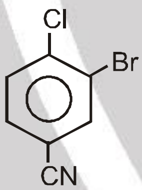

(C) 

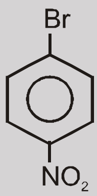

(D) 


**8.** The product (H) is :
उत्पाद (H) है :

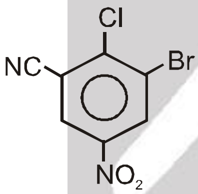
(A) 

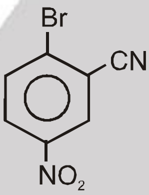

(B*) 

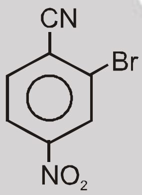

(C) 

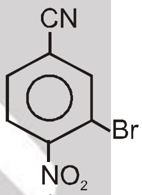

(D) 


**9.** The product (I) is :
उत्पाद (I) है :

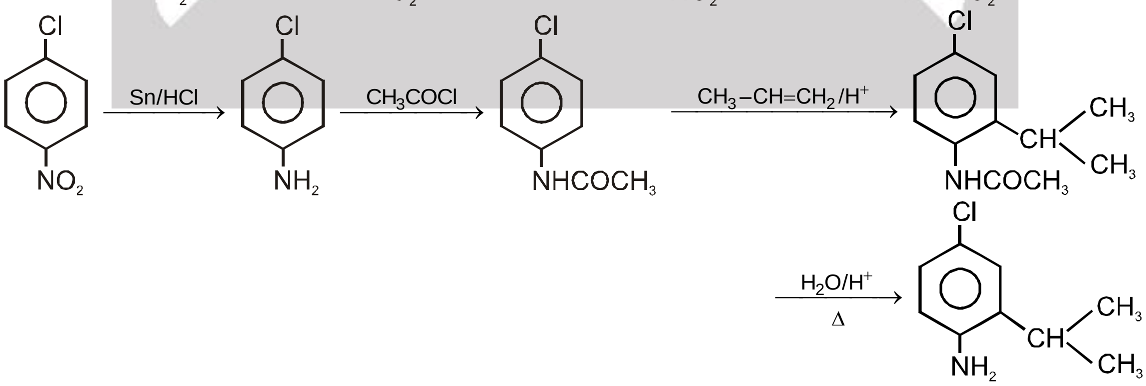
(A) 


(B) 

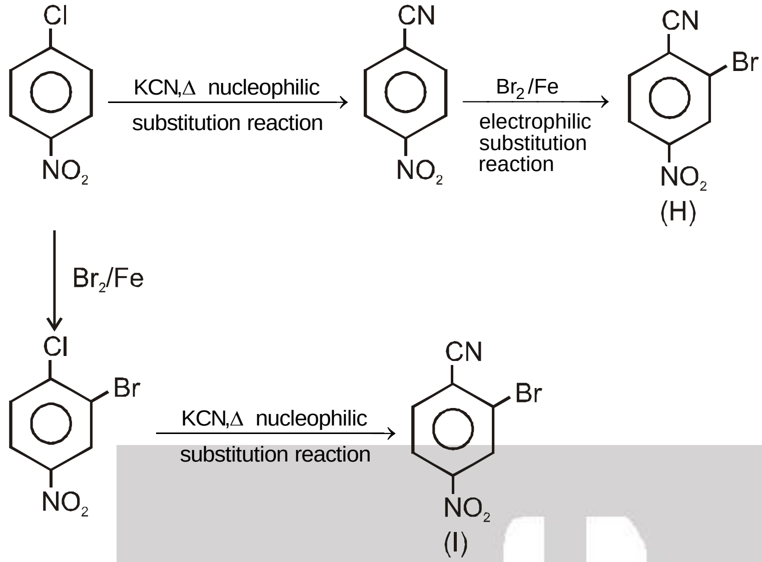

(C*) 


(D) 

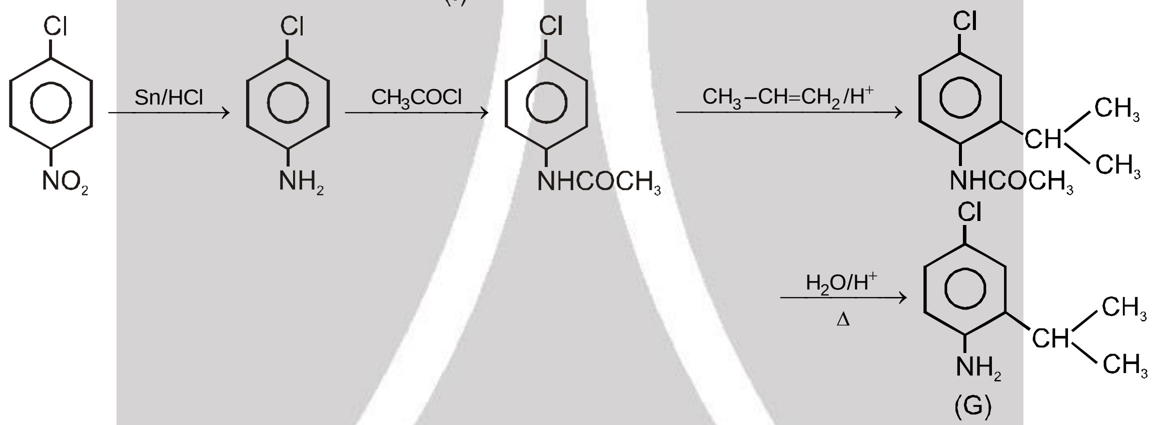

**Sol.**

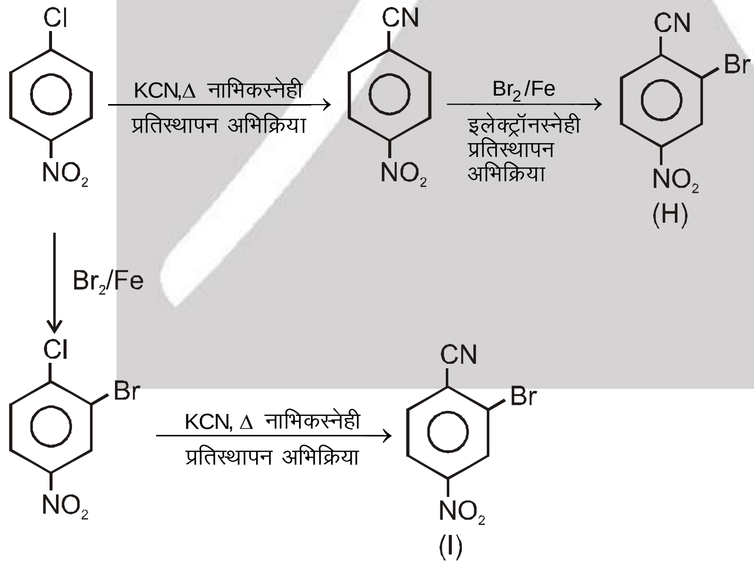



(G)


Cl
NO2
KCN,Δ nucleophilic
substitution reaction
CN
Br2/Fe
electrophilic
substitution
reaction
Br
(H)
Br2/Fe
(I)

**Sol.**


Sn/HCl
NH2
CH3COCl
NHCOCH3
CH3–CH=CH2/H+
CH
CH3
H2O/H+
Δ
(G)


KCN,Δ नाभिकस्नेही
प्रतिस्थापन अभिक्रिया
Br2/Fe
इलेक्ट्रॉनस्नेही
प्रतिस्थापन
अभिक्रिया
(H)
Br2/Fe
KCN, Δ नाभिकस्नेही
प्रतिस्थापन अभिक्रिया
(I)

## Comprehension # 4

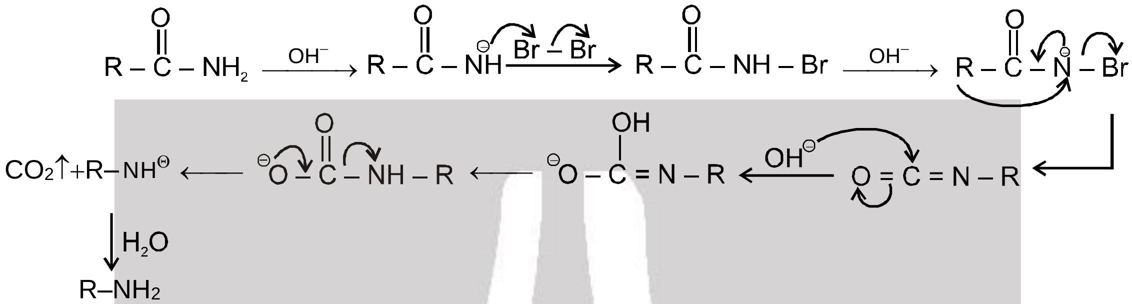
### Hofmann rearrangement

In the Hofmann rearrangement an unsubstituted amide is treated with sodium hydroxide and bromine to give a primary amine that has one carbon lesser than starting amide.

**General reaction :**

$$R-\overset{\overset{\displaystyle O}{||}}{C}-NH_2 + NaOH + Br_2 \longrightarrow \underset{\text{isocyanate}}{R-N=C=O} \xrightarrow{\text{hydrolysis}} R-NH_2$$

**Mechanism :**



If the migrating group is chiral then its cofiguration is retained. Electron releasing effects in the migrating group increases reactivity of Hofmann rearrangement.

## अनुच्छेद # 4

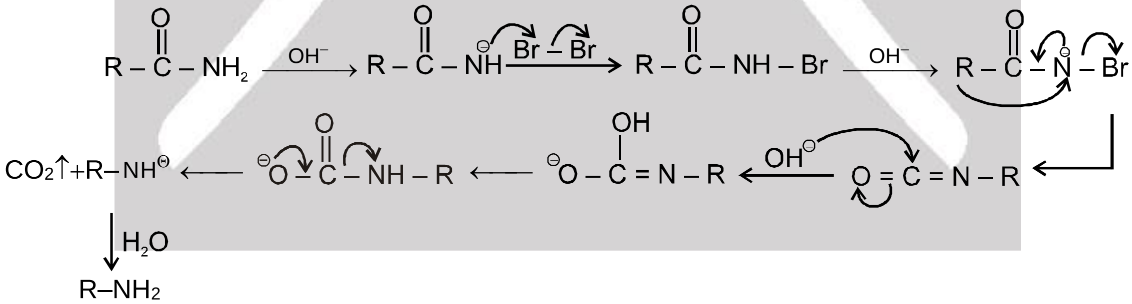
### हॉफमान पुनर्विन्यास

हॉफमान पुर्नविन्यास में अप्रतिस्थापित एमाइड की अभिक्रिया सोडियम हाइड्रॉक्साइड तथा $Br_2$ से करने पर प्रारम्भिक एमाइड से एक कार्बन कम वाली प्राथमिक एमीन मिलती है।

**सामान्य अभिक्रिया :**

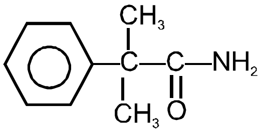
$$R-\overset{\overset{\displaystyle O}{||}}{C}-NH_2 + NaOH + Br_2 \longrightarrow \underset{\text{आइसोसायनेट}}{R-N=C=O} \xrightarrow{\text{जलअपघटन}} R-NH_2$$

**क्रियाविधि :**

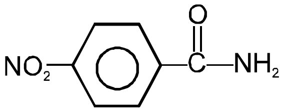


यदि अभिगमन समूह किरैल है तो उसका विन्यास समान रहता है। अभिगमन समूह में इलैक्ट्रॉन दाता प्रभाव हॉफमान पुनर्विन्यास की क्रियाशीलता को बढ़ा देता है।

**10.** Which of the following compound(s) cannot give Hofmann rearrangement :
निम्न में से कौनसा यौगिक हॉफमान पुर्नविन्यास नही देगा।

(A) 

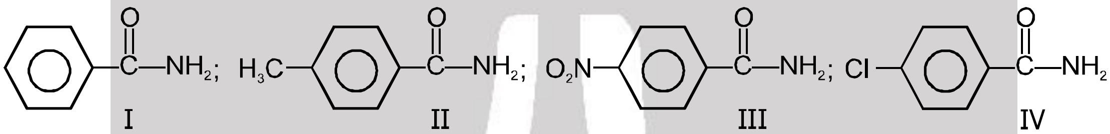
(B*) $CH_3–CH_2–C(=O)–NH–Ph$

(C) 

(D) $Ph–C(=O)–NH_2$

**Sol.** Hofmann rearrangement is shown by 1º amide only.
हॉफमैन पुनर्विन्यास केवल 1º एमाइड द्वारा दर्शाया जाता है।

**11.** Arrange the following amides according to their relative reactivity when reacted with $Br_2$ in excess of strong base :
निम्न एमाइडों की $Br_2$ के साथ प्रबल क्षार के आधिक्य में अभिक्रिया कराने पर अभिक्रियाशीलता का सही क्रम होगा।



I II III IV

(A) IV > I > II > III (B) II > I > III > IV (C) II > IV > III > I (D*) II > I > IV > III

**Sol.** Rate of reaction in hofmann rearrangement among different amide depends on migratory aptitude of group in the amide.
विभिन्न एमाइडों के मध्य हॉफमैन पुनर्विन्यास अभिक्रिया दर, एमाइड में उपस्थित अभिगमन प्रवृत्ति वाले समूह पर निर्भर करता है।

**Comprehension # 5**

**Q.12, Q.13 and Q.14 by appropriately matching the information given in the three columns of the following table.**

| Column-I, 2 and 3 contain starting materials, reaction conditions and type of reactions respectively. | | |
|---|---|---|
| **Column 1** | **Column 2** | **Column 3** |
| (I) p-Fluoro nitrobenzene | (i) NaOH + heat | (P) Nucleophilic substitution |
| (II) Ethyl benzene carboxylate | (ii) $Br_2$ + U.V | (Q) Free radical substitution |
| (III) 1-Bromo-1-phenyl ethane | (iii) $Br_2 + A\ell$ | (R) Electrophilic substitution |
| (IV) Ethyl benzene | (iv) Conc. $HNO_3$ + conc. $H_2SO_4$ | (S) Hydrolysis |

**अनुच्छेद # 5**

**नीचे दी गयी टेबल के तीन कॉलमों में उपलब्ध सूचना का उपयुक्त ढंग से सुमेल कर प्रश्नों Q.12, Q.13 और Q.14 के उत्तर दीजिये।**

| कॉलम-I, 2 तथा 3 में क्रमशः पदार्थ, अभिक्रिया परिस्थितियों तथा अभिक्रियाओं के प्रकार उपस्थित हैं। | | |
|---|---|---|
| **कॉलम-1** | **कॉलम-2** | **कॉलम-3** |
| (I) p-फ्लोरो नाइट्रोबेन्जीन | (i) NaOH + ऊष्मा | (P) नाभिकस्नेही प्रतिस्थापन |
| (II) एथिल बेन्जीन कार्बोक्सिलेट | (ii) $Br_2$ + U.V | (Q) मुक्त मूलक प्रतिस्थापन |
| (III) 1-ब्रोमो-1-फेनिलएथेन | (iii) $Br_2 + A\ell$ | (R) इलेक्ट्रॉनस्नेही प्रतिस्थापन |
| (IV) एथिल बेन्जीन | (iv) सान्द्र. $HNO_3$ + सान्द्र. $H_2SO_4$ | (S) जलअपघटन |

**12._** Match the correct combination?
गलत संयोजन का मिलान कीजिए।
(A*) (IV) (iii) (R) (B) (I) (i) (R) (C) (III) (iv) (P) (D) (II) (ii) (R)

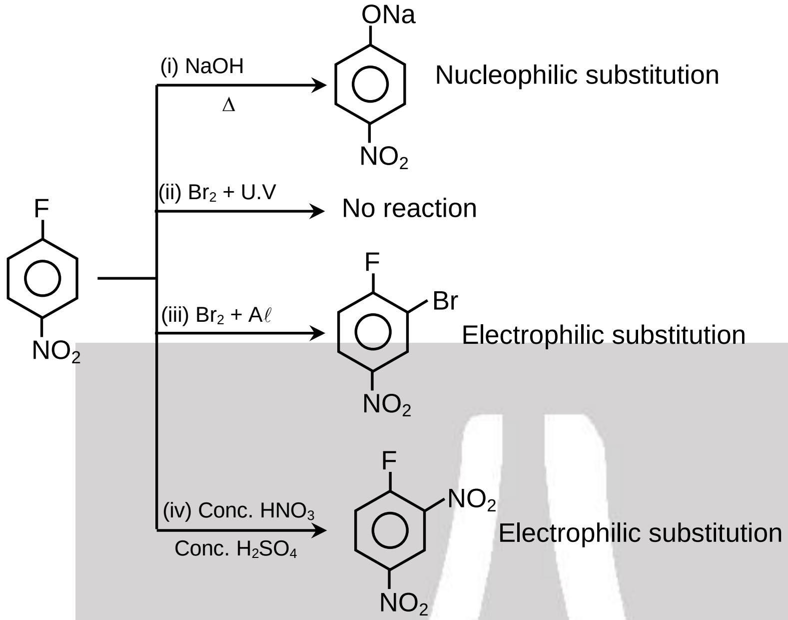
**13._** In which amongs the following product is formed by free radical mechanism?
किसमें निम्न उत्पाद मुक्त मूलक क्रियाविधि द्वारा बनता है ?
(A) (I) (ii) (P) (B*) (IV) (ii) (Q) (C) (II) (iii) (Q) (D) (III) (iii) (P)

**14.**_ In which amongs the following more than one products are not formed?

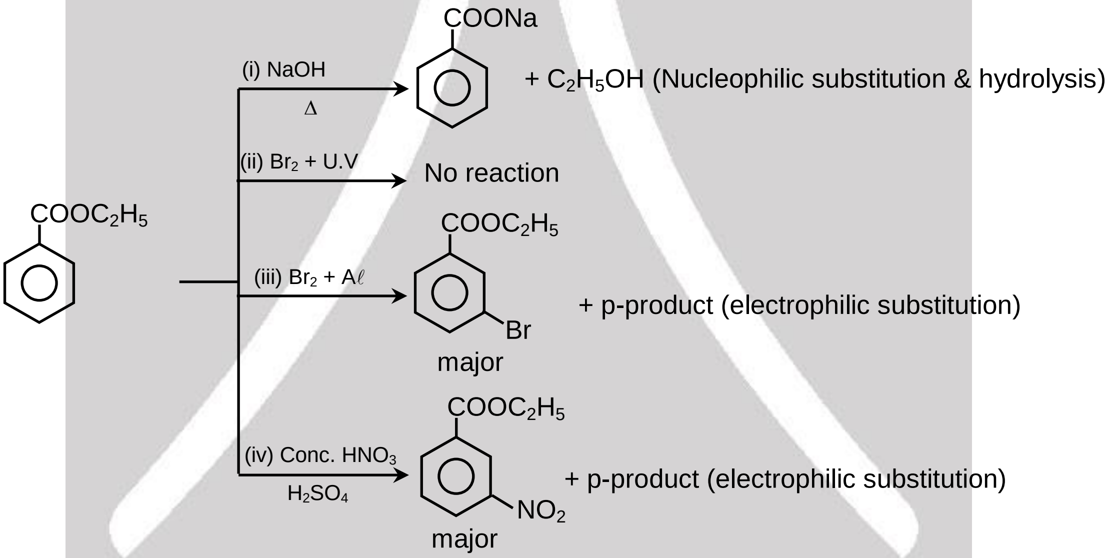
किसमें एक से अधिक उत्पाद नहीं बनते है ?

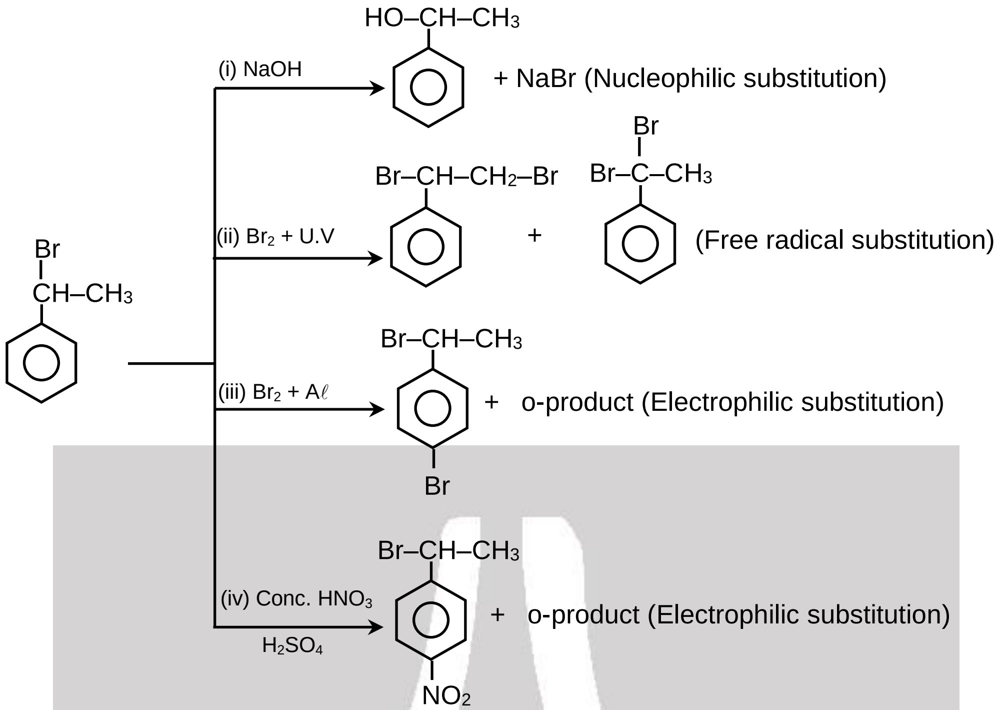
(A) (IV) (iv) (R) (B) (III) (ii) (Q) (C) (II) (iii) (R) (D*) (I) (i) (P)

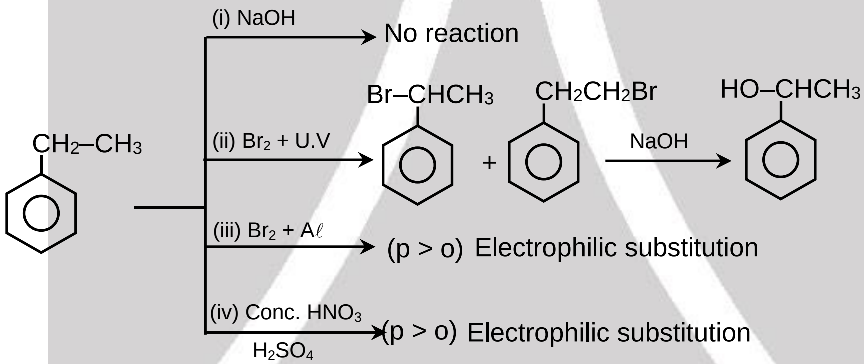
**Sol.** (I)

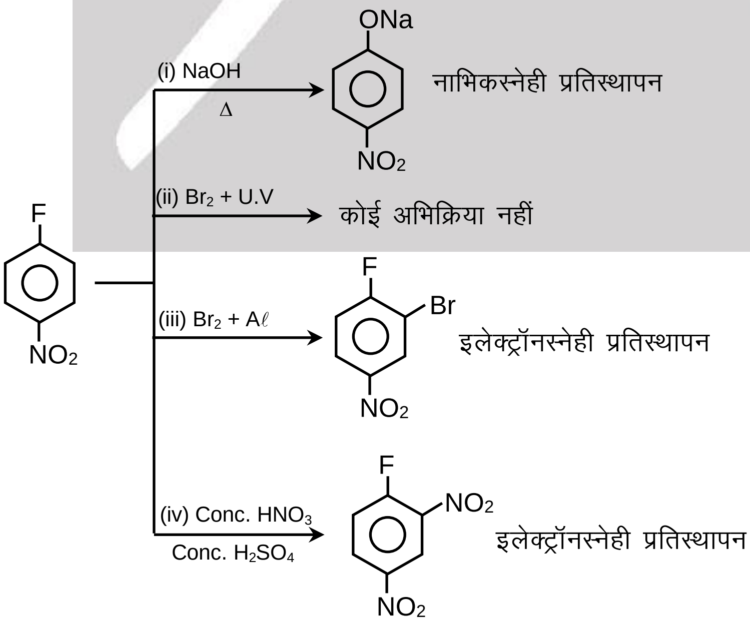



(II)

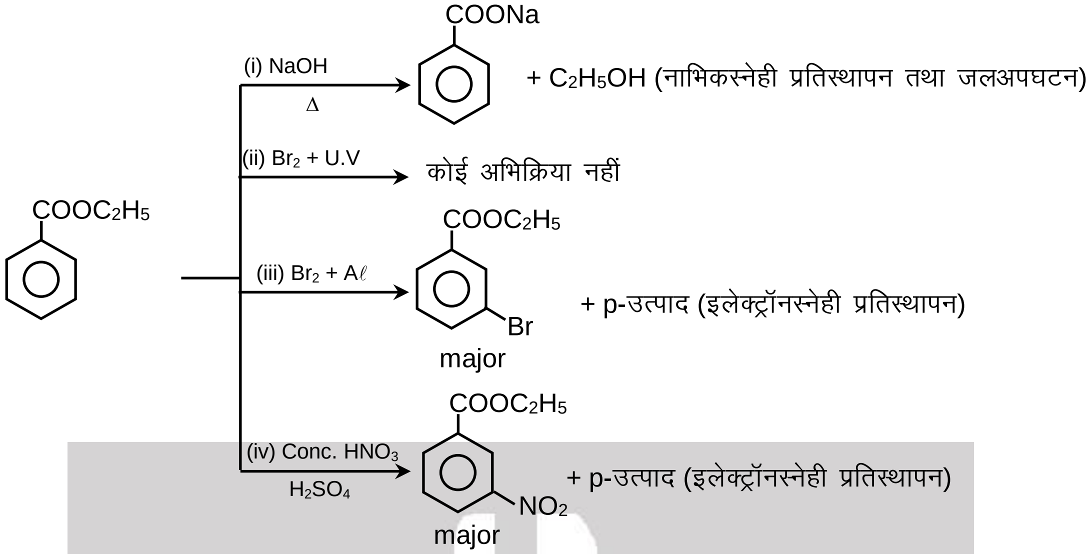


(III) 
HO–CH–CH3
(i) NaOH
+ NaBr (Nucleophilic substitution)
Br
Br–CH–CH2–Br
Br–C–CH3
(ii) Br2 + U.V
+
(Free radical substitution)
Br
CH–CH3
Br–CH–CH3
(iii) Br2 + Aℓ
+ o-product (Electrophilic substitution)
Br
Br–CH–CH3
(iv) Conc. HNO3
H2SO4
+ o-product (Electrophilic substitution)
NO2

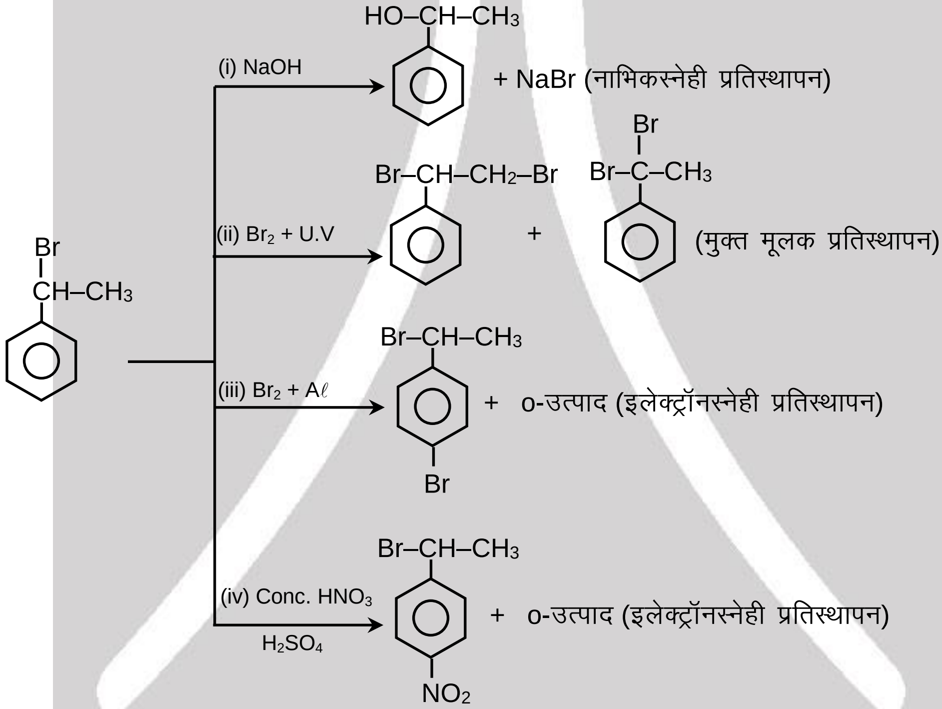
(IV) 
(i) NaOH
No reaction
Br–CHCH3
CH2CH2Br
HO–CHCH3
CH2–CH3
(ii) Br2 + U.V
+
NaOH
(iii) Br2 + Aℓ
(p > o) Electrophilic substitution
(iv) Conc. HNO3
H2SO4
(p > o) Electrophilic substitution

**Sol.** (I) 
ONa
(i) NaOH
Δ
नाभिकस्नेही प्रतिस्थापन
NO2
(ii) Br2 + U.V
कोई अभिक्रिया नहीं
F
NO2
F
Br
(iii) Br2 + Aℓ
इलेक्ट्रॉनस्नेही प्रतिस्थापन
NO2
F
NO2
(iv) Conc. HNO3
Conc. H2SO4
इलेक्ट्रॉनस्नेही प्रतिस्थापन
NO2

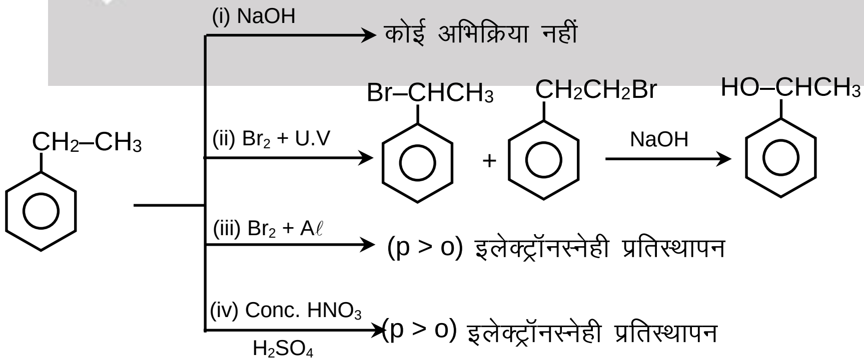
(II)


COOC2H5
(i) NaOH
Δ
COONa
+ C2H5OH (नाभिकस्नेही प्रतिस्थापन तथा जलअपघटन)
(ii) Br2 + U.V
कोई अभिक्रिया नहीं
(iii) Br2 + Aℓ
COOC2H5
Br
major
+ p-उत्पाद (इलेक्ट्रॉनस्नेही प्रतिस्थापन)
(iv) Conc. HNO3
H2SO4
COOC2H5
NO2
major
+ p-उत्पाद (इलेक्ट्रॉनस्नेही प्रतिस्थापन)

(III)


Br
CH–CH3
(i) NaOH
HO–CH–CH3
+ NaBr (नाभिकस्नेही प्रतिस्थापन)
(ii) Br2 + U.V
Br–CH–CH2–Br
+
Br
Br–C–CH3
(मुक्त मूलक प्रतिस्थापन)
(iii) Br2 + Aℓ
Br–CH–CH3
Br
+ o-उत्पाद (इलेक्ट्रॉनस्नेही प्रतिस्थापन)
(iv) Conc. HNO3
H2SO4
Br–CH–CH3
NO2
+ o-उत्पाद (इलेक्ट्रॉनस्नेही प्रतिस्थापन)

(IV)


CH2–CH3
(i) NaOH
कोई अभिक्रिया नहीं
(ii) Br2 + U.V
Br–CHCH3
+
CH2CH2Br
NaOH
HO–CHCH3
(iii) Br2 + Aℓ
(p > o) इलेक्ट्रॉनस्नेही प्रतिस्थापन
(iv) Conc. HNO3
H2SO4
(p > o) इलेक्ट्रॉनस्नेही प्रतिस्थापन

# Exercise-3

*** Marked Questions may have more than one correct option.**
*** चिन्हित प्रश्न एक से अधिक सही विकल्प वाले प्रश्न है -**

## PART - I : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)
### भाग - I : JEE (ADVANCED) / IIT-JEE (पिछले वर्षो) के प्रश्न

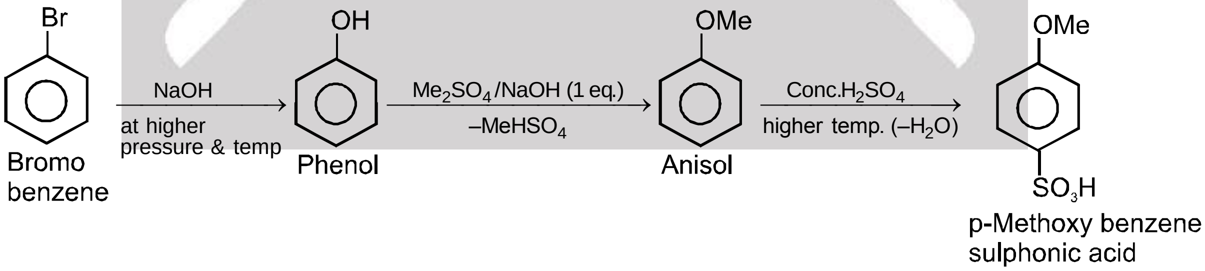
**1.** **Assertion :** In strongly acidic solutions, aniline becomes more reactive towards electrophilic reagents.
**Reason :** The amino group being completely protonated in strongly acidic solution, the lone pair of electrons on the nitrogen is no longer available for resonance. **[IIT-JEE 2001(S), 1/35]**
(A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(B) Both Assertion and Reason are true but Reason is not correct explanation of Assertion.
(C) Assertion is true but Reason is false.
(D*) Assertion is false but Reason is true.
**कथन :** प्रबल अम्लीय विलयन में एनीलीन इलेक्ट्रॉन स्नेही अभिकर्मक के प्रति अधिक सक्रिय हो जाता है।
**कारण :** प्रबल अम्लीय विलयन में एमीनो समूह पूर्णरूप से प्रोटीनीकृत हो जाता है तब नाइट्रोजन पर उपस्थित इलेक्ट्रॉन युग्म अनुनाद के लिए उपस्थित नहीं रहते हैं। **[IIT-JEE 2001(S), 1/35]**
(A) **कथन** व **कारण** दोनों सही है और **कारण**, **कथन** का सही वर्णन है।
(B) **कथन** व **कारण** दोनों सही है लेकिन **कारण**, **कथन** का सही वर्णन नहीं है।
(C) **कथन** सही है लेकिन **कारण** गलत
(D*) **कथन** गलत है लेकिन **कारण** सही

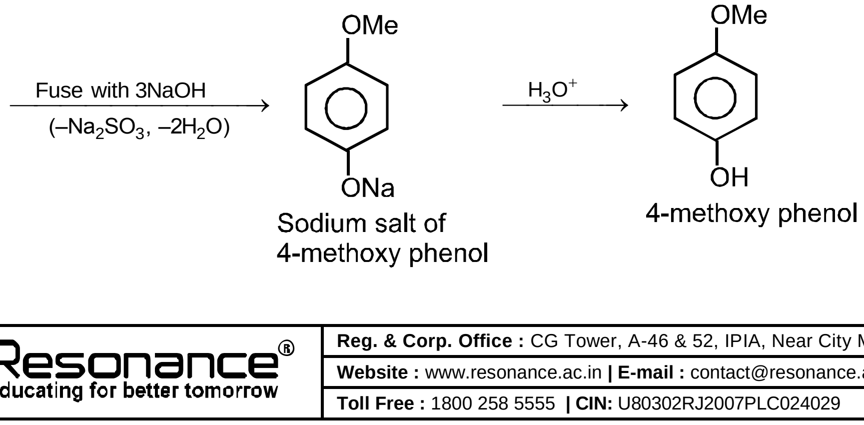
**Sol.** In strongly acidic solutions, aniline converts into anilinium ion i.e. more electron withdrawing nature so the ring deactivates towards electrophilic reagents.
प्रबल अम्लीय माध्यम में एनिलीन एनिलीनियम आयन में परिवर्तित हो जाता है। जो एक प्रबल इलेक्ट्रॉन आकर्षि समूह है। इसलिए बेन्जीन वलय इलेक्ट्रॉन स्नेही के प्रति कम क्रियाशील हो जाती है।

**2.** How would you synthesised 4-methoxyphenol from bromobenzene in NOT more than five steps ? State clearly the reagents used in each step and show the structure of the intermediate compounds in your synthetic scheme. **[IIT-JEE 2001(M), 5/100]**
4-मेथॉक्सीफिनॉल को ब्रोमोबेन्जीन से कैसे बनाओंगें तथा पद पाँच से अधिक नहीं होने चाहिए। प्रत्येक पद में उपयोग आने वाले अभिकर्मक तथा मध्यवर्ती यौगिकों को बताइए। **[IIT-JEE 2001(M), 5/100]**

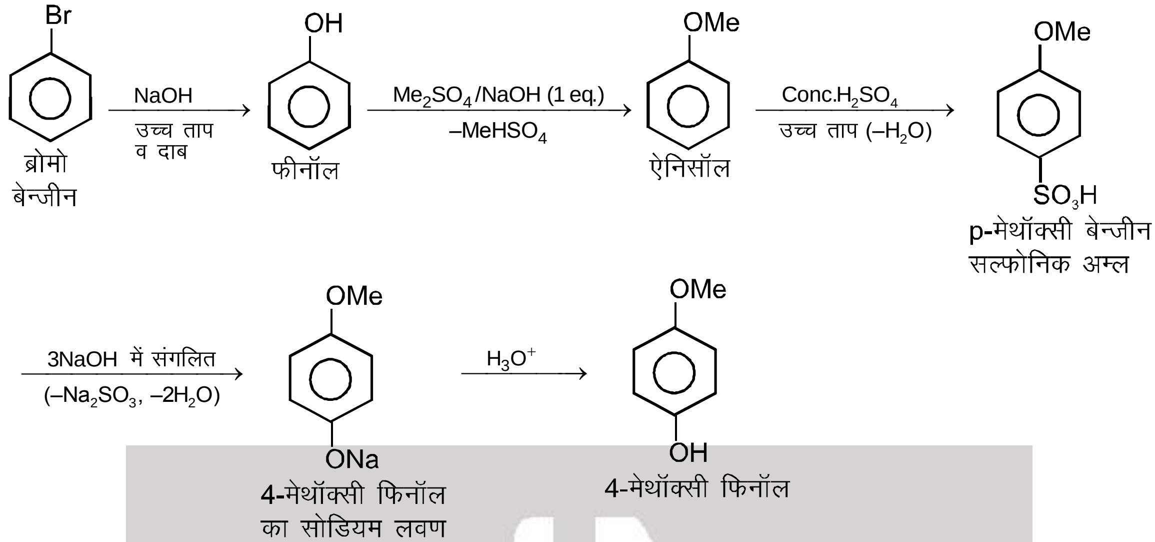
**Ans.** Reagents are (1) NaOH / high temperature and pressure (2) $Me_2SO_4$ (3) conc. $H_2SO_4$ (4) Fusion with NaOH (5) $H_3O^+$
(1) NaOH / उच्च ताप एवम् दाब (2) $Me_2SO_4$ (3) सान्द्र $H_2SO_4$ (4) NaOH के साथ संगलन (5) $H_3O^+$

**Sol.**



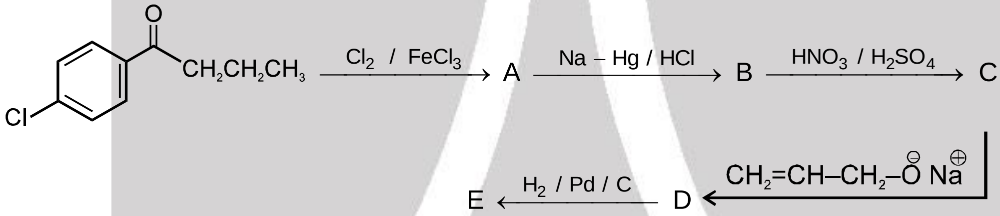



**Sol.**

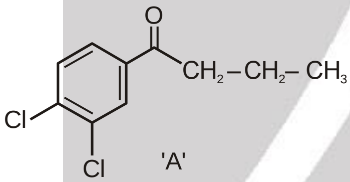



**3.** Write structures of the products A, B, C, D and E in the following scheme. **[IIT-JEE 2002(M), 5/60]**

निम्न अभिक्रिया में उत्पाद A, B, C, D तथा E की संरचना बताओ। **[IIT-JEE 2002(M), 5/60]**

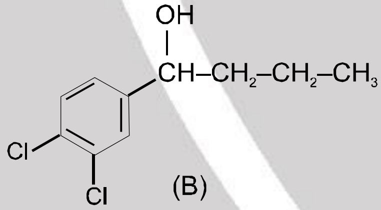



**Ans.** A =



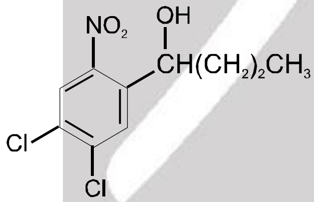

'A'

B =



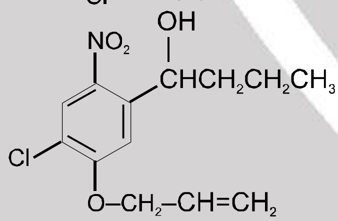

(B)

C =



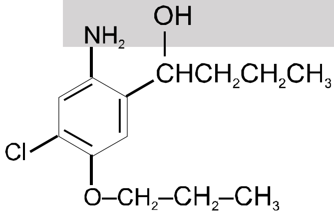

(C)

D =



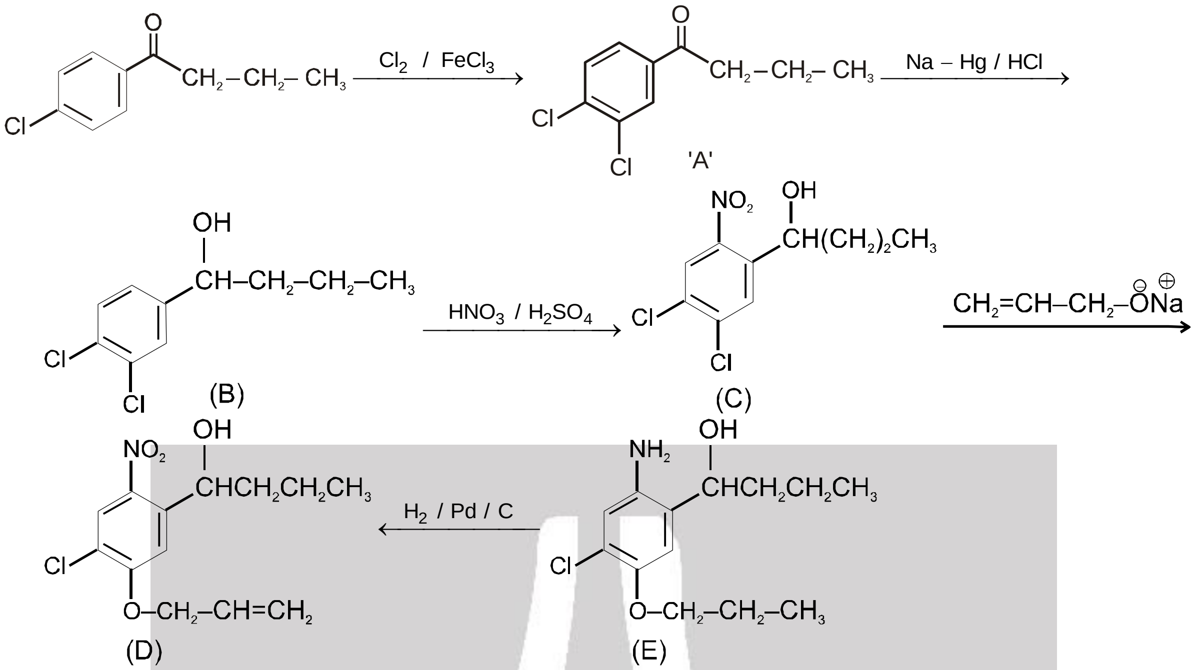

(D)

E =

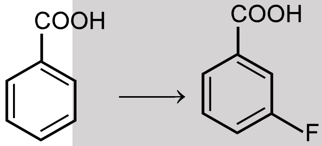



(E)

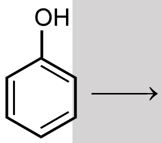
**Sol.**




**4.** Convert परिवर्तित कीजिए। **[IIT-JEE 2003(M), 4/60]**

(a)  (in not more than 3 steps) (तीन पदों से अधिक नहीं होना चाहिए)


**[2 marks]**

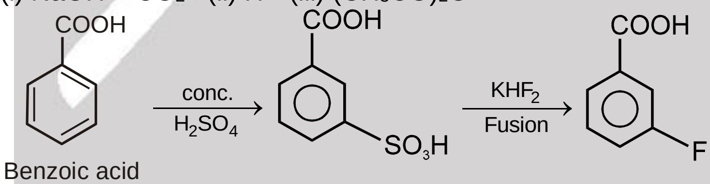
(b)  Aspirin एस्प्रीन **[2 marks]**


**Ans.** **(a)** (i) Conc. $H_2SO_4$ (ii) $KHF_2/\Delta$

or (i) conc. $HNO_3/H_2SO_4$ (ii) Sn + HCl (iii) $NaNO_2$ + HCl & $HBF_4/\Delta$

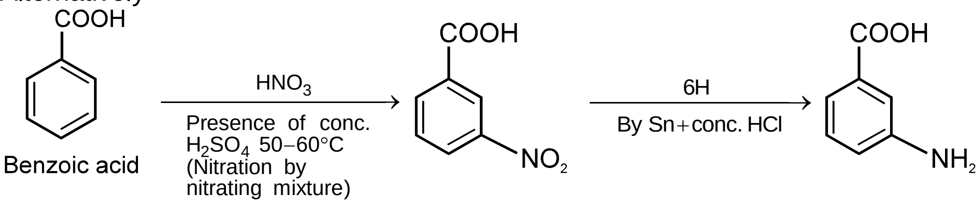
**(b)** (i) NaOH + $CO_2$ (ii) $H^{\oplus}$ (iii) $(CH_3CO)_2O$

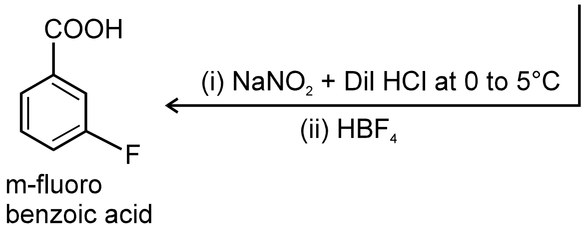
**Sol.** **(a)**



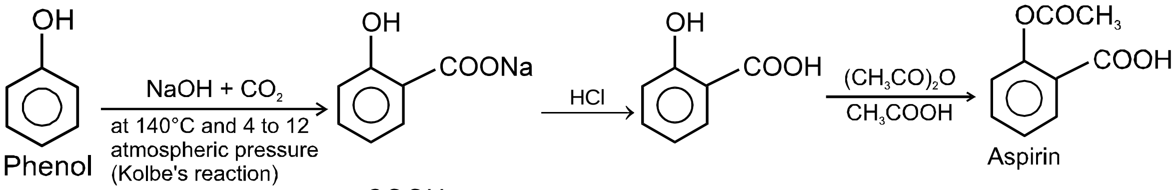

Benzoic acid

Alternatively

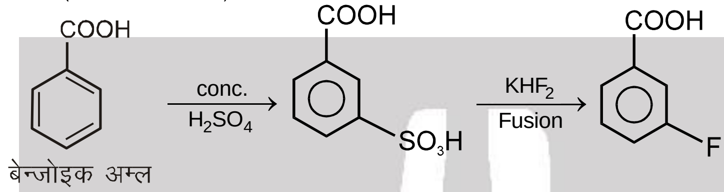




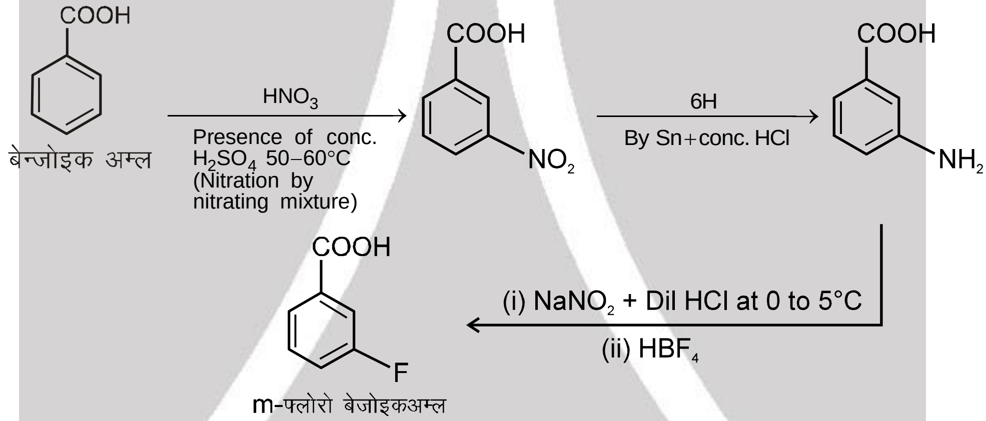

**(b)**



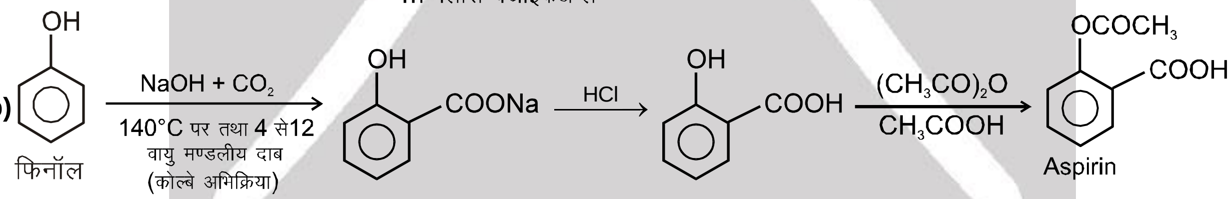

**Sol.** **(a)**




दूसरा तरीका

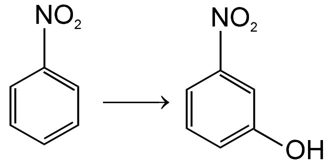



**(b)**

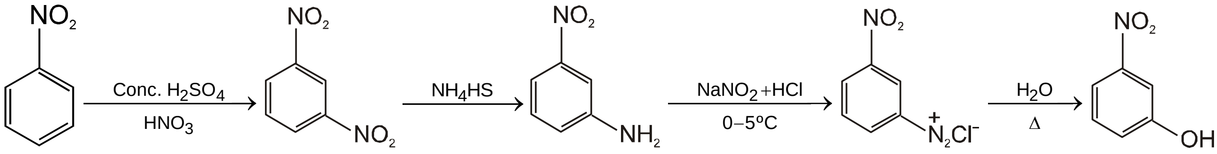


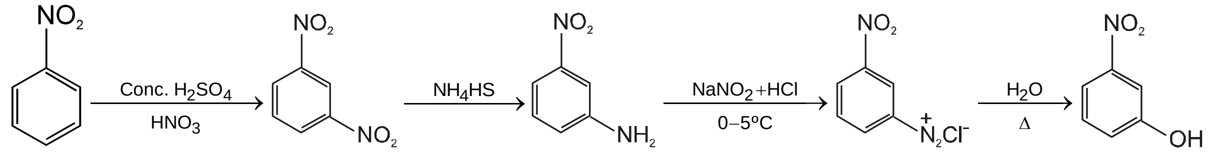

**5.** How would you carry out the following conversion efficiently using NOT more than four steps ? Give the appropriate reagent(s) and reaction condition(s) employed in each step. **[IIT-JEE 2004(M), 4/60]**

निम्न परिवर्तन को अधिकतम चार पदों का उपयोग करते हुऐ कैसे करोगे। प्रत्येक पद में प्रयुक्त उचित अभिकर्मक तथा अभिक्रिया की परिस्थितियाँ भी दर्शाइये। **[IIT-JEE 2004(M), 4/60]**

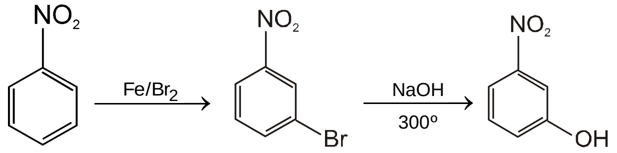


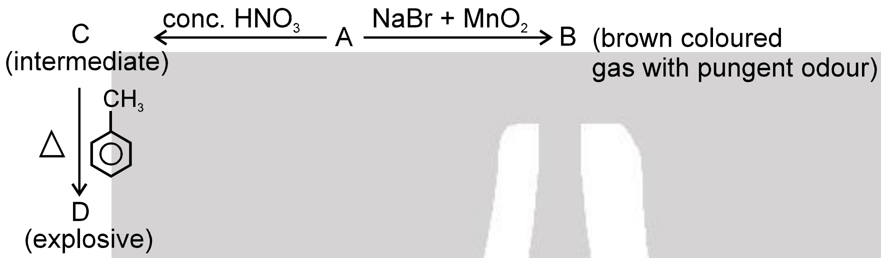

**Ans.**



**Sol.** 

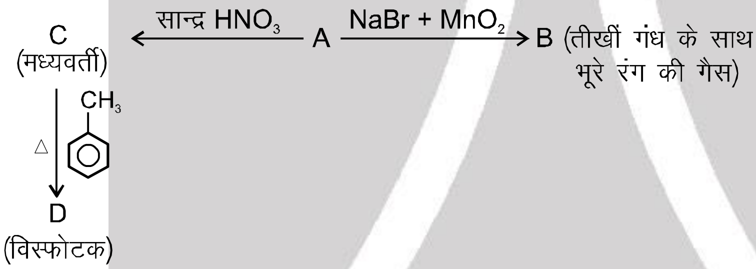

An alternative method can also be :
एक अन्य विधि निम्न प्रकार हो सकती है।




**6.** 

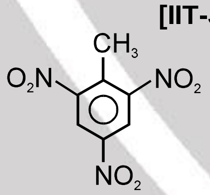

Identify A, B, C, D and write the balanced chemical equation of formation of A to B and A to C.

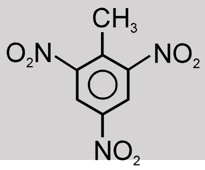
**[IIT-JEE-2005(M), 4/60]**




A, B, C, D पहचानों और A से B तथा A से C निर्माण की संतुलित रासायनिक समीकरण दीजिए।

**[IIT-JEE 2005(M), 4/60]**

**Ans.** (A) $H_2SO_4$ (conc.) , (B) $Br_2$ , (C) $NO_2^{\oplus}$ , (D)  (T.N.T. = Trinitrotoluene)


**Ans.** (A) $H_2SO_4$ (सान्द्र) , (B) $Br_2$ ,(C) $NO_2^{\oplus}$ , (D)  (T.N.T. = ट्राइनाइट्रोटॉलुइन)


**Sol.** Reaction involved are

(1) A $\longrightarrow$ B

$$\underset{(A)}{3H_2SO_4} + 2NaBr + MnO_2 \longrightarrow \underset{(B)}{Br_2} + MnSO_4 + 2NaHSO_4 + 2H_2O$$

(2) A $\longrightarrow$ C

$$2H_2SO_4 + H-O-\underset{\downarrow \atop O}{N}=O \longrightarrow (H-\overset{+}{\underset{|\atop H}{O}}-\underset{\downarrow\atop O}{N}=O + HSO_4^- + H_2SO_4) \longrightarrow H_3\overset{\oplus}{O} + \overset{\oplus}{N}O_2 + 2HSO_4^{\ominus}.$$

**Sol.** अभिक्रिया निम्न सम्बन्धित हैं;

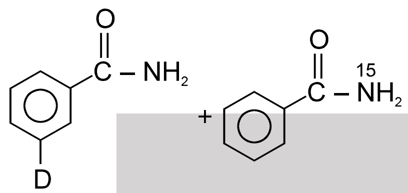
(1) A $\longrightarrow$ B

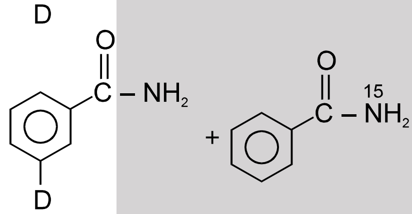
$3H_2SO_4 + 2NaBr + MnO_2 \longrightarrow Br_2 + MnSO_4 + 2NaHSO_4 + 2H_2O$

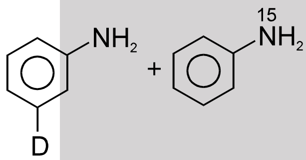
(A) (B)

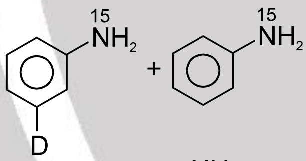
(2) A $\longrightarrow$ C

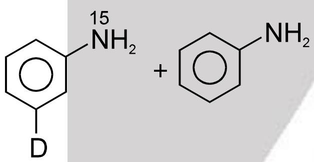
$2H_2SO_4 + H-O-\underset{\downarrow \atop O}{N}=O \longrightarrow (H-\underset{| \atop H}{\overset{+}{O}}-\underset{\downarrow \atop O}{N}=O + HSO_4^- + H_2SO_4) \longrightarrow H_3\overset{\oplus}{O} + \overset{\oplus}{N}O_2 + 2HS\overset{\ominus}{O_4}$ .

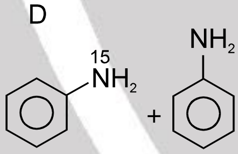
**7.**  under Hofmann conditions will give : **[JEE 2006, 5/184]**

 हॉफमान स्थिति के अन्तर्गत देगा : **[JEE 2006, 5/184]**

(A*) 

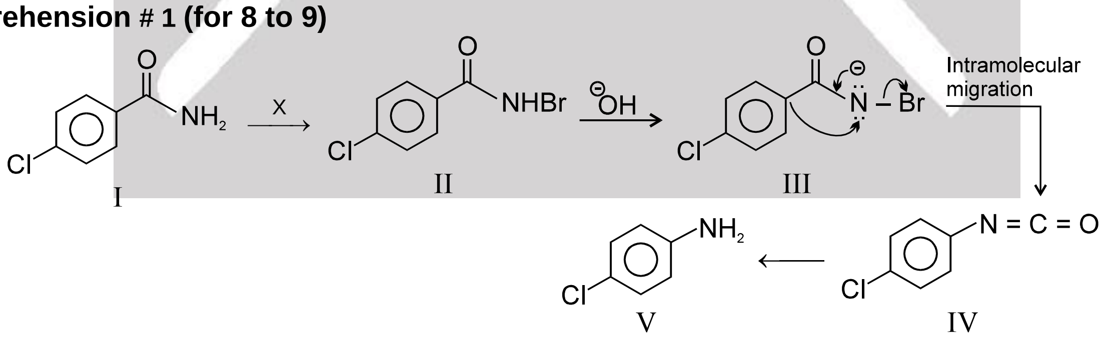
(B) 

(C) 

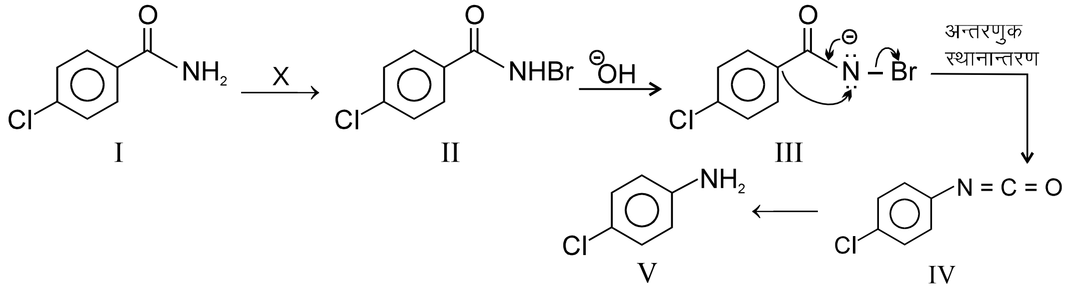
(D) 

Sol. Since the overall reaction is intramolecular the product under Hofmann conditions will be self product only.
अतः सम्पूर्ण अभिक्रिया अन्तः आणविक है और हॉफमान स्थिति के अन्तर्गत केवल स्वंय का उत्पाद प्राप्त होगा।

**Comprehension # 1 (for 8 to 9)**



**अनुच्छेद # 1 (8 से 9 के लिए)**

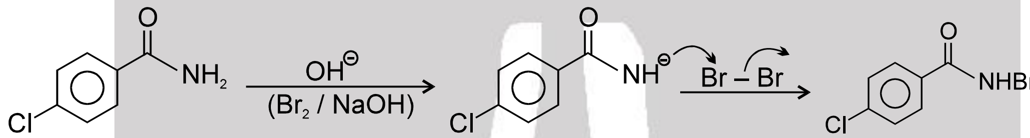



**8.** Which reagent (X) is used to convert I to II **[IIT-JEE 2006, 5/184]**

(A) KBr / NaOH (B*) $Br_2$ / NaOH (C) $NaHCO_3$ (D) N-Bromo succinamide

कौनसा अभिकर्मक (X) I को II में परिवर्तित करने में उपयोग किया जाता है **[IIT-JEE 2006, 5/184]**

(A) KBr / NaOH (B*) $Br_2$ / NaOH (C) $NaHCO_3$ (D) N-ब्रोमो सक्सिनैमाइड

**Sol.** 


**9.** Which step is rate determining step **[IIT-JEE 2006, 5/184]**

(A) Formation of II (B) Formation of III (C) Formation of V (D*) Formation of IV

कौनसा पद दर निर्धारण पद है : **[IIT-JEE 2006, 5/184]**

(A) II का संश्लेषण (B) III का संश्लेषण (C) V का संश्लेषण (D*) IV का संश्लेषण

**Sol.** The migration of p-chlorophenyl group to N-atom is the slowest step. Therefore formation of isocyanate is rate determining step.

p-क्लोरोफेनिल समूह का N-परमाणु पर अभिगमन धीमा पद है। इसलिए आइसोसायनेट का संश्लेषण दर निर्धारण पद होगा।

**10.** $CH_3NH_2 + CHCl_3 + KOH \rightarrow$ Nitrogen containing compound + KCl + $H_2O$.

Nitrogen containing compound is : **[IIT-JEE 2006, 3/184]**

$CH_3NH_2 + CHCl_3 + KOH \rightarrow$ नाइट्रोजन युक्त यौगिक + KCl + $H_2O$

नाइट्रोजन युक्त यौगिक है: **[IIT-JEE 2006, 3/184]**

(A) $CH_3–C\equiv N$ (B) $CH_3–NH–CH_3$ (C) $CH_3–N^-\equiv C^+$ (D*) $CH_3–N^+\equiv C^-$

**Sol.** $CH_3NH_2 + CHCl_3 + 3KOH \rightarrow CH_3NC + 3KCl + 3H_2O$

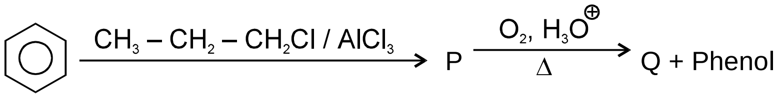
$CH_3NC$ or $CH_3–\overset{+}{N}\equiv\overset{-}{C}$ Methyl isocyanide or Methyl carbylamine

This reaction is a test for primary amine and it is used for the distinction of primary-amines with secondary and tertiary-amines.

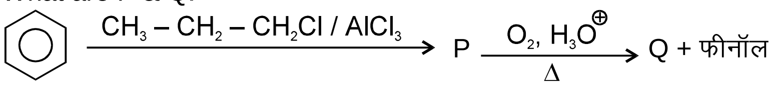
**हल.** $CH_3NH_2 + CHCl_3 + 3KOH \rightarrow CH_3NC + 3HCl + 3H_2O$

$CH_3NC$ या $CH_3–\overset{+}{N}\equiv\overset{-}{C}$ मैथिलआइसो सायनाइड़ या मैथिल कार्बिल एमीन

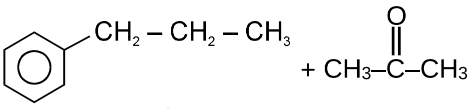
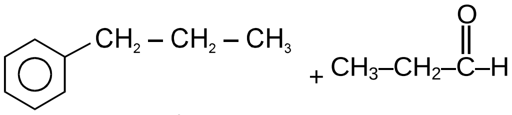
यह अभिक्रिया प्राथमिक एमीन का परीक्षण है तथा प्राथमिक एमीन को द्वितीयक व तृतीयक एमीन से विभेदित करने में इसका उपयोग किया जाता है।

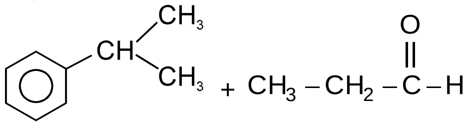
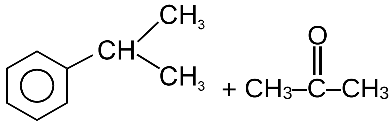
**11.** 

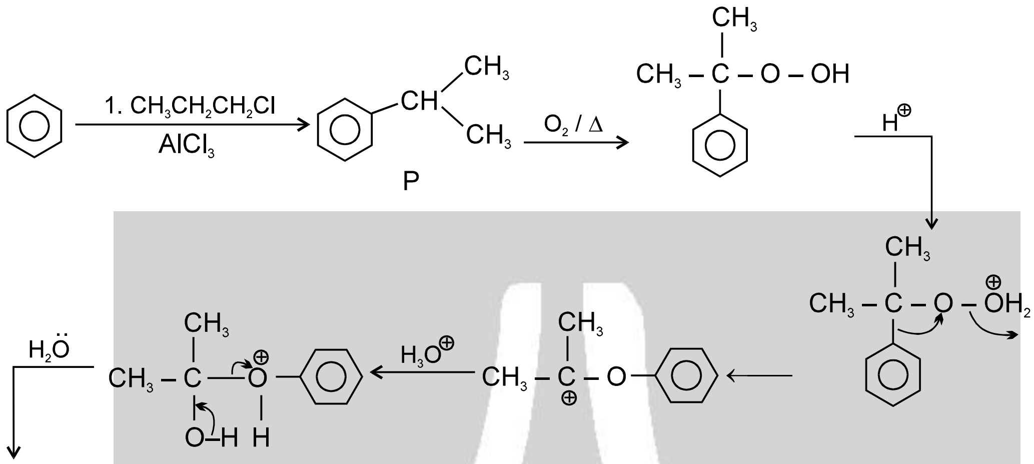

What are P & Q. **[IIT-JEE-2006, 5/184]**




P तथा Q क्या है ? **[IIT-JEE-2006, 5/184]**

(A)  (B) 

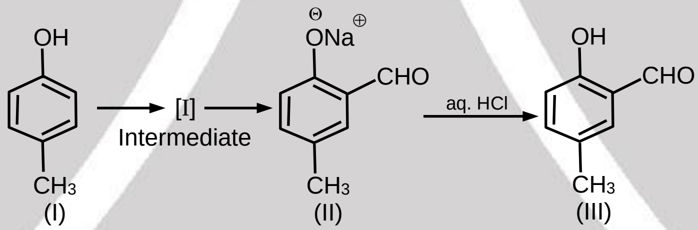
(C)  (D*) 

**Sol.** 

PhOH + $CH_3COCH_3$

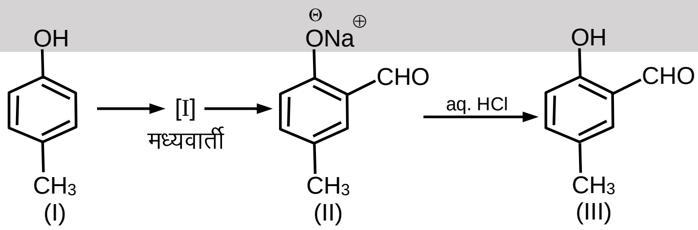
**Comprehension # 2 (for 12 to 14)**

Riemer-Tiemann reaction introduces an aldehyde group, on to the aromatic ring of phenol, ortho to the hydroxyl group. This reaction involves electrophilic aromatic substitution. This is a general method for the synthesis of substituted salicylaldehydes as depicted below.




**अनुच्छेद # 2 (for 12 to 14)**

राइमर–टिमान अभिक्रिया में फिनॉल की एरोमैटिक वलय पर हाइड्रॉक्सिल समूह की ऑर्थो स्थिति पर एल्डिहाइड समूह का प्रवेश कराया जाता है। इस अभिक्रिया में इलेक्ट्रॉन स्नेही एरोमैटिक प्रतिस्थापन होता है। यह अभिक्रिया प्रतिस्थापित सैलीसिलएल्डिहाइड के संश्लेषण के लिए एक सामान्य विधि है, जैसे कि नीचे दर्शाया गया है।




**12.** Which one of the following reagents is used in the above reaction ? **[IIT-JEE 2007, 4/162]**

ऊपर दी गई अभिक्रिया में निम्न में से कौनसा अभिकारक प्रयुक्त किया जाता है ? **[IIT-JEE 2007, 4/162]**

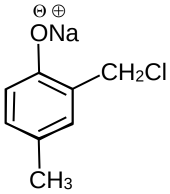
(A) aq. NaOH + $CH_3Cl$ (B) aq. NaOH + $CH_2Cl_2$

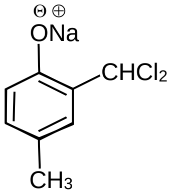
(C*) aq. NaOH + $CHCl_3$ (D) aq. NaOH + $CCl_4$

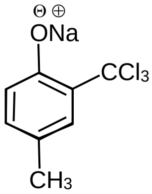
**13.** The electrophile in this reaction is : **[IIT-JEE 2007, 4/162]**
इस अभिक्रिया में इलैक्ट्रान स्नेही है : **[IIT-JEE 2007, 4/162]**

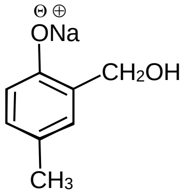
(A) :CHCl (B) $^{+}CHCl_2$ (C*) :$CCl_2$ (D) $^{\bullet}CCl_3$

**14.** The structure of the intermediate **I** is : **[IIT-JEE 2007, 4/162]**
मध्यवर्ती **I** की संरचना है : **[IIT-JEE 2007, 4/162]**

(A) 

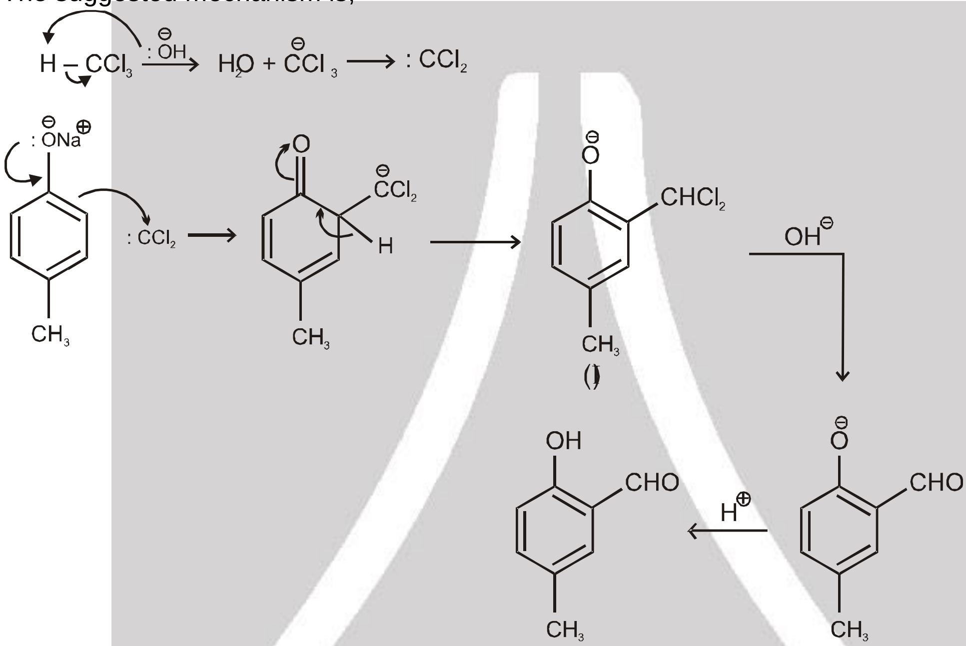

(B*) 


(C) 


(D) 

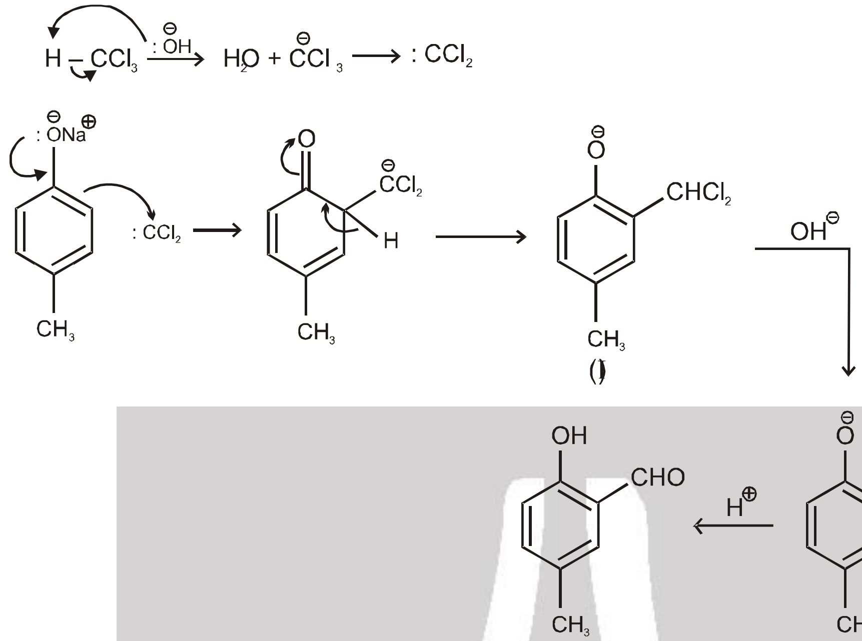

**Sol.** **Comprehension (12 to 14)**

The suggested mechanism is,

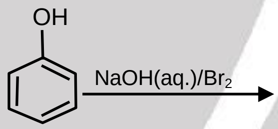


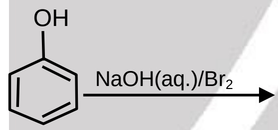

In Reimer-Tiemann reaction, phenol on treating with chloroform-alkali gives isomeric product o- & p-hydroxybenzaldehyde. Here electrophile is dichloro carbene formed by $\alpha$-elimination of HCl from chloroform and intermediate will be sodium salt of o-dichloromethyl phenol.

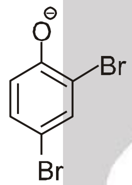
**Sol.** **अनुच्छेद (12 से 14)** क्रियाविधि है।

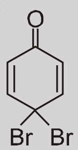


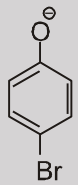

राइमर टिमान अभिक्रिया में, फीनाल क्षारीय क्लोरोफार्म के साथ अभिक्रिया करके समावयवी उत्पाद o- तथा p-हाइड्रोक्सी बेन्जल्डिहाइड देता है। इलैक्ट्रानस्नेही डाइक्लोरो कार्बिन है जो क्लोरोफॉर्म से HCl के $\alpha$-विलोपन से प्राप्त होता है। इसमें मध्यवर्ती o-डाइक्लोरोमैथिल फिनॉल का सोडियम लवण होता है।

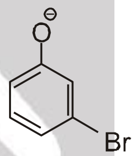
**15.** In the reaction  the intermediate (s) is (are) : **[IIT-JEE-2010, 3/163]**

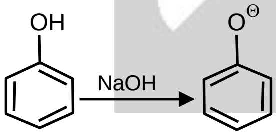

अभिक्रिया,  में मध्यवर्ती है/हैं : **[IIT-JEE-2010, 3/163]**


(A*) 


(B) 

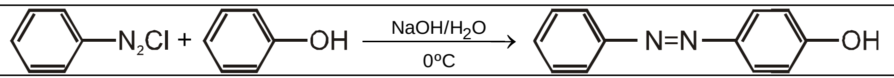
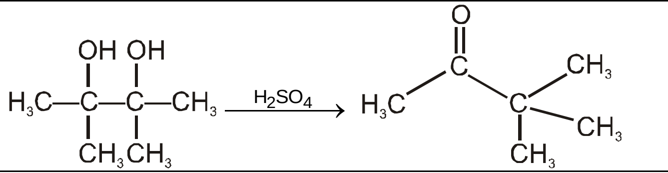
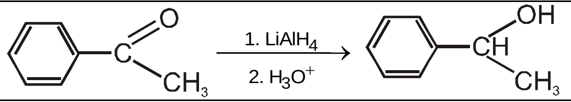
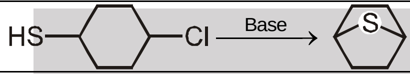

(C*) 


(D) 

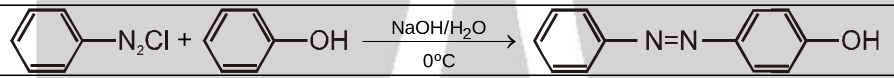
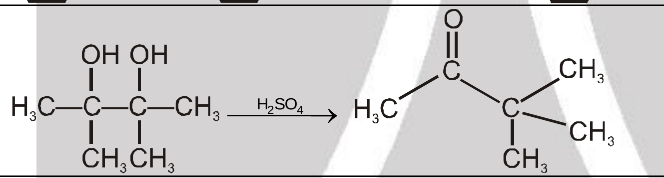
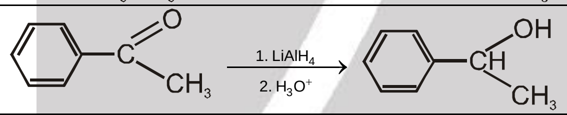
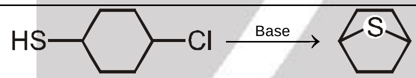

**Sol.** 


It is ortho-para directing. (ऑर्थो–पेरा पर इलेक्ट्रोन स्नेही का आक्रमण होगा।)

**16.** Match the reactions in **Column I** with appropriate options in **Column II**. **[IIT-JEE 2010, 8/163]**

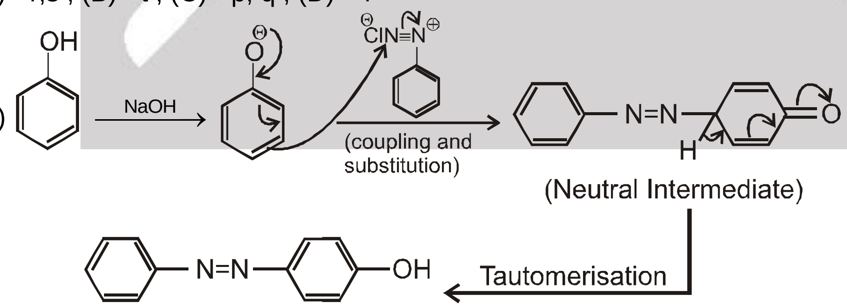
| | **Column-I** | | **Column-II** |
|---|---|---|---|
| (A) |  | (p) | Racemic mixture |
| (B) |  | (q) | Addition reaction |
| (C) |  | (r) | Substitution reaction |
| | | | |
| (D) |  | (s) | Coupling reaction |
| | | (t) | Carbocation intermediate |

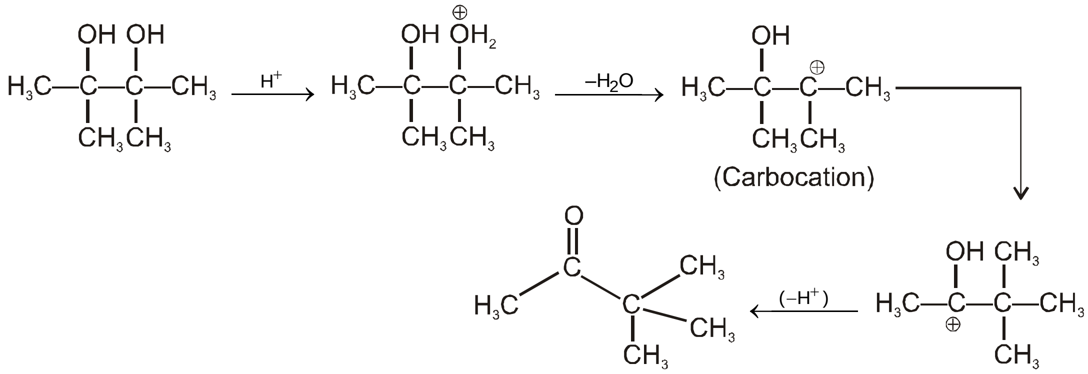
**कॉलम-I** की अभिक्रियाओं को **कॉलम-II** के उचित विकल्पों के साथ मिलाएं। **[IIT-JEE 2010, 8/163]**

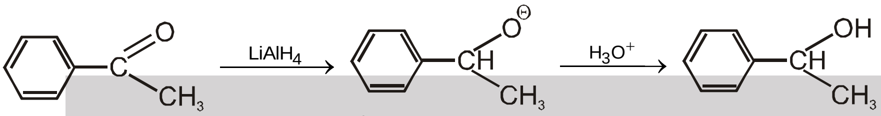
| | **कॉलम-I** | | **कॉलम-II** |
|---|---|---|---|
| (A) |  | (p) | रेसमिक मिश्रण |
| (B) |  | (q) | योगज (addition) अभिक्रिया |
| (C) |  | (r) | प्रतिस्थापन (substitution) अभिक्रिया |
| (D) |  | (s) | युग्मन (coupling) अभिक्रिया |
| | | (t) | कार्बोकैटायन मध्यक |

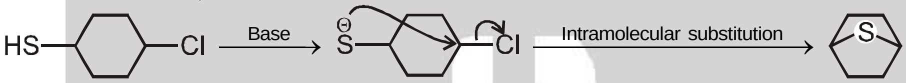
**Ans.** (A) - r,s ; (B) - t ; (C) - p, q ; (D) – r

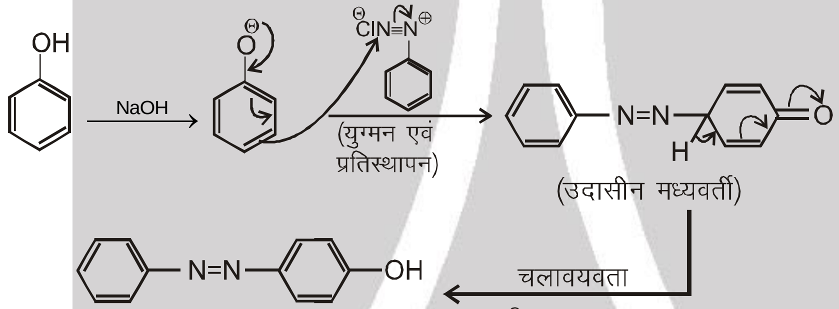
**Sol.** (A)

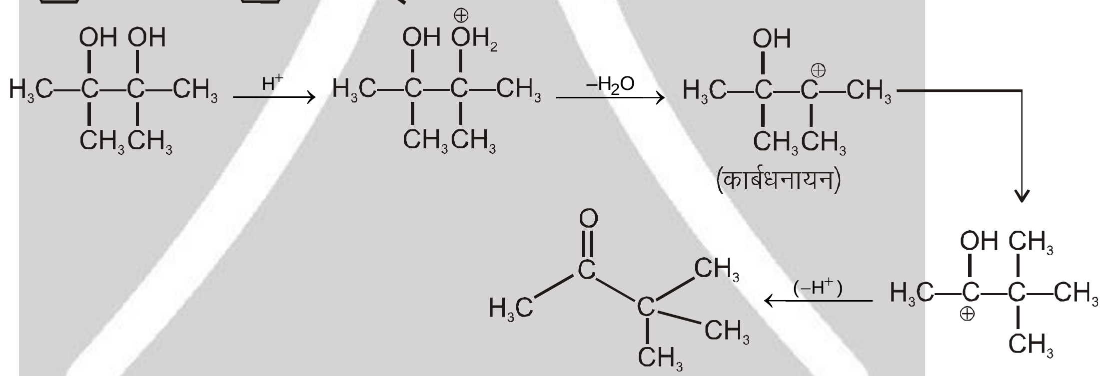


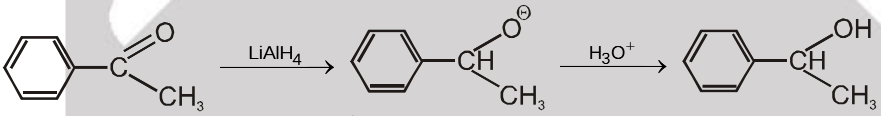
(B)


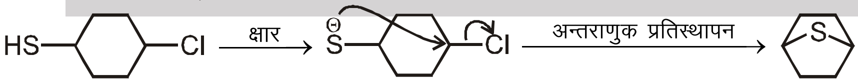

(C)

(racemic mixture)

(D)


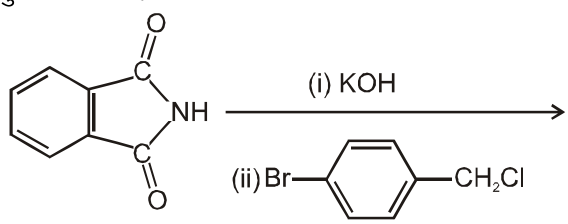

**Sol.** (A)


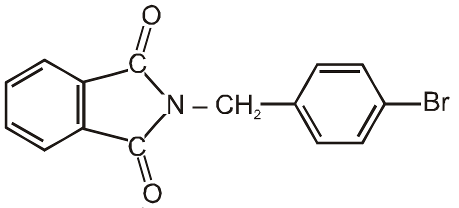

(B)


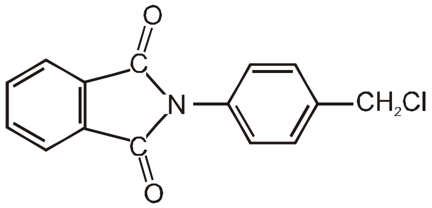

(C)

(रेसमिक मिश्रण)

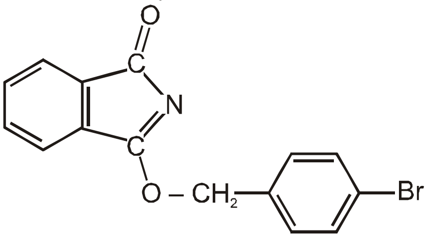
(D)


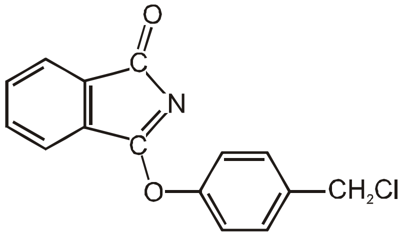

**17.** The major product of the following reaction is : **[JEE-2011, 3/160]**
निम्न अभिक्रिया में मुख्य उत्पाद है : **[JEE-2011, 3/160]**

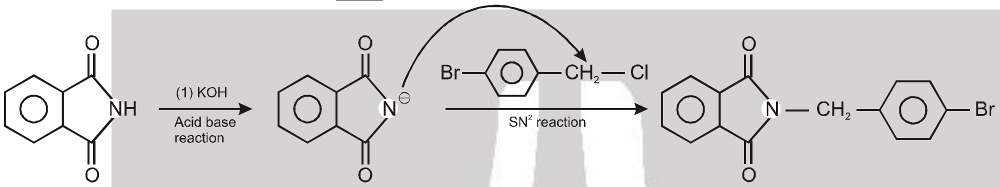


(A*) 

(B) 

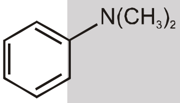
(C) 

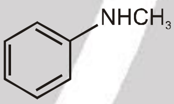
(D) 

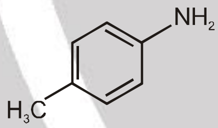
**Sol.** 

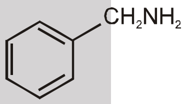
**18.** Amongst the compounds given, the one that would form a brilliant colored dye on treatment with $NaNO_2$ in dilute HCl followed by addition to an alkaline solution of β-naphthol is : **[JEE-2011, 3/160]**

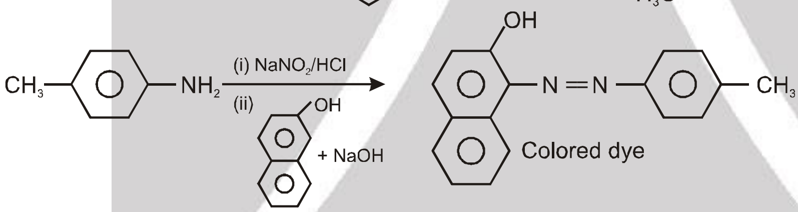
नीचे दिए गये यौगिकों में वह जो तनु HCl की उपस्थिति मे $NaNO_2$ से उपचारित करने के बाद β-नैफ्थॉल के क्षारीय विलयन में डालने पर चमकीला रंगीन रंजक देगा, है **[JEE-2011, 3/160]**

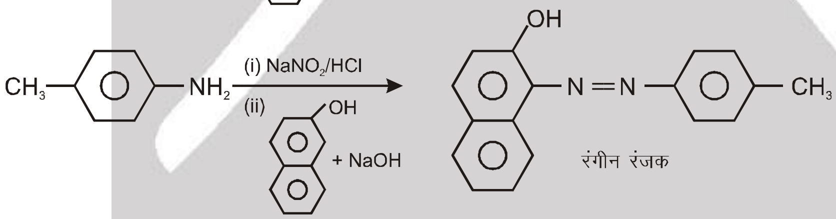
(A) 

(B) 

(C*) 

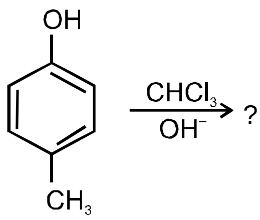
(D) 

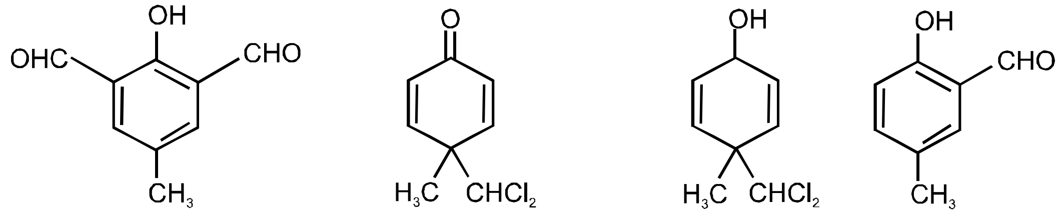
**Sol.** 

**हल.** 

**19.*** In the following reaction, the product(s) formed is(are) **[JEE (Advanced)-2013, 3/120]**

निम्नलिखित अभिक्रिया के उत्पाद/उत्पादों को बताएँ। **[JEE (Advanced)-2013, 3/120]**



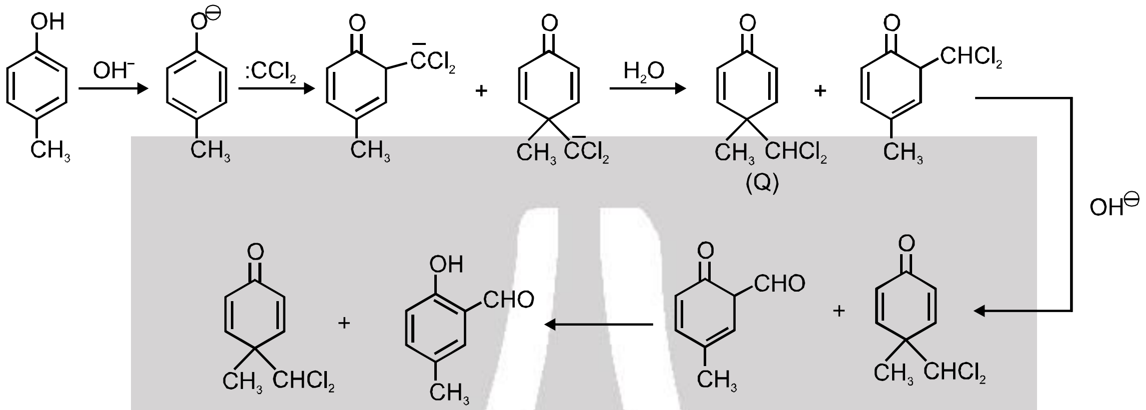


**P** **Q** **R** **S**

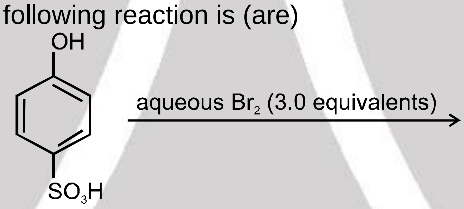
(A) **P** (major) (B*) **Q** (minor) (C) **R** (minor) (D*) **S** (major)

(A) **P** (मुख्य) (B*) **Q** (गौण) (C) **R** (गौण) (D*) **S** (मुख्य)

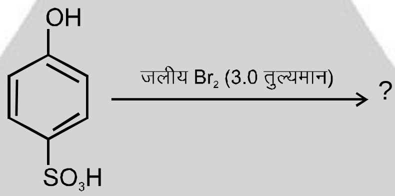
**Sol.**

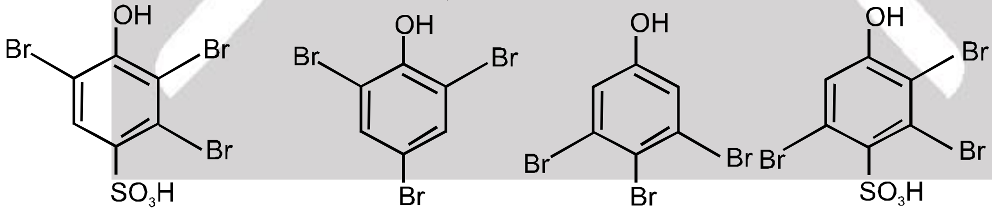


**20.** The major product(s) of the following reaction is (are) **[JEE (Advance)-2013, 3/120]**



निम्नलिखित अभिक्रिया का (के) मुख्य उत्पाद है (हैं) **[JEE (Advance)-2013, 3/120]**

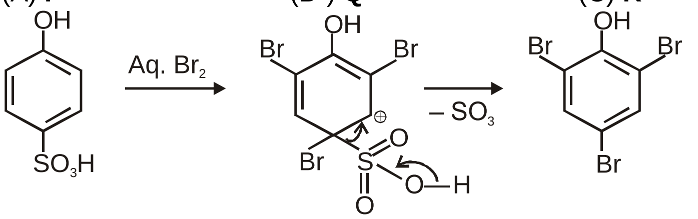




**P** **Q** **R** **S**

(A) **P** (B*) **Q** (C) **R** (D) **S**

**Sol.**



**Comprehension # 3 (Q.21 to 22)**

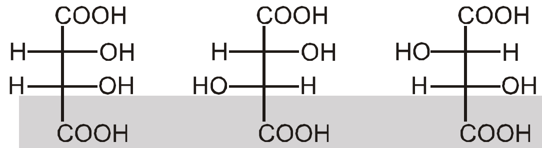
**P** and **Q** are isomers of dicarboxylic acid $C_4H_4O_4$. Both decolorize $Br_2/H_2O$. On heating, **P** forms the cyclic anhydride.

Upon treatment with dilute alkaline $KMnO_4$, **P** as well as **Q** could produce one or more than one from **S, T** and **U**.

**अनुच्छेद # 3 (Q.21 से 22)**

**P** और **Q** एक डाइकार्बोक्सिलिक अम्ल $C_4H_4O_4$ के दो समावयवी हैं। दोनों $Br_2/H_2O$ को रंगहीन करते हैं। गर्म करने पर **P** चक्रीय एनहाइड्राइड बनाता है।

तनु क्षारीय $KMnO_4$ द्वारा **P** और **Q** अलग–अलग अभिक्रिया कर एक अथवा एक से अधिक यौगिक **S, T** अथवा **U** बना सकते हैं।




**S** **T** **U**

**21.** Compounds formed form **P** and **Q** are, respectively : **[JEE (Advance)-2013, 3/120]**

(A) Optically active **S** and optically active pair **(T, U)**

(B*) Optically inactive **S** and optically inactive pair **(T, U)**

(C) Optically active pair **(T, U)** and optically active **S**

(D) Optically inactive pair **(T, U)** and optically inactive **S**

**P** तथा **Q** द्वारा बने यौगिक क्रमशः है **[JEE (Advance)-2013, 3/120]**

(A) ध्रुवण घूर्णक **S** एवं ध्रुवण घूर्णक युग्म **(T, U)**

(B*) ध्रुवण निष्क्रिय **S** एवं ध्रुवण निष्क्रिय युग्म **(T, U)**

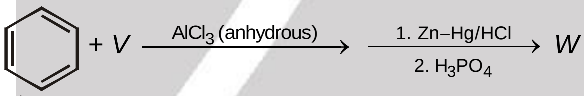
(C) ध्रुवण घूर्णक युग्म **(T, U)** एवं ध्रुवण घूर्णक **S**

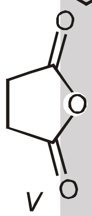
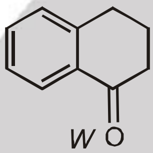
(D) ध्रुवण निष्क्रिय युग्म **(T, U)** एवं ध्रुवण निष्क्रिय **S**

**22.** In the following reaction sequences **V** and **W** are respectively :

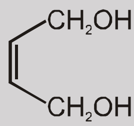
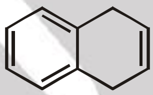
निम्नलिखित अभिक्रिया अनुक्रमों में, **V** और **W** क्रमशः हैं :

$$Q \xrightarrow[\Delta]{H_2/Ni} V$$

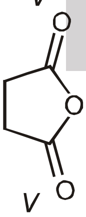
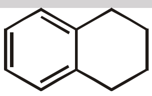



(A*)  and / और 

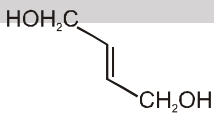
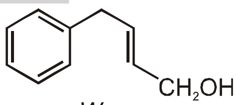
*V* *W*

(B)  and / और 

*V* *W*

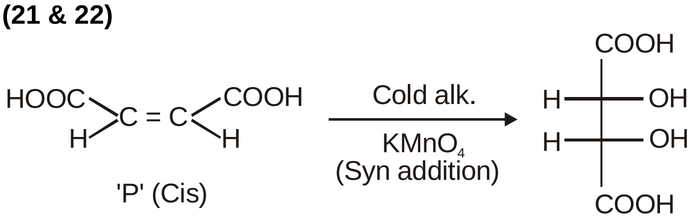
(C)  and / और 

*V* *W*

(D)  and / और 

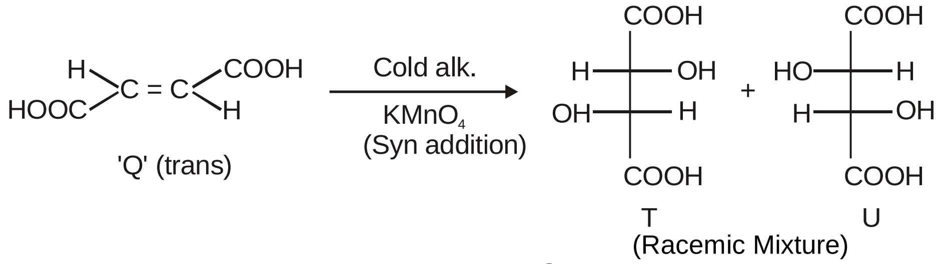
*V* *W*

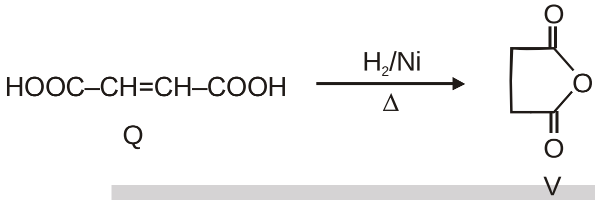
**Sol.** **(21 & 22)**

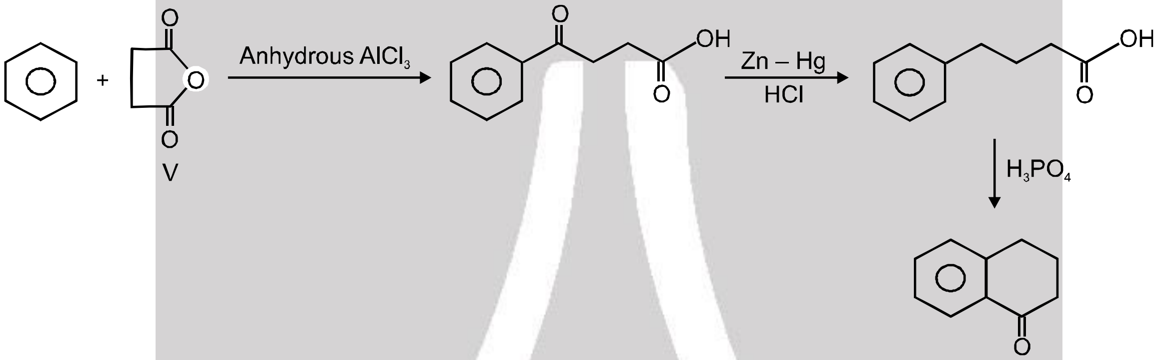



'P' (Cis)

Meso (S)

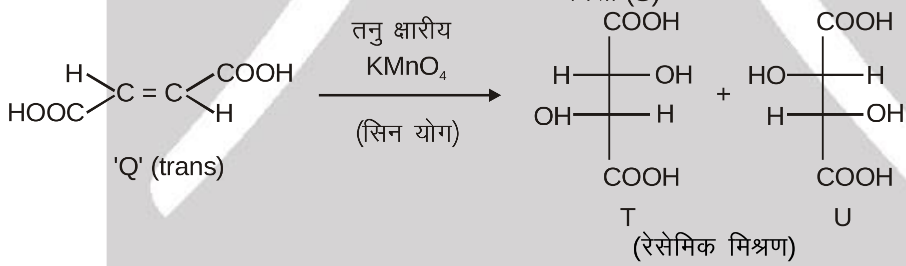

H
HOOC
C = C
COOH
H
'Q' (trans)
Cold alk.
KMnO4
(Syn addition)
COOH
H
OH
OH
H
COOH
+
HO
H
H
OH
T
U
(Racemic Mixture)

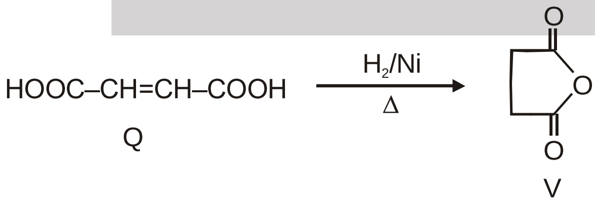

HOOC–CH=CH–COOH
Q
H2/Ni
Δ
O
O
O
V

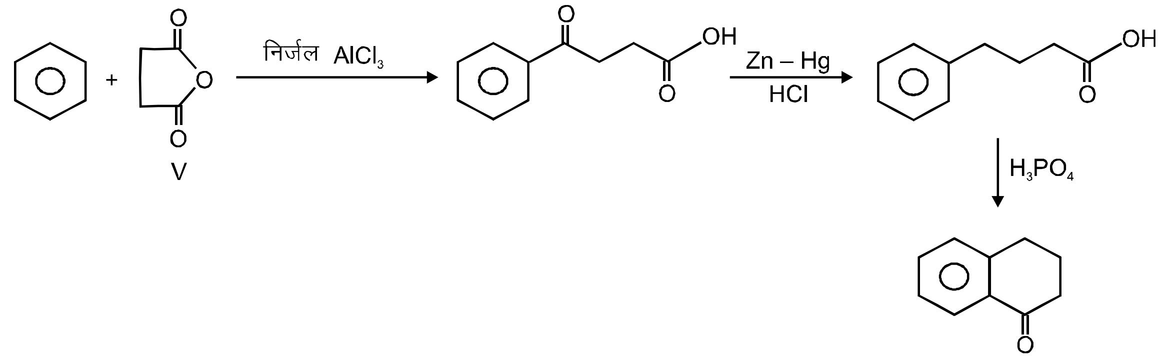

+
O
O
O
V
Anhydrous AlCl3
O
OH
O
Zn – Hg
HCl
OH
O
H3PO4
O

**Sol. (21 & 22)**

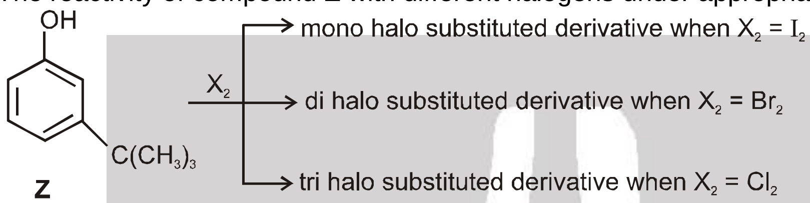
HOOC
H
C = C
COOH
H
'P' (Cis)
तनु क्षारीय
KMnO4
(सिन योग)
COOH
H
OH
H
OH
COOH
मिसो (S)


H
HOOC
C = C
COOH
H
'Q' (trans)
तनु क्षारीय
KMnO4
(सिन योग)
COOH
H
OH
OH
H
COOH
+
HO
H
H
OH
T
U
(रेसेमिक मिश्रण)


HOOC–CH=CH–COOH
Q
H2/Ni
Δ
O
O
O
V




**23.*** The reactivity of compound **Z** with different halogens under appropriate conditions is given below :



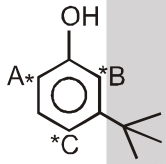

The observed pattern of electrophilic substitution can be explained by **[JEE(Advanced)-2014, 3/120]**

(A*) the steric effect of the halogen
(B*) the steric effect of the *tert-butyl* group
(C*) the electronic effect of the phenolic group
(D) the electronic effect of the *tert-butyl* group

यौगिक **Z** की भिन्न–भिन्न हैलोजनों के साथ अभिक्रियाशीलता उपयुक्त शर्तो में नीचे दर्शित है:

इलेक्ट्रानस्नेही प्रतिस्थापन (electrophilic substitution) से प्राप्त पैटर्न को स्पष्टीकृत किया जा सकता है

(A*) हैलोजन के त्रिविमी प्रभाव (steric effect) द्वारा
(B*) तृतीयक-ब्यूटिल समूह के त्रिविमी प्रभाव द्वारा
(C*) फिनॉलिक समूह के इलेक्ट्रॉनिक प्रभाव द्वारा
(D) तृतीयक-ब्यूटाइल समूह के इलेक्ट्रॉनिक प्रभाव द्वारा

**Sol.** 

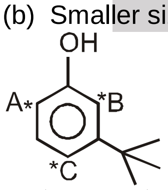

–OH group is strongly activating & O, P–directing due to its powerful +M effect.

With $I_2$ only A is substituted, since –I is large, steric inhibition by large $–CMe_3$ group forbids substitution at B or C.

–Br and –Cl become progessively more reactive, due to –

(a) increasing electrophilic nature of $X^{\oplus}$ (not mentioned is any option).

(b) Smaller size most sterically hindered loaction is B which is substituted only by –Cl.

**हल.** 


–OH समूह इसके प्रबल +M प्रभाव के कारण प्रबलतम सक्रियणकारी व O,P निर्देशी होता है।

$I_2$ के साथ केवल A प्रतिस्थापित होता है क्योंकि –I बड़ा होता है, बडे $–CMe_3$ समूह की त्रिविम बाधा के द्वारा B या C पर प्रतिस्थापन को निषेध करता है।

–Br तथा –Cl मुख्य रूप से अधिक क्रियाशील होते है, जिसका कारण यह है ;

(a) $X^{\oplus}$ की इलेक्ट्रान स्नेही प्रकृति बढ़ती है (किसी भी विकल्प में यह नहीं है।)

(b) छोटे आकार द्वारा सर्वाधिक त्रिविम बाधित स्थान B है जो केवल –Cl द्वारा प्रतिस्थापित है।

**24.** For the identification of β-naphthol using dye test, it is necesary to use : **[JEE(Advanced)-2014, 3/120]**

(A) dichloromethane solution of β-naphthol. (B) acidic solution of β-naphthol.
(C) neutral solution of β-naphthol. (D*) alkaline solution of β-naphthol.

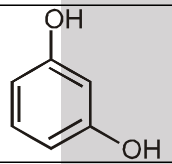
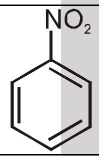
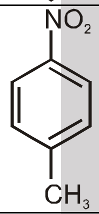
रंजक परीक्षण में β-नैफ्थॉल को पहचानने के लिए प्रयोग करना आवश्यक है : **[JEE(Advanced)-2014, 3/120]**

(A) β-नैफ्थॉल का डाइक्लोरोमिथेन विलयन (B) β-नैफ्थॉल का अम्लीय विलयन
(C) β-नैफ्थॉल का उदासीन विलयन (D*) β-नैफ्थॉल का क्षारीय विलयन

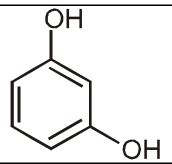
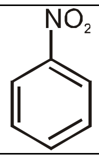
**Sol.** In dye test, phenolic –OH is converted to $-O^{\ominus}$, which activates the ring towards EAS. This is possible only in alkaline solution. Hence (D).

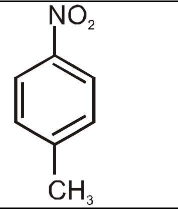
**हल.** रंजक परीक्षण में, फिनॉलिक –OH समूह $-O^{\ominus}$ में परिवर्तित हो जाता है जो वलय को EAS के प्रति सक्रिय कर देता है। यह केवल क्षारीय विलयन में ही सम्भव है। अतः उत्तर (D) होगा।

**25.** Match the four starting materials **(P, Q, R, S)** given in **List-I** with the corresponding reaction schemes **(I, II, III, IV)** provided in List II and select the correct answer using the code given below the lists. **[JEE(Advanced)-2014, 3/120]**

| | List-I | | List-II |
|---|---|---|---|
| P. | H—≡—H | 1. | Scheme I<br>(i) $KMnO_4$, $H\overset{\ominus}{O}$, heat (ii) $H^{\oplus}$, $H_2O$<br>(iii) $SOCl_2$, (iv) $NH_3$<br>? ⟶ $C_7H_6N_2O_3$ |
| Q. |  | 2. | Scheme II<br>(i) Sn/HCl (ii) $CH_3COCl$ (iii) conc. $H_2SO_4$<br>(iv) $HNO_3$ (v) dil. $H_2SO_4$, heat (vi) $HO^{\ominus}$<br>? ⟶ $C_6H_6N_2O_2$ |
| R. |  | 3. | Scheme III<br>(i) red hot iron, 873 K (ii) fuming $HNO_3$, $H_2SO_4$, heat<br>(iii) $H_2S.NH_3$ (iv) $NaNO_2$, $H_2SO_4$ (v) hydrolysis<br>? ⟶ $C_6H_5NO_3$ |
| S. |  | 4. | Scheme IV<br>(i) conc. $H_2SO_4$, 60ºC<br>(ii) conc. $HNO_3$, conc. $H_2SO_4$ (iii) dil. $H_2SO_4$, heat<br>? ⟶ $C_6H_5NO_4$ |

सूची-I में लिखित आरंभिक पदार्थों **(P, Q, R, S)** को सूची-**II** में लिखित अभिक्रिया योजनाओं (Scheme) **(I, II, III, IV)** से सुमेल कीजिए तथा सूचियों के नीचे दिये कोड का प्रयोग करके सही उत्तर चुनिये :

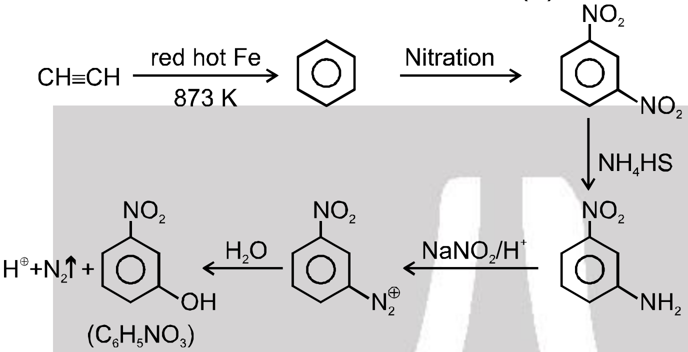
| | **सूची-I** | | **सूची-II** |
|---|---|---|---|
| P. | H—≡—H | 1. | योजना I<br>(i) $KMnO_4$, $H\overset{\ominus}{O}$, ऊष्मा (ii) $H^{\oplus}$, $H_2O$<br>(iii) $SOCl_2$, (iv) $NH_3$<br>? ⟶ $C_7H_6N_2O_3$ |
| Q. |  | 2. | योजना II<br>(i) Sn/HCl (ii) $CH_3COCl$ (iii) सान्द्र $H_2SO_4$<br>(iv) $HNO_3$ (v) तनु $H_2SO_4$, ऊष्मा (vi) $HO^{\ominus}$<br>? ⟶ $C_6H_6N_2O_2$ |
| R. |  | 3. | योजना III<br>(i) लाल तप्त लौह, 873 K (ii) धूम्र $HNO_3$, $H_2SO_4$, ऊष्मा<br>(iii) $H_2S.NH_3$ (iv) $NaNO_2$, $H_2SO_4$ (v) जल अपघटन<br>? ⟶ $C_6H_5NO_3$ |

| | | | |
|---|---|---|---|
| S. |  | 4. | योजना IV (i) सान्द्र $H_2SO_4$, 60ºC (ii) सान्द्र $HNO_3$, सान्द्र $H_2SO_4$ (iii) तनु $H_2SO_4$, ऊष्मा<br>? $\longrightarrow$ $C_6H_5NO_4$ |

Code (कोड) :

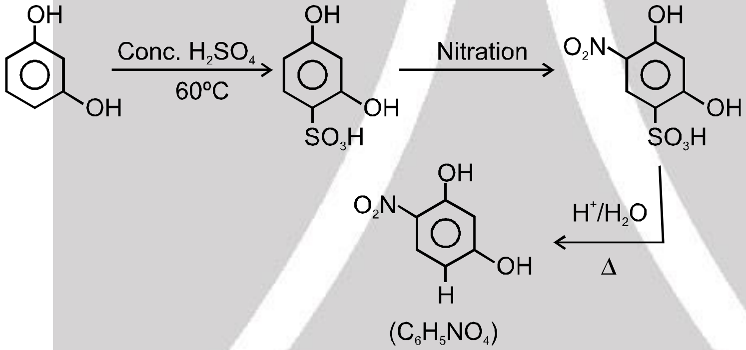
| | P | Q | R | S | | P | Q | R | S |
|---|---|---|---|---|---|---|---|---|---|
| (A) | 1 | 4 | 2 | 3 | (B) | 3 | 1 | 4 | 2 |
| (C*) | 3 | 4 | 2 | 1 | (D) | 4 | 1 | 3 | 2 |

**Sol.** **P :**



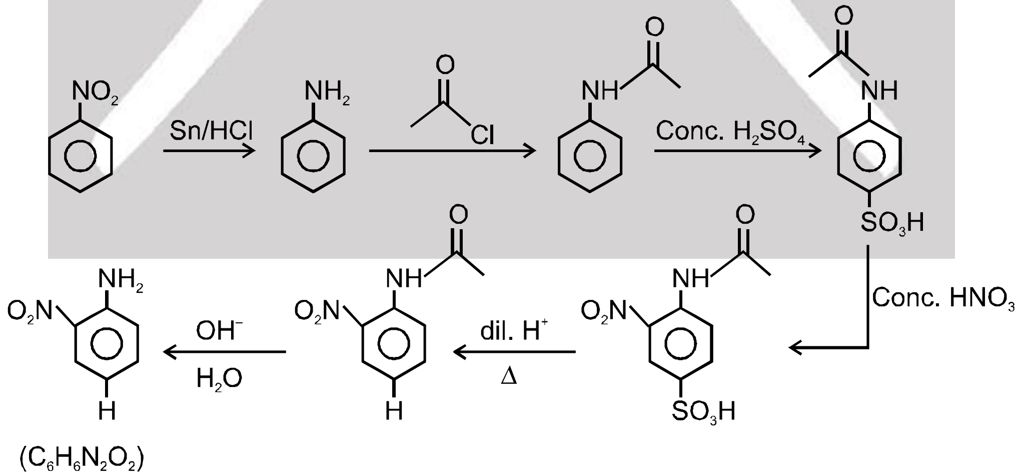

$\therefore$ P $\rightarrow$ 3

**Q :**

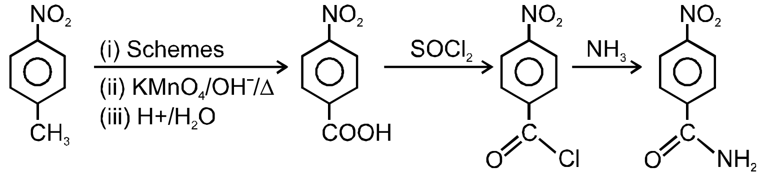



$\therefore$ Q $\rightarrow$ 4

**R :**




$\therefore$ R $\rightarrow$ 2

**S :** 

$(C_7H_6N_2O_3)$

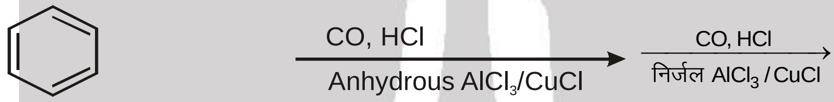
$\therefore$ S $\rightarrow$ 1

Hence the answer is (C) (अतः सही उत्तर (C) है।)

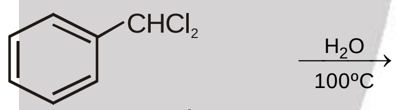
**Note :** Verifying any two can easily give you the answer complete details are given for reference & understanding.

**नोट :** आप अपने उत्तर को किन्ही दो के द्वारा आसानी से प्रमाणिक कर सकते हैं। आपके निर्देश (reference) तथा समझने के लिए पूर्ण विवरण दिया गया है।

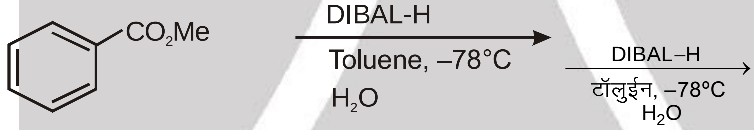
**26.** Among the following the number of reaction(s) that produce(s) benzaldehyde is
निम्नलिखित में बेन्जेल्डिहाइड (benzaldehyde) उत्पाद देने वाले अभिक्रिया (अभिक्रियाओं) की सख्या है

I. 

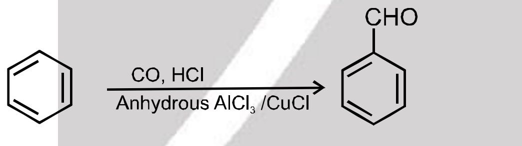
**[JEE(Advanced)-2015, 4/168]**

II. 

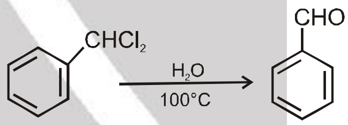
III.

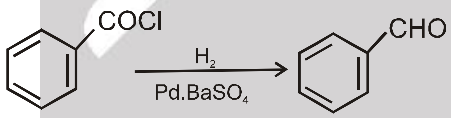
IV. 

**Ans.** 4

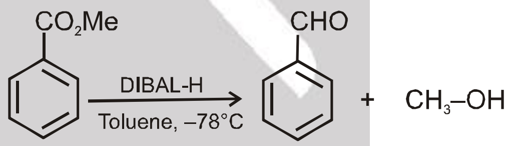
**Sol.** **(I)** 

(Gattermann Koch reaction)

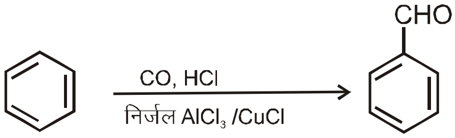
**(II)** 

**(III)** 

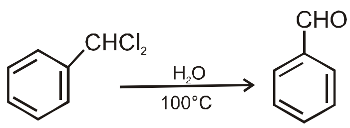
(Rosenmund's reaction)

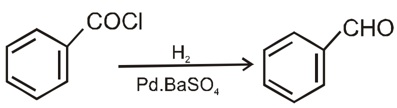
**(IV)** 

(Partial reduction)

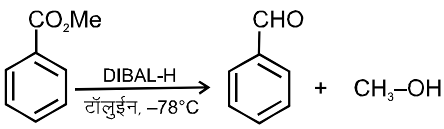
**हल.** **(I)** 

(गाटरमान कोच अभिक्रिया)

**(II)** 

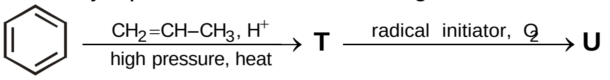
**(III)** 

(रोजेनमुण्ड अभिक्रिया)

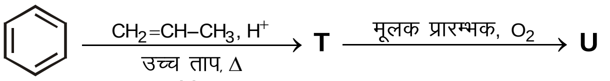
**(IV)** 

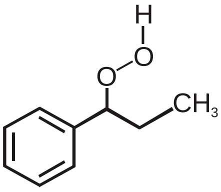
(आंशिक अपचयन)

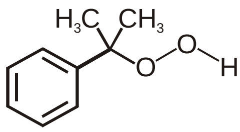
**27.*** The major product **U** in the following reactions is **[JEE(Advanced)-2015, 4/168]**

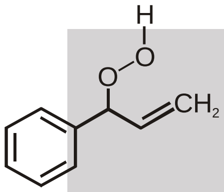


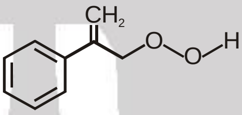

निम्नलिखित अभिक्रियाओं में मुख्य उत्पाद **U** है **[JEE(Advanced)-2015, 4/168]**



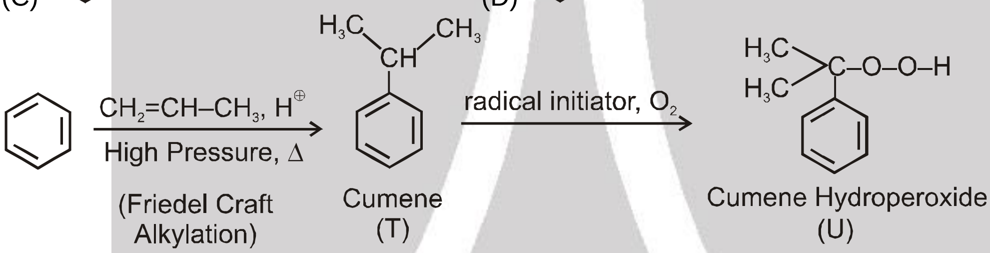

(A)


(B*)


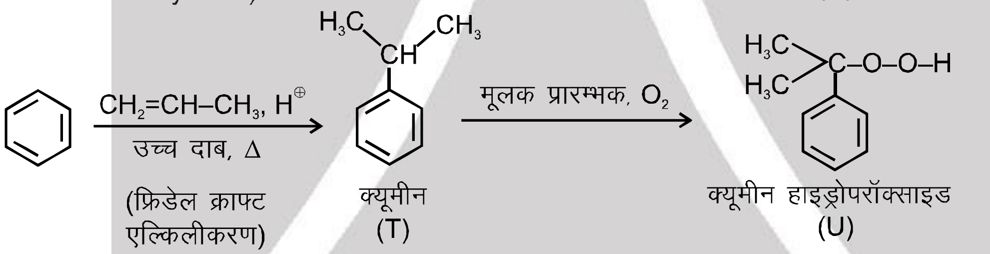
(C)


(D)


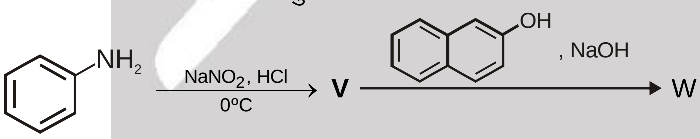
**Sol.**

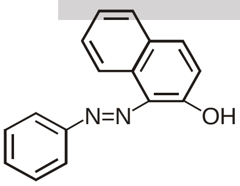


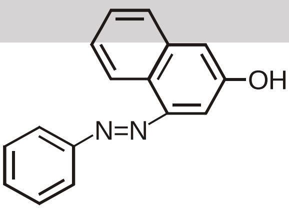

**हल**

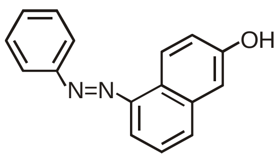


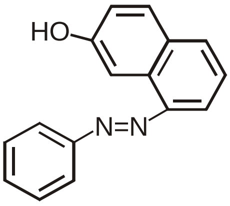

**28.** In the following reactions, the major product **W** is **[JEE(Advanced)-2015, 4/168]**
निम्नलिखित अभिक्रियाओं में मुख्य उत्पाद **W** है **[JEE(Advanced)-2015, 4/168]**

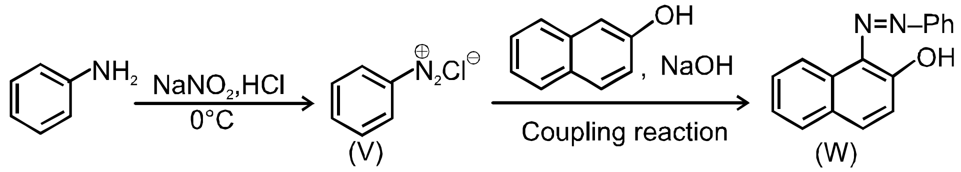


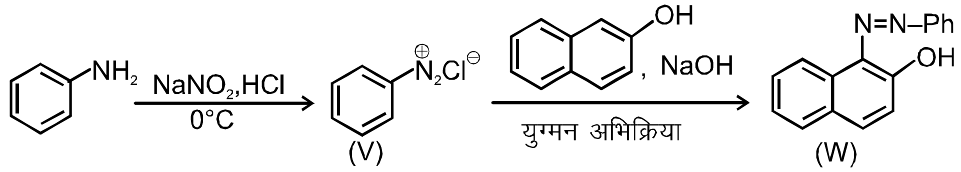

(A*)


(B)


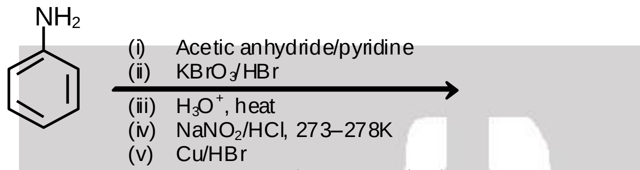
(C)


(D)


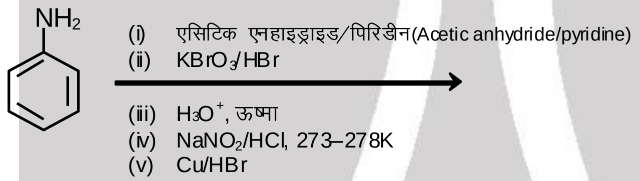
**Sol.** 

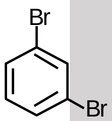

**Sol.** 

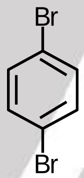

**29.*** The product(s) of the following reaction sequence is(are) **[JEE(Advanced)-2016, 4/124]**

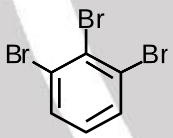


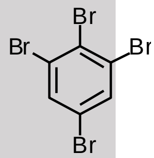

निम्नलिखित अभिक्रिया अभिक्रमक का(के) उत्पाद है/हैं **[JEE(Advanced)-2016, 4/124]**

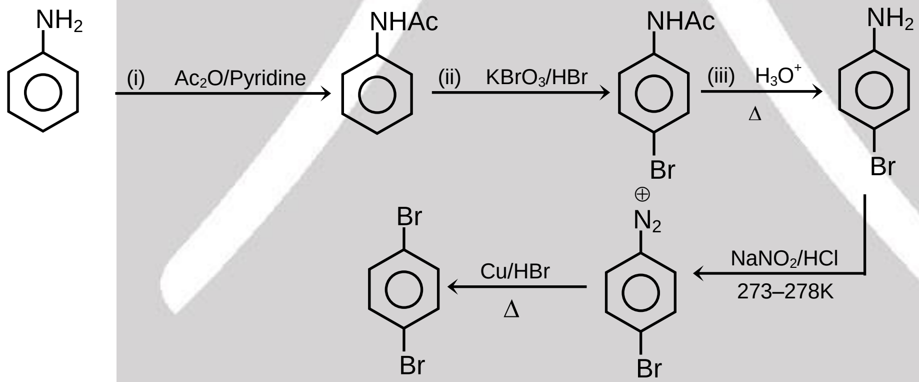


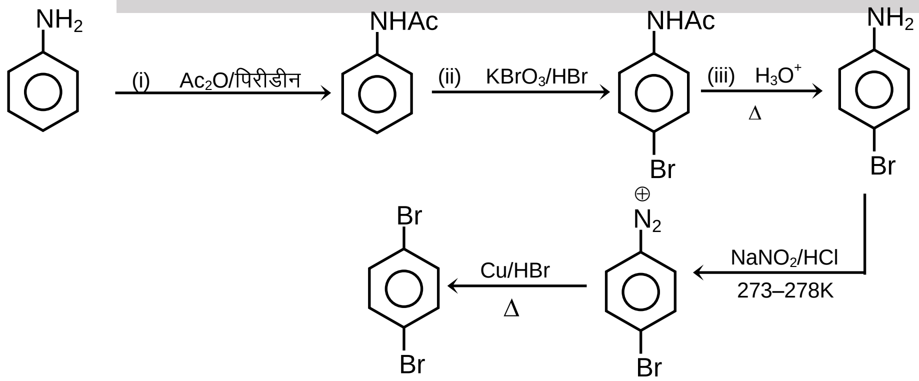

(A) 


(B*) 


(C) 


(D) 


**Sol.** 


**Sol.** 

**30.*** The correct statement(s) about the following reaction sequence is(are) **[JEE(Advanced)-2016, 4/124]**

Cumene ($C_9H_{12}$) $\xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } O_2}$ **P** $\xrightarrow{CHCl_3/NaOH}$ **Q** (major) + **R** (minor)

**Q** $\xrightarrow[PhCH_2Br]{NaOH}$ **S**

(A) **R** is steam volatile
(B*) **Q** gives dark violet coloration with 1% aqueous $FeCl_3$ solution
(C*) **S** gives yellow precipitate with 2, 4-dinitrophenylhydrazine
(D) **S** gives dark violet coloration with 1% aqueous $FeCl_3$ solution

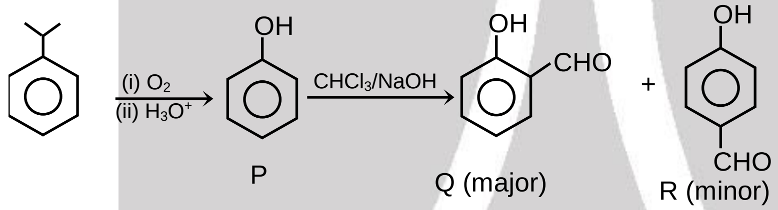
निम्नलिखित अभिक्रिया अभिक्रम से संबधित सही कथन है/हैं **[JEE(Advanced)-2016, 4/124]**

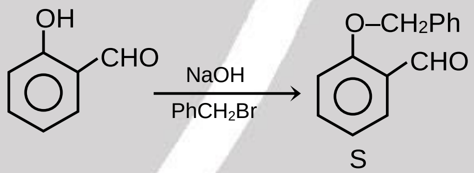
क्युमीन ($C_9H_{12}$) $\xrightarrow[\text{(ii) } H_3O^+]{\text{(i) } O_2}$ **P** $\xrightarrow{CHCl_3/NaOH}$ Q (मुख्य) + R (गौण)

**Q** $\xrightarrow[PhCH_2Br]{NaOH}$ **S**

(A) **R** भाप वाष्पशील है।
(B*) 1% जलीय $FeCl_3$ विलयन के साथ Q गहन बैंगनी रंग देता है।
(C*) 2, 4-डाइनाइट्रोफेनिलहाइड्रेजीन dinitrophenylhydrazine के साथ S पीला अवक्षेप देता है।
(D) 1% जलीय $FeCl_3$ विलयन के साथ S गहन बैंगनी रंग देता है।

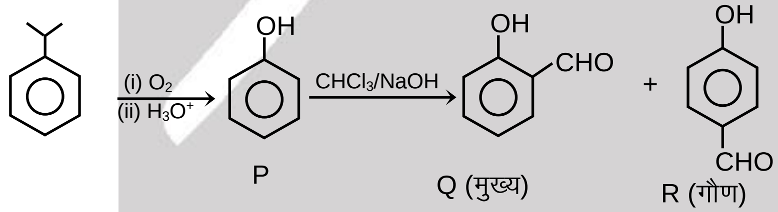
**Sol.**

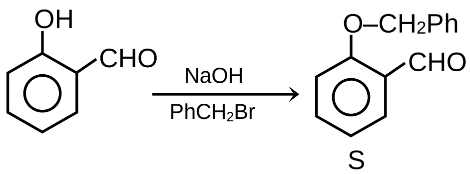



Q is steam volatile not R.
Q & R show positive test with 1% aqueous $FeCl_3$ Solution.
Q, R, S show positive 2,4-dinitrophenyl hydrazine.

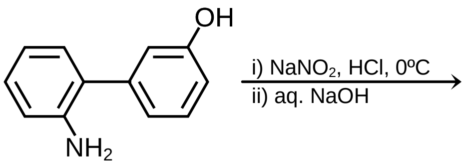
**Sol.**

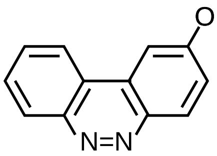


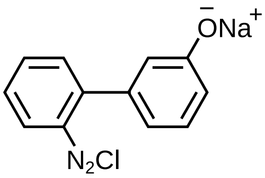



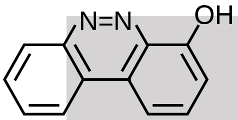

Q भाप वाष्पशील होता है R नहीं।
1% जलीय $FeCl_3$ विलयन के साथ Q व R धनात्मक परीक्षण देता है।
Q, R, S धनात्मक 2,4-डाईनाइट्रोफेनिल हाइड्रेजीन दर्शाता है।

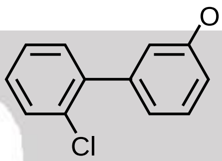
**31.** The major product of the following reaction is **[JEE(Advanced)-2017, 3/122]**
निम्नलिखित अभिक्रिया का मुख्य उत्पाद है– **[JEE(Advanced)-2017, 3/122]**



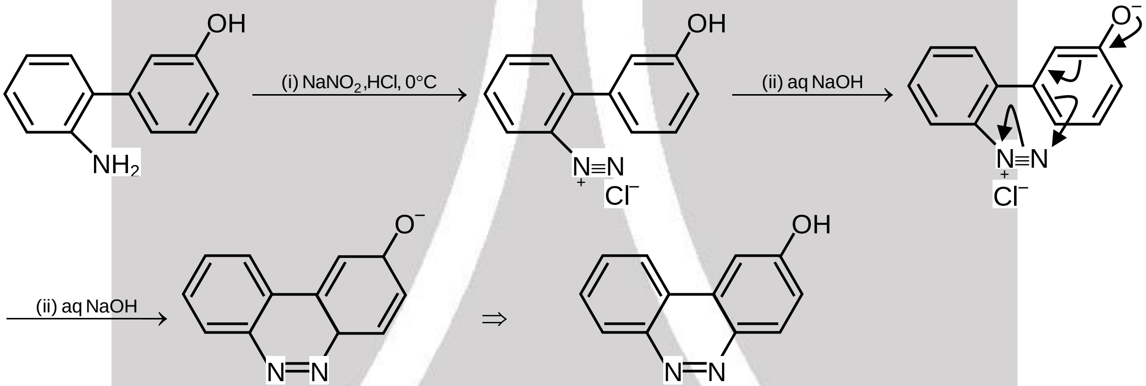

(A*) 


(B) 


(C) 


(D) 


**Sol.**

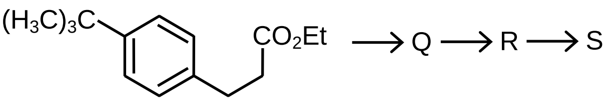



**Comprehension # 4 (Q.32 to 33)**

The reaction of compound **P** with $CH_3MgBr$(excess) in $(C_2H_5)_2O$ followed by addition of $H_2O$ gives **Q**. The compound **Q** on treatment with $H_2SO_4$ at 0ºC gives **R**. The reaction of **R** with $CH_3COCl$ in the presence of anhydrous $AlCl_3$ in $CH_2Cl_2$ followed by treatment with $H_2O$ produces compound **S**. [Et in compound **P** is ethyl group]

**अनुच्छेद # 3 (Q.32 से 33)**

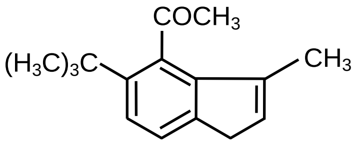
$(C_2H_5)_2O$ में यौगिक **P** की $CH_3MgBr$ की अधिकता के साथ अभिक्रिया के उपरान्त जल डालने पर **Q** मिलता है। यौगिक **Q** $H_2SO_4$ के साथ 0ºC पर विवेचन करने पर **R** देता है। $CH_2Cl_2$ में **R** की निर्जलीय $AlCl_3$ की उपस्थिति में $CH_3COCl$ के साथ अभिक्रिया के उपरान्त जल डालने पर यौगिक **S** उत्पन्न होता है। [यौगिक **P** में Et एथिल ग्रुप है।]

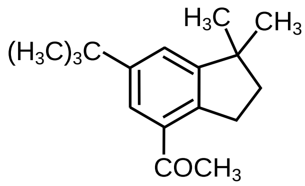


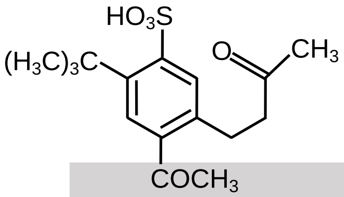

P

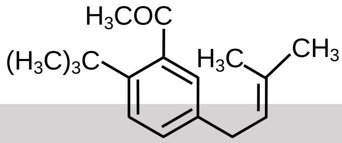
**32.** The product **S** is **[JEE(Advanced)-2017, 3/122]**

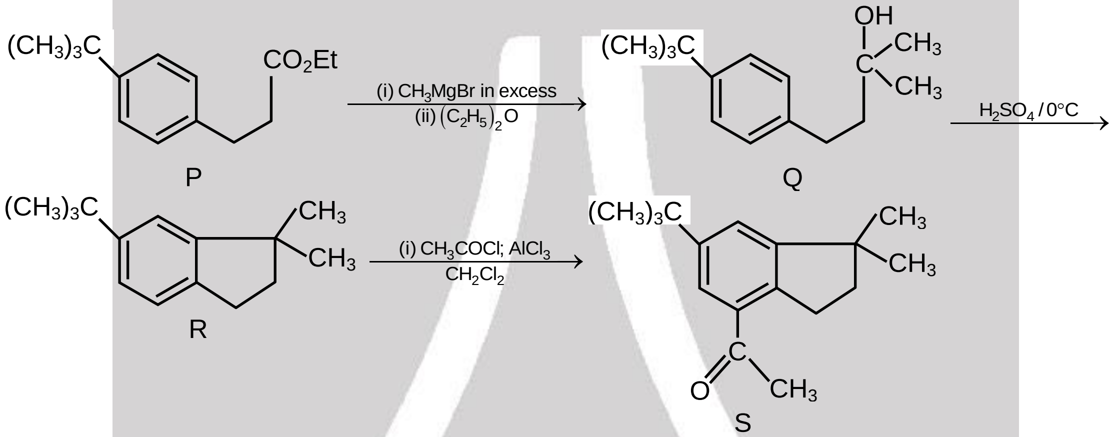
उत्पाद **S** है। **[JEE(Advanced)-2017, 3/122]**

(A) 

(B*) 

(C) 

(D) 

**Sol.** 

**33.** The reactions, **Q** to **R** and **R** to **S**, are **[JEE(Advanced)-2017, 3/122]**

(A) Aromatic sulfonation and Friedel-Crafts acylation

(B*) Friedel-Crafts alkylation and Friedel-Crafts acylation

(C) Friedel-Crafts alkylation, dehydration and Friedel-Crafts acylation

(D) Dehydration and Friedel-Crafts acylation

**Q** से **R** और **R** से **S** अभिक्रियाएँ हैं **[JEE(Advanced)-2017, 3/122]**

(A) ऐरोमेटिक सल्फोनैसन और फ्रीडल–क्राफ्ट ऐसिलिकरण (Friedel-Crafts acylation)

(B*) फ्रीडल–क्राफ्ट एल्किलीकरण (Friedel-Crafts alkylation) और फ्रीडल–क्राफ्ट ऐसिलिकरण (Friedel-Crafts acylation)

(C) फ्रीडल–क्राफ्ट एल्किलीकरण (Friedel-Crafts alkylation), निर्जलीकरण और फ्रीडल–क्राफ्ट ऐसिलिकरण (Friedel-Crafts acylation)

(D) निर्जलीकरण और फ्रीडल–क्राफ्ट ऐसिलिकरण (Friedel-Crafts acylation)

**Sol.** Process involved in Q $\longrightarrow$ R reaction is alkylation

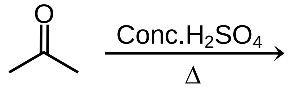
Process involved in R $\longrightarrow$ S reaction is acylation.

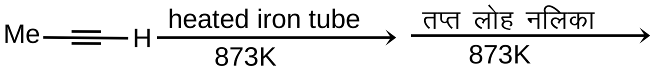
**हल :** प्रक्रम Q $\longrightarrow$ R अभिक्रिया में एल्कलीकरण है।

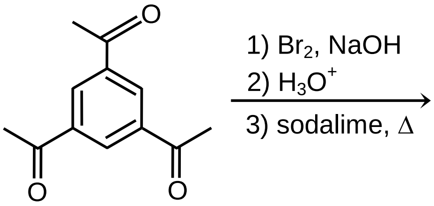
प्रक्रम R $\longrightarrow$ S अभिक्रिया में ऐसिलीकरण होती है।

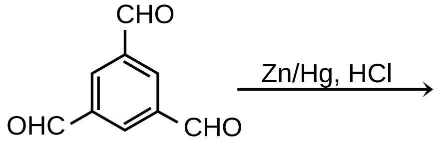
**34.*** The reaction(s) leading to the formation of 1,3,5-trimethylbenzene is (are)
अभिक्रिया (अभिक्रियाएँ) जो 1,3,5-ट्राईमेथिलबेंजीन (1,3,5-trimethylbenzene) की रचना करती है (हैं)

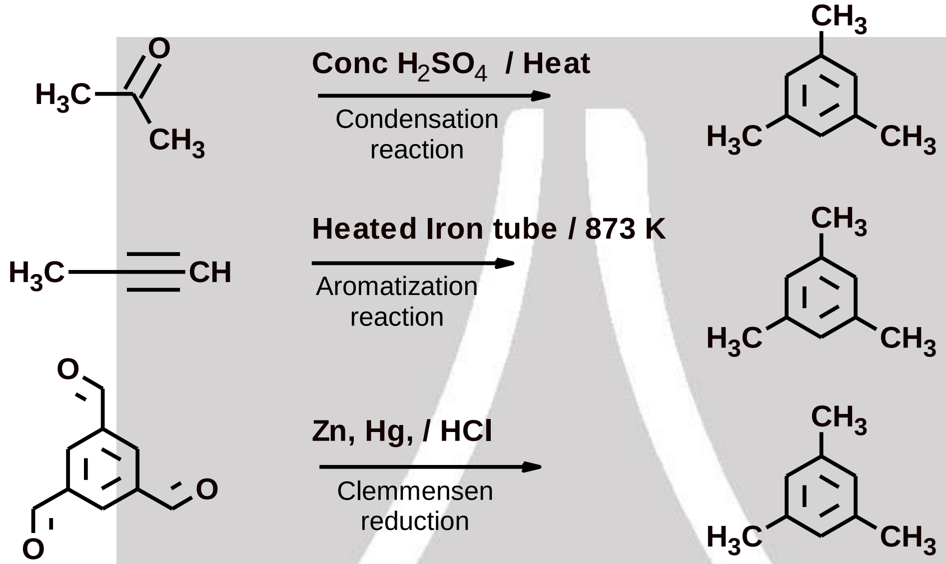
**[JEE(Advanced)-2018, 4/120]**

(A*) 


(B*) 


(C) 


(D*) 

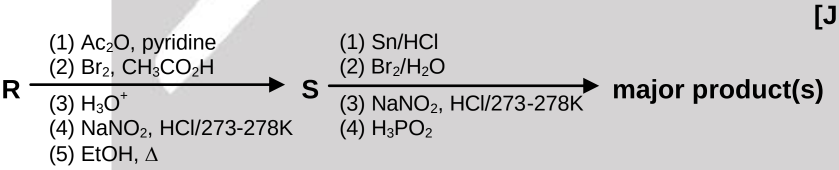

**Sol.** 

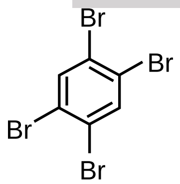

**35.*** Aniline reacts with mixed acid (conc. $HNO_3$ and conc. $H_2SO_4$) at 288 K to give **P** (51%), **Q** (47%) and R (2%). The major product(s) of the following reaction sequence is (are)

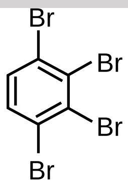
**[JEE(Advanced)-2018, 4/120]**

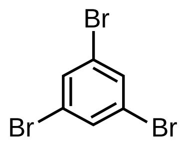
ऐनिलिन मिश्र अम्ल (सान्द्र $HNO_3$ तथा सान्द्र $H_2SO_4$) के साथ 288 K पर अभिक्रिया करके **P** (51%), **Q** (47%) और R (2%) देता है। निम्नलिखित अभिक्रिया अनुक्रमों का (के) मुख्य उत्पाद (major product(s)) है (हैं)

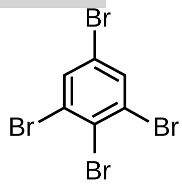
**[JEE(Advanced)-2018, 4/120]**



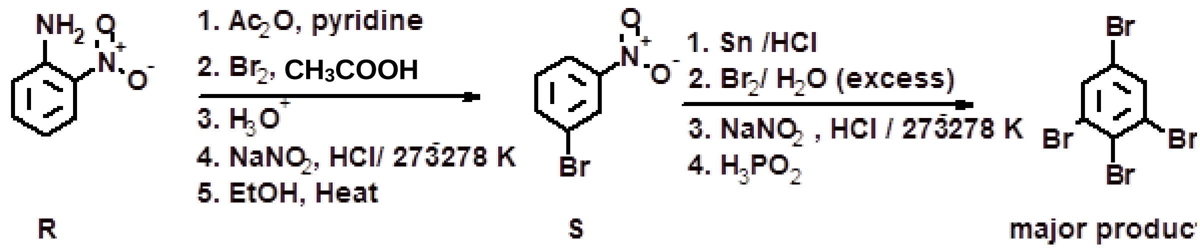

(A) 


(B) 


(C) 

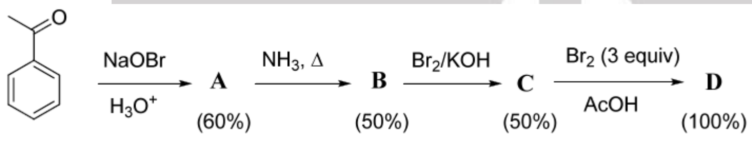

(D*) 

**Sol.**



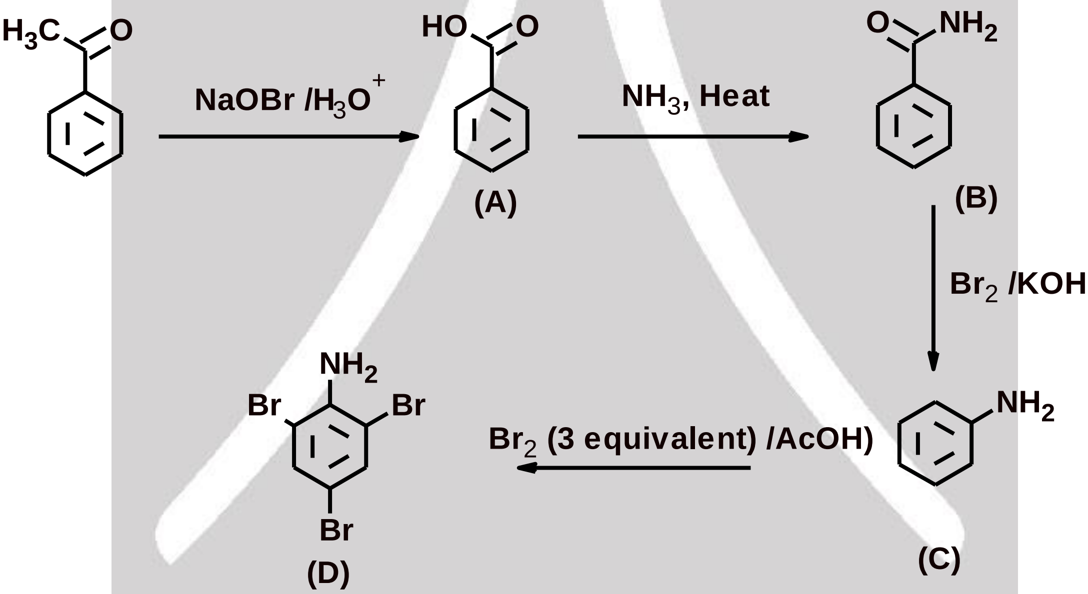

**36.** In the following reaction sequence, the amount of D (in g) formed from 10 moles of acetophenone is…..... (Atomic weights in g $mol^{-1}$ : H = 1, C = 12, N = 14, O = 16, Br = 80. The yield (%) corresponding to the product in each step is given in the parenthesis) **[JEE(Advanced)-2018, 3/120]**

निम्नलिखित अभिक्रिया अनुक्रम में, ऐसीटोफीनॉन के 10 मोल से प्राप्त D की बनी मात्रा (ग्राम में)..............है।
(दिया गया है, परमाणु भार g $mol^{-1}$ में : H = 1, C = 12, N = 14, O = 16, Br = 80. प्रत्येक चरण में उत्पाद की उपज (%) कोष्ठक में दी गयी है) **[JEE(Advanced)-2018, 3/120]**




**Ans.** **495**

**Sol.**



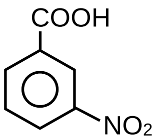
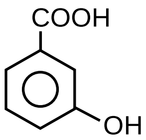
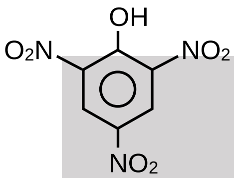
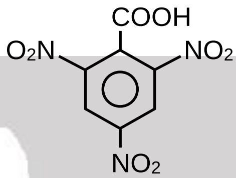

Moles of D formed = 10 x 0.6 x0.5 x 0.5 x 1 =1.5
Mass of D formed = 1.5 x 330 = 495 gram
निर्मित D के मोल = 10 x 0.6 x 0.5 x 0.5 x 1 =1.5
निर्मित D का द्रव्यमान = 1.5 x 330 = 495 gram

# PART - II : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

## भाग - II : JEE (MAIN) / AIEEE (पिछले वर्षो) के प्रश्न

## JEE(MAIN) OFFLINE PROBLEMS

**1.** Picric acid is **[AIEEE-2002, 3/225]**
पिक्रिक अम्ल है

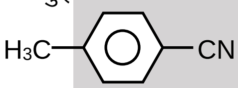
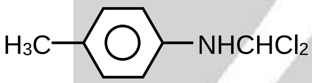
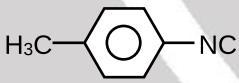
(1) 
(2) 
(3*) 
(4) 

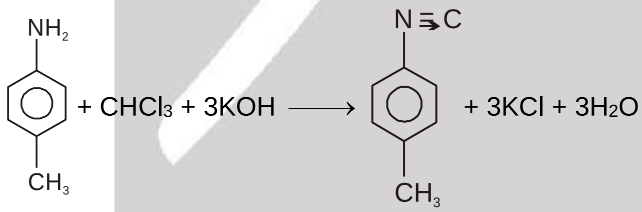
**Sol.** It is 2, 4, 6-trinitrophenol.
यह 2, 4, 6-ट्राईनाइट्रोफीनॉल है।

**2.** When primary amine reacts with chloroform in ethanolic KOH then the product is: **[AIEEE-2002, 3/225]**
(1*) an isocyanide. (2) an aldehyde. (3) a cyanide. (4) an alcohol.
प्राथमिक ऐमीन को क्लोरोफॉर्म तथा ऐथेनॉलिक KOH के साथ गर्म करने पर, प्राप्त उत्पाद क्या होगा: **[AIEEE-2002, 3/225]**
(1*) आइसोसायनाइड। (2) ऐल्डिहाइड। (3) सायनाइड। (4) ऐल्कोहॉल।

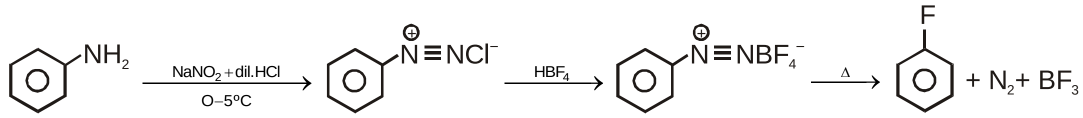
**Sol.** $R–CH_2–NH_2 + CHCl_3 + 3KOH \rightarrow R–CH_2–N \equiv C + 3KCl + 3HCl$.

**3.** The reaction of chloroform with alcoholic KOH and p-toluidine forms : **[AIEEE-2003, 3/225]**
पैरा–टालुईडिन की क्लोरोफार्म एवं एल्कोहलिक KOH के साथ अभिक्रिया के फलस्वरूप प्राप्त उत्पाद निम्न में से होगा ?

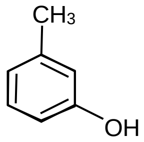
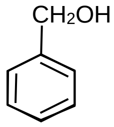
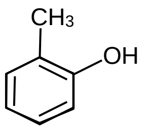
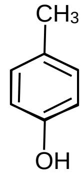
(1) 
(2)
(3) 
(4*) 

**Sol.** 

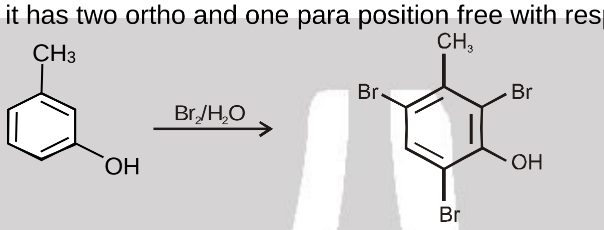
**4.** Fluorobenzene ($C_6H_5F$) can be synthesized in the laboratory **[AIEEE-2006, 3/165]**
(1*) from aniline by diazotisation followed by heating the diazonium salt with $HBF_4$.
(2) by direct fluorination of benzene with $F_2$ gas.
(3) by reacting bromobenzene with NaF solution.
(4) by heating phenol with HF and KF.
प्रयोगशाला में फ्लोरोबेंन्जीन ($C_6H_5F$) का संश्लेषण किया जा सकता है **[AIEEE-2006, 3/165]**
(1*) एनिलीन के डाईएजोटीकरण, उसके बाद डाईएजोनियम लवण को $HBF_4$ के साथ गर्म करने पर
(2) बेन्जीन का $F_2$ गैस के साथ सीधे फ्लोरीनीकरण द्वारा
(3) ब्रोमोबेंन्जीन की NaF विलयन के साथ अभिक्रिया द्वारा
(4) फीनॉल को HF तथा KF के साथ गर्म करने पर

**Sol.** 

**5.** The structure of the compound that gives a tribromo derivative on treatment with bromine water is :
निम्न में से कौनसी संरचना ब्रोमीन जल के साथ ट्राईब्रोमो व्युत्पन्न देती है। **[AIEEE-2006, 3/165]**

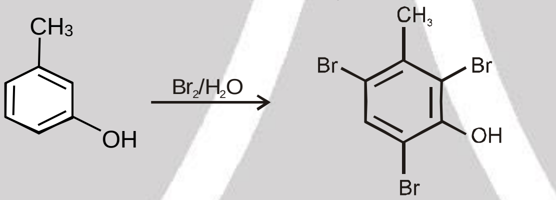
(1*)  (2)  (3)  (4) 

**Sol.** Since the compound on treatment with $Br_2$/water gives a tribromoderivative, therefore it must be m-cresol, because it has two ortho and one para position free with respect to –OH group.

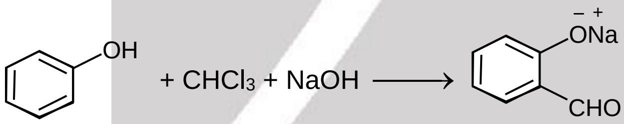


2, 4, 6, -tribromo-3-methylphenol

**Sol.** यौगिक ब्रोमीनजल ($Br_2/H_2O$) से अभिकृत होकर ट्राइब्रोमोव्युत्पन्न देता है अतः यौगिक m-क्रीसॉल होना चाहिए क्योंकि यह –OH के सापेक्ष दो ऑर्थो तथा एक पैरा स्थिति मुक्त रखता है।



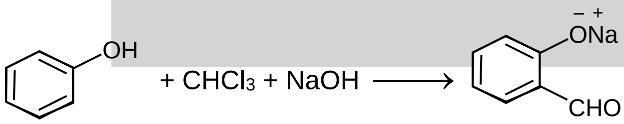
2, 4, 6, -ट्राईब्रोमो-3-मेथिल फिनॉल

**6.** 

The electrophile involved in the above reaction is : **[AIEEE-2006, 3/165]**

(1) Dichloromethyl cation ($\overset{\oplus}{C}HCl_2$) (2*) Dichlorocarbene ($:CCl_2$)

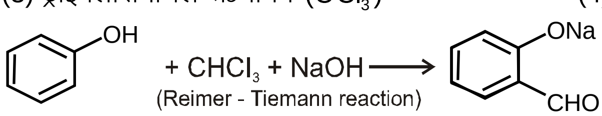
(3) Trichloromethyl anion ($\overset{\ominus}{C}Cl_3$) (4) Formyl cation ($\overset{\oplus}{C}HO$)



उपरोक्त अभिक्रिया में इलेक्ट्रॉनस्नेही होगा : **[AIEEE-2006, 3/165]**

(1) डाईक्लोरोमेथिल धनायन ($\overset{\oplus}{C}HCl_2$) (2*) डाईक्लोरोकार्बीन ($:CCl_2$)

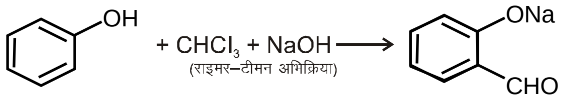
(3) ट्राईक्लोरोमेथिल ऋणायन ($\overset{\ominus}{C}Cl_3$) (4) फॉर्मिल धनायन ($\overset{\oplus}{C}HO$)

**Sol.** 

The electrophile is dichlorocarbene, ($:CCl_2$) generated from chloroform by the action of a base

$$OH^- + CHCl_3 \rightleftharpoons HOH + :\overset{\ominus}{C}Cl_3$$

$: \overset{\ominus}{C}Cl_3 \longrightarrow Cl^{\ominus} + :CCl_2$

**Sol.** 


डाईक्लोरोकार्बीन (:$CCl_2$) इलेक्ट्रॉनस्नेही है जो क्षार की क्लोरोफॉर्म पर अभिक्रिया से बनता है।

$$OH^- + CHCl_3 \rightleftharpoons HOH + :\overset{\ominus}{C}Cl_3$$

$$:\overset{\ominus}{C}Cl_3 \longrightarrow Cl^{\ominus} + :CCl_2$$

**7.** In the chemical reaction, $CH_3CH_2NH_2 + CHCl_3 + 3KOH \rightarrow (A) + (B) + 3H_2O$, the compounds (A) and (B) are respectively, **[AIEEE-2007, 3/120]**

(1) $C_2H_5NC$ and $K_2CO_3$ (2*) $C_2H_5NC$ and 3KCl
(3) $C_2H_5CN$ and 3KCl (4) $CH_3CH_2CONH_2$ and 3KCl

एक रासायनिक अभिक्रिया, $CH_3CH_2NH_2 + CHCl_3 + 3KOH \rightarrow (A) + (B) + 3H_2O$, में यौगिक (A) व (B) क्रमश होगें: **[AIEEE-2007, 3/120]**

(1) $C_2H_5NC$ और $K_2CO_3$ (2*) $C_2H_5NC$ और 3KCl
(3) $C_2H_5CN$ और 3KCl (4) $CH_3CH_2CONH_2$ और 3KCl

**Sol.** $CH_3\ CH_2NH_2 + CHCl_3 + 3KOH \rightarrow C_2H_5NC + 3KCl + 3H_2O$

**8.** Phenol, when it first reacts with concentrated sulphuric acid and then with concentrated nitric acid, gives **[AIEEE-2008, 3/105]**

(1*) o-nitrophenol (2) p-nitrophenol (3) nitrobenzene (4)2,4,6-rinitrobenzene

फिनॉल पहले सान्द्र $H_2SO_4$ से अभिक्रिया करता है तथा बाद में सान्द्र $HNO_3$ से, तो उत्पाद होगा। **[AIEEE-2008, 3/105]**

(1) o-नाइट्रोफिनॉल (2) p-नाइट्रोफिनॉल (3) नाइट्रोबेन्जीन (4) 2,4,6-ट्राइनाइट्रोबेन्जीन

**9.** Toluene is nitrated and the resulting product is reduced with tin and hydrochloric acid. The product so obtained is diazotised and then heated with cuprous bromide. The reaction mixture so formed contains : **[AIEEE-2008, 3/105]**

(1) mixture of o- and p-dibromobenzenes (2) mixture of o- and p-bromoanilines
(3) mixture of o- and m-bromotoluenes (4*) mixture of o- and p-bromotoluenes

टालूईन का नाइट्रीकरण करके, प्राप्त उत्पाद को अपचयित किया जाता है। प्राप्त उत्पाद का डाईऐजोटीकरण किया जाता है और फिर उसे CuBr के साथ गर्म किया जाता है इस तरह प्राप्त उत्पाद होगा। **[AIEEE-2008, 3/105]**

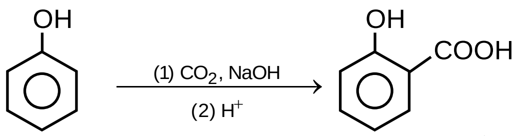
(1) o- तथा p-डाइब्रोमोबेन्जीन का मिश्रण (2) o- तथा p-ब्रोमोएनिलीन का मिश्रण
(3) o- तथा m-ब्रोमोटालुईन का मिश्रण (4) o- तथा p-ब्रेमोटालुईन का मिश्रण

**10.** The major product obtained on interaction of phenol with sodium hydroxide and carbon dioxide is : **[AIEEE-2009, 4/144]**

(1) salicylaldehyde (2*) salicylic acid (3) phthalic acid (4) benzoic acid

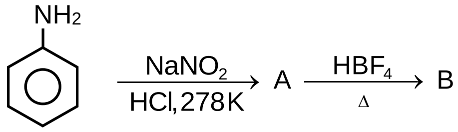
फिनॉल की सोडियम हाइड्रॉक्साइड तथा कार्बनडाइऑक्साइड के साथ अभिक्रिया में प्राप्त होने वाला मुख्य उत्पाद है : **[AIEEE-2009, 4/144]**

(1) सैलिसिलैल्डिहाइड (2*) सैलिसिलिक अम्ल (3) थैलिक अम्ल (4) बेंजोइक अम्ल

**Sol.** 

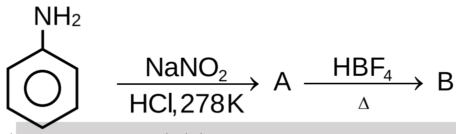

Salicylic acid (सैलिसिलिक अम्ल)

**11.** In the chemical reactions the compounds 'A" and 'B' respectively are : **[AIEEE-2010, 4/144]**



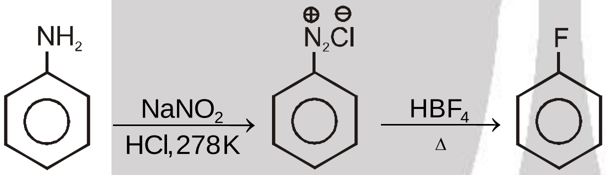

(1) nitrobenzene and fluorobenzene
(2) phenol and benzene
(3*) benzene diazonium chloride and fluorobenzene
(4) nitrobenzene and chlorobenzene

रासायनिक अभिक्रियाओं में यौगिक 'A" और 'B' क्रमशः हैं : **[AIEEE-2010, 4/144]**




(1) नाइट्रोबेन्जीन तथा क्लोरोबेन्जीन (2) फीनॉल तथा बेन्जीन
(3*) बेंजीन डाइऐजोनियम क्लोराइड तथा फ्लोरोबेन्जीन (4) नाइट्रोबेन्जीन तथा क्लोरोबेन्जीन

**Sol.**



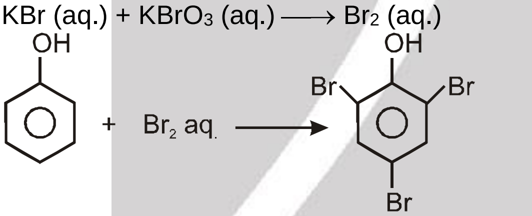

**12.** Phenol is heated with a solution of mixture of KBr and $KBrO_3$. The major product obtained in the above reaction is : **[AIEEE-2011, 4/144]**

(1) 2-Bromophenol (2) 3-Bromophenol (3) 4-Bromophenol (4*) 2,4,6-Tribromophenol

KBr और $KBrO_3$ के मिश्रण के एक घोल को फीनॉल के साथ गर्म किया जाता है। इस अभिक्रिया में जो मुख्य उत्पाद प्राप्त हुआ वह है : **[AIEEE-2011, 4/144]**

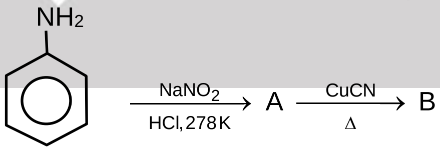
(1) 2-ब्रोमोफीनॉल (2) 3-ब्रोमोफीनॉल (3) 4-ब्रोमोफीनॉल (4*) 2,4,6-ट्राईब्रोमोफीनॉल

**Sol.** KBr (aq.) + $KBrO_3$ (aq.) $\longrightarrow$ $Br_2$ (aq.)



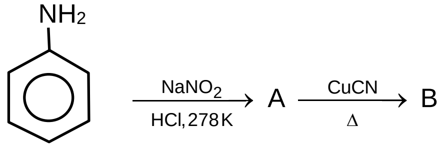

2, 4, 6-tribromophenol

**13.** In the following chemical reactions, the compounds A and B are respectively : **[AIEEE-2011, 4/144]**



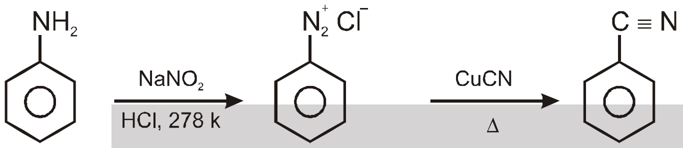

(1*) Benzene diazonium chloride and benzonitrile
(2) Nitrobenzene and chlorobenzene
(3) Phenol and bromobenzene
(4) Fluorobenzene and phenol

निम्न अभिक्रिया में यौगिक A तथा B क्रमशः हैं : **[AIEEE-2011, 4/144]**



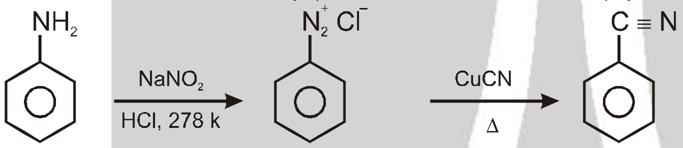
(1*) बेन्जीन डाईएजोनियम क्लोराइड और बेन्जोनाइट्राइल
(2) नाइट्रोबेन्जीन और क्लोरोबेन्जीन
(3) फीनॉल और ब्रोमोबेन्जीन
(4) फ्लोरोबेन्जीन और फीनॉल

**Sol.**



Benzene diazonium chloride (A)    Benzonitrile (B)

**Sol.**



बेन्जीन डाईएजोनियम क्लोराइड (A)    बेन्जोनाइट्राइल (B)

**14.** An organic compound A upon reacting with $NH_3$ gives B. On heating B gives C. C in presence of KOH reacts with $Br_2$ to given $CH_3CH_2NH_2$. A is : **[JEE (Main) 2013, 4/120]**

एक कार्बनिक यौगिक A, $NH_3$ के साथ क्रिया कराने पर B देता है, जो गर्म करने पर C देता है। KOH की उपस्थिति में C, $Br_2$ के साथ क्रिया करके $CH_3CH_2NH_2$ देता है। A है : **[JEE (Main) 2013, 4/120]**

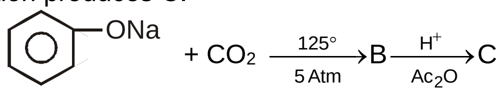
(1) $CH_3COOH$    (2) $CH_3CH_2CH_2COOH$

(3) $CH_3-CH(CH_3)-COOH$    (4*) $CH_3CH_2COOH$

**Sol.** $\underset{(A)}{CH_3CH_2-\overset{O}{\overset{||}{C}}-OH} \xrightarrow{NH_3} \underset{(B)}{CH_3CH_2CO\overset{\ominus}{O}\overset{\oplus}{N}H_4} \xrightarrow{\Delta} \underset{(C)}{CH_3-CH_2-\overset{O}{\overset{||}{C}}-NH_2} \xrightarrow[\text{Hofmann bromamide reaction}]{Br_2, KOH} CH_3-CH_2-NH_2$

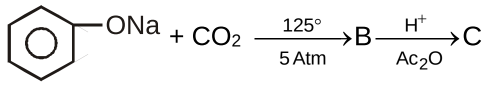
**हल.** $\underset{(A)}{CH_3CH_2-\overset{O}{\overset{||}{C}}-OH} \xrightarrow{NH_3} \underset{(B)}{CH_3CH_2CO\overset{\ominus}{O}\overset{\oplus}{N}H_4} \xrightarrow{\Delta} \underset{(C)}{CH_3-CH_2-\overset{O}{\overset{||}{C}}-NH_2} \xrightarrow[\text{हॉफमान ब्रोमेमाइड अभिक्रिया}]{Br_2, KOH} CH_3-CH_2-NH_2$

**15.** Sodium phenoxide when heated with $CO_2$ under pressure at 125°C yields a product which on acetylation produces C. **[JEE(Main)-2014, 4/120]**

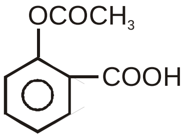
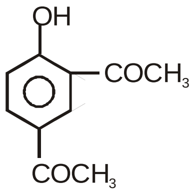
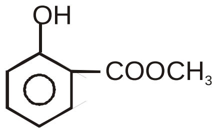
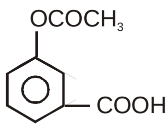


The major product C would be :

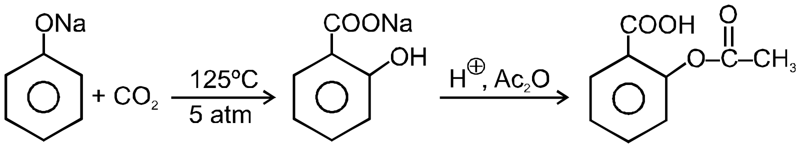
सोडियम फिनॉक्साइड की उच्च दाब और 125°C पर $CO_2$ से अभिक्रिया करने पर जो यौगिक प्राप्त होता है उसके एसीटिलीकरण पर उत्पाद C प्राप्त होता है। **[JEE(Main)-2014, 4/120]**



उत्पाद C होगा :

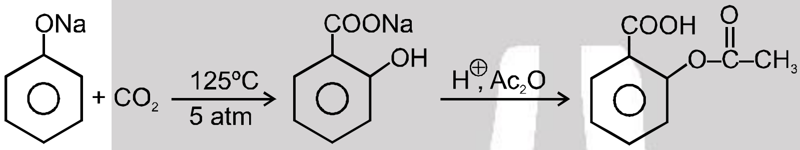
(1*) 
(2) 
(3) 
(4) 

**Sol.** It is a kolbe schmidt reaction.



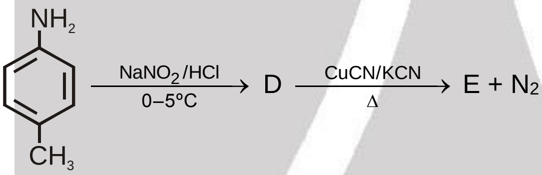
Aspirin
(pain Killer)

**Sol.** यह एक कोल्बे–श्मिट अभिक्रिया है।



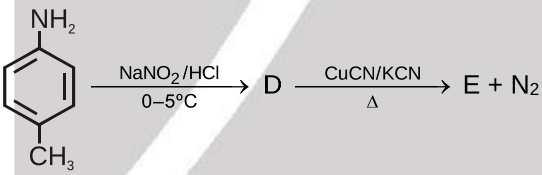
एस्प्रीन
(दर्द निवारक)

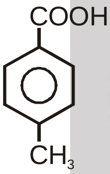
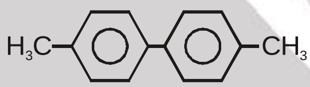
**16.** In the reaction

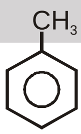


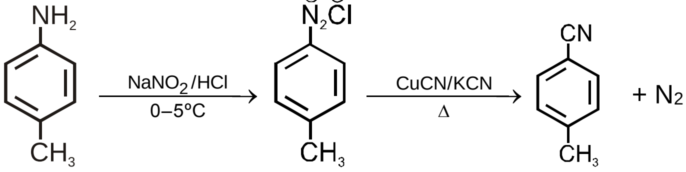
the product E is : **[JEE(Main)-2015, 4/120]**

दिए गए अभिक्रिया में उत्पाद E है : **[JEE(Main)-2015, 4/120]**



(1) 
(2) 

(3*)
(4) 

**Sol.** 

**17.** In the Hofmann bromamide degradation reaction, the number of moles of NaOH and $Br_2$ used per mole of amine produced are : **[JEE(Main)-2016, 4/120]**

(1) Four moles of NaOH and two moles of $Br_2$ (2) Two moles of NaOH and two moles of $Br_2$
(3*) Four moles of NaOH and one mole of $Br_2$ (4) One mole of NaOH and one mole of $Br_2$

हॉफमान ब्रोमामाइड निम्नीकरण अभिक्रिया में, NaOH तथा $Br_2$ के प्रयुक्त मोलों की संख्या प्रतिमोल अमीन के बनने मे होगी : **[JEE(Main)-2016, 4/120]**

(1) चार मोल NaOH तथा दो मोल $Br_2$ (2) दो मोल NaOH तथा दो मोल $Br_2$
(3*) चार मोल NaOH तथा एक मोल $Br_2$ (4) एक मोल NaOH तथा एक मोल $Br_2$

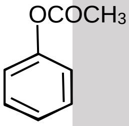
**Sol.** Hofmann bromamide degradation reaction
हॉफमान ब्रोमामाइड निम्नीकरण अभिक्रिया

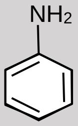
$$R{-}\overset{\overset{\large O}{\|}}{C}{-}NH_2 + Br_2 + 4\,NaOH \longrightarrow R{-}NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$

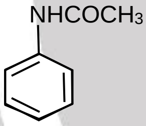
1 mole bromine and 4 moles of NaOH are used for per mole of amine produced.
1 मोल ब्रोमीन व 4 मोल NaOH, ऐमिन के प्रतिमोल संश्लेषण के लिए प्रयुक्त होते है।

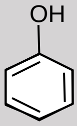
**18.** Which of the following compounds will form significant amount of *meta* product during mono-nitration reaction ? **[JEE(Main)-2017, 4/120]**

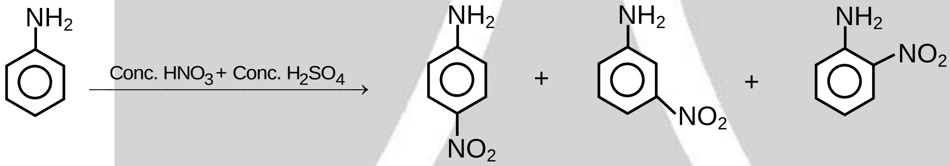
मोनोनाइट्रीकरण अभिक्रिया में निम्न में से कौन सा यौगिक मेटा उत्पाद की महत्वपूर्ण मात्रा उत्पन्न करेगा ? **[JEE(Main)-2017, 4/120]**

(1) 

(2*) 

(3) 

(4) 

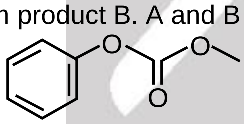

**Sol.** 

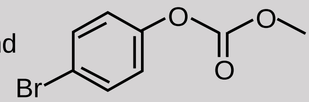

% para = 51 % meta = 47 % ortho = 2

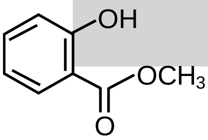
**Reason :** Aniline in acidic medium converts into anilinium ion and it is meta directing so significant amount of meta product is obtained.

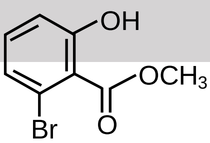
**कारण :** ऐनिलिन अम्लीय माध्यम में ऐनिलिनियम आयन बनाता है यह मेटा निर्देशी है ओर महत्वपुर्ण मात्रा मे मेटा उत्पाद देता है।

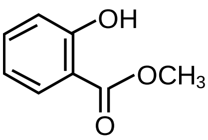
**19.** Phenol reacts with methyl chloroformate in the presence of NaOH to form product A. A react with $Br_2$ to form product B. A and B are respectively : **[JEE(Main)-2018, 4/120]**

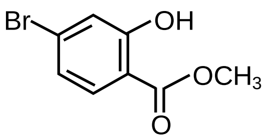
(1*) 

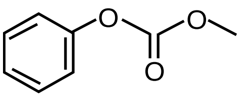
and 

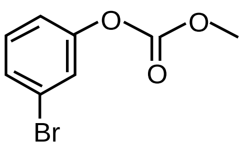

(2) 

and 

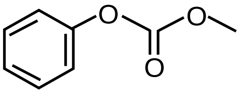
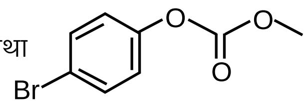

(3) 

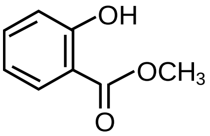
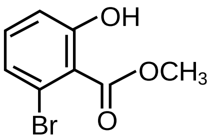
and 

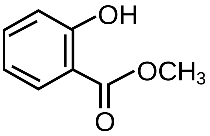
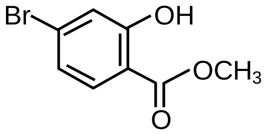

(4) 

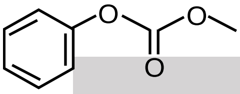
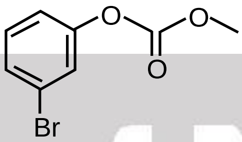
and 

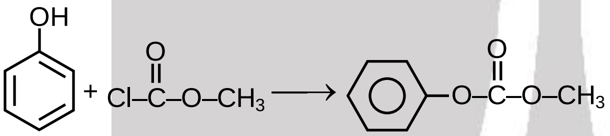

NaOH की उपस्थिति में फिनॉल, मेथिल क्लोरोफॉर्मेट से अभिक्रिया करके A उत्पाद बनाता है। A, $Br_2$ के साथ अभिक्रिया करके उत्पाद B देता है। A तथा B क्रमशः है : **[JEE(Main)-2018, 4/120]**

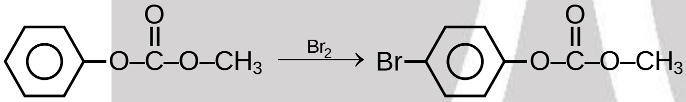
(1*)  तथा 

(2)  तथा 

(3)  तथा 

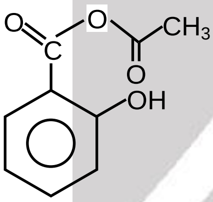
(4)  तथा 

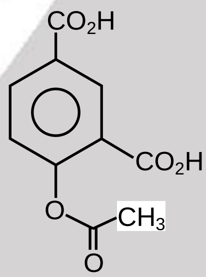
**Sol.** 

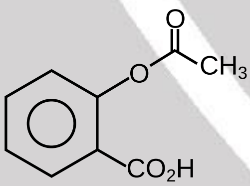


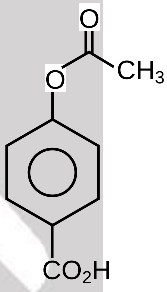
**20.** Phenol on treatment with $CO_2$ in the presence of NaOH followed by acidification produces compound X as the major product. X on treatment with $(CH_3CO)_2O$ in the presence of catalytic amount of $H_2SO_4$ produces : **[JEE(Main)-2018, 4/120]**

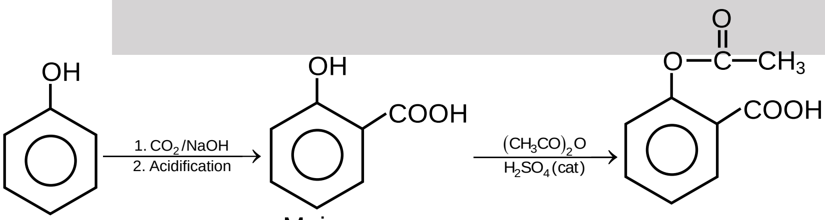
NaOH की उपस्थिति में फेनॉल $CO_2$ के साथ अभिक्रियित करने तदुपरान्त अम्लित करने पर एक यौगिक X मुख्य उत्पाद के रूप में देता है। $H_2SO_4$ की उत्प्रेरकीय मात्रा में उपस्थित रहने में X को $(CH_3CO)_2O$ के साथ अभिक्रियित करने पर प्राप्त होगा : **[JEE(Main)-2018, 4/120]**

(1) 

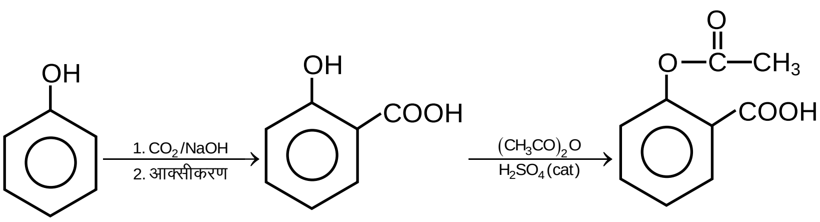
(2) 

(3*) 

(4) 

**Sol.** 

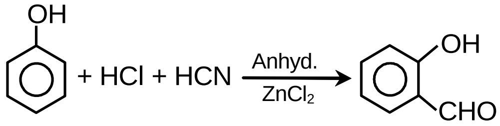
Major



मुख्य

## JEE(MAIN) ONLINE PROBLEM

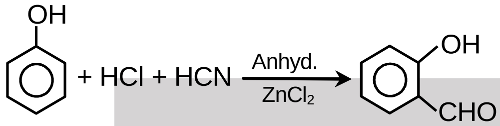
**1.** The following reaction



is known as : **[JEE(Main) 2014 Online (11-04-14), 4/120]**

(1) Perkin reaction (2) Gattermann-Koch formylation
(3) Kolbe's reaction (4*) Gattermann reaction

अभिक्रिया



को इनमें से किस नाम से जाना जात है? **[JEE(Main) 2014 Online (11-04-14), 4/120]**

(1) परकिन अभिक्रिया (2) गैटरमन -कॉच फरमीलेशन
(3) कोलबे की अभिक्रिया (4*) गैटरमन अभिक्रिया

**2.** Complete reduction of benzene-diazonium chloride with Zn/HCl gives :
**[JEE(Main) 2014 Online (11-04-14), 4/120]**

(1*) Aniline (2) Phenylhydrazine (3) Azobenzene (4) Hydrazobenzene

Zn/HCl के द्वारा डायाजोनियम क्लोराइड का पूरा अपचयन करने पर देती है :
**[JEE(Main) 2014 Online (11-04-14), 4/120]**

(1*) ऐनीलीन (2) फिनाइलहाइड्राजीन (3) ऐजोबैन्जीन (4) हाइड्रऐजोबैन्जीन

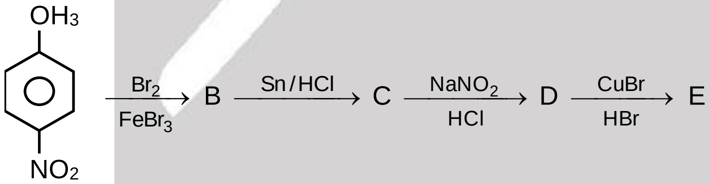
**3.** Conversion of benzene diazonium chloride to chloro benzene is an example of which of the following reactions? **[JEE(Main) 2014 Online (12-04-14), 4/120]**

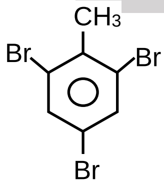
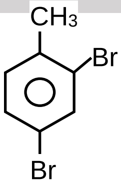
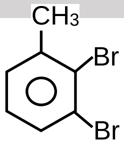
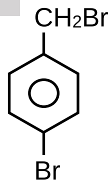
(1) Claisen (2) Friedel-craft (3*) Sandmeyer (4) Wurtz

बैन्जीन डायाजोनियम क्लोराइड का क्लोरो बैन्जीन में बदलना इनमें से किस अभिक्रिया का उदाहरण होता है?
**[JEE(Main) 2014 Online (12-04-14), 4/120]**

(1) क्लेज़न (2) फ्रिडल-क्राफ्ट (3*) सैंडमायर (4) वूर्ट्ज

**4.** In a set of reactions p-nitrotoluene yielded a product E. The product E would be :
अभिक्रियाओं के इस क्रम में p-नाइट्रोटॉलुईन से प्राप्त क्रियाफल E क्या होगा :
**[JEE(Main) 2014 Online (19-04-14), 4/120]**



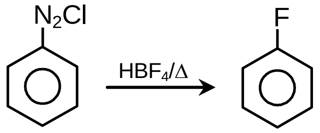
(1)  (2*)  (3)  (4) 

**5.** Fluorination of an aromatic ring is easily accomplished by treating a diazonium salt with $HBF_4$. Which of the following conditions is correct about this reaction? **[JEE(Main) 2016 Online (10-04-16), 4/120]**

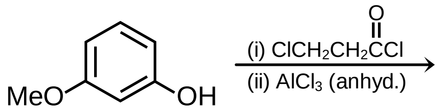
(1*) Only heat (2) $NaNO_2/Cu$ (3) $Cu_2O/H_2O$ (4) NaF/Cu

एरोमेटिक वलय पर फ्लोरीनीकरण डाईएजोनियम लवण को $HBF_4$ के साथ क्रिया करके आसानी से किया जाता है। निम्न में से कौनसी शर्त उपरोक्त अभिक्रिया के लिए सही है ? **[JEE(Main) 2016 Online (10-04-16), 4/120]**

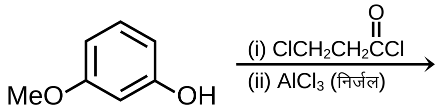
(1) केवल ऊष्मा (2) $NaNO_2/Cu$ (3) $Cu_2O/H_2O$ (4) NaF/Cu

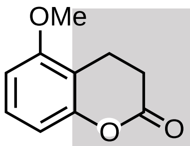
**Sol.** 

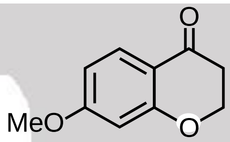
**6.** The major product of the following reaction is : **[JEE(Main) 2018 Online (15-04-18), 4/120]**

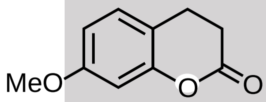


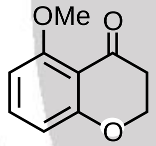
निम्न अभिक्रिया का मुख्य उत्पाद है: **[JEE(Main) 2018 Online (15-04-18), 4/120]**



(1) 

(2) 

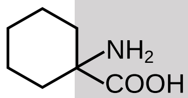
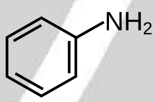
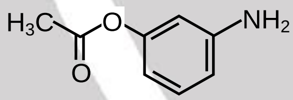
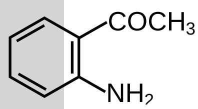
(3*) 

(4) 

**Sol.** The reactant undergoes acylation first followed by substitution Intramolecular.

**7.** The increasing order of diazotization of the following compound is :
**[JEE(Main) 2018 Online (15-04-18), 4/120]**

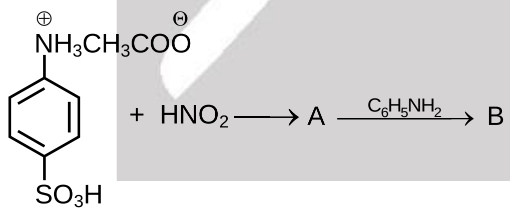
निम्न यौगिकों के डाइऐजोटीकरण का बढता हुआ क्रम है : **[JEE(Main) 2018 Online (15-04-18), 4/120]**

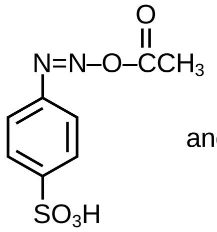
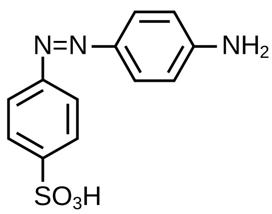
(a) 
(b) 
(c) 
(d) 

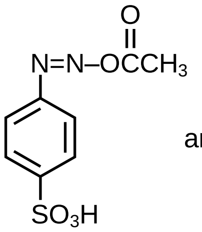
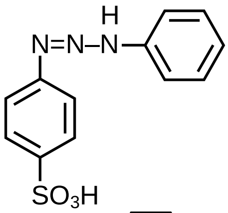
(1) (a) < (b) < (c) < (d)  (2) (a) < (d) < (b) < (c)  (3*) (a) < (d) < (c) < (b)  (4) (d) < (c) < (b) < (a)

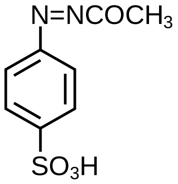
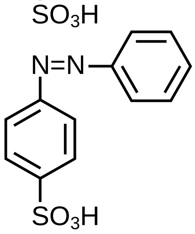
**Sol.** Greater the $e^-$ density on N, easier the formation of diazonium salt.
N का इलेक्ट्रॉन घनत्व अधिक होने पर, डाईएजोनियम लवण का निर्माण आसानी से होता है।

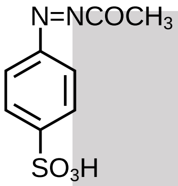
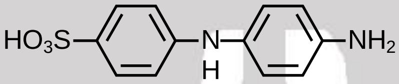
**8.** Products A and B formed in the following reactions are respectively :
**[JEE(Main) 2018 Online (16-04-18), 4/120]**



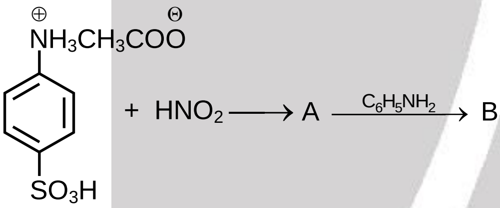
(1*)  and 

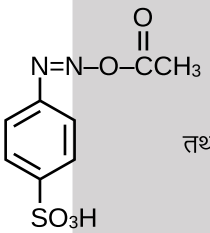
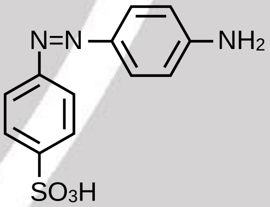
(2)  and 

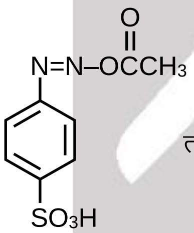
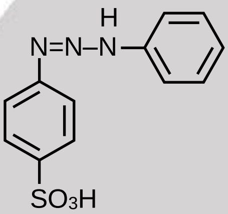
(3)  and 

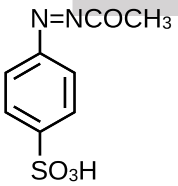
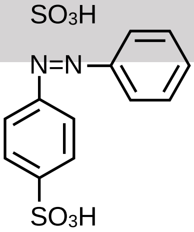
(4)  and 

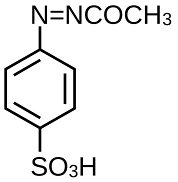
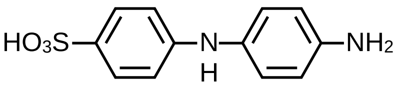
निम्न अभिक्रियाओं में बने उत्पाद A तथा B क्रमशः हैं : **[JEE(Main) 2018 Online (16-04-18), 4/120]**



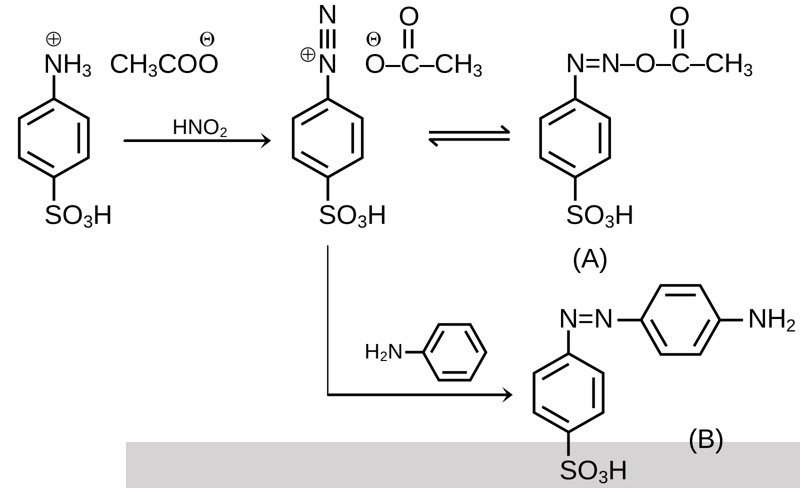
(1)  तथा 

(2)  तथा 

(3)  तथा 

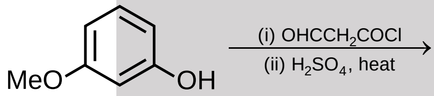
(4)  तथा 

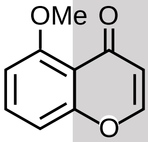
**Sol.**

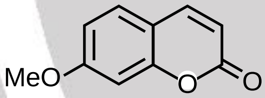


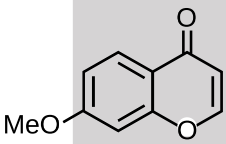
**9.** The major product of the following reaction is : **[JEE(Main) 2018 Online (16-04-18), 4/120]**

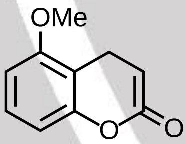
निम्न अभिक्रिया का मुख्य उत्पाद है : **[JEE(Main) 2018 Online (16-04-18), 4/120]**



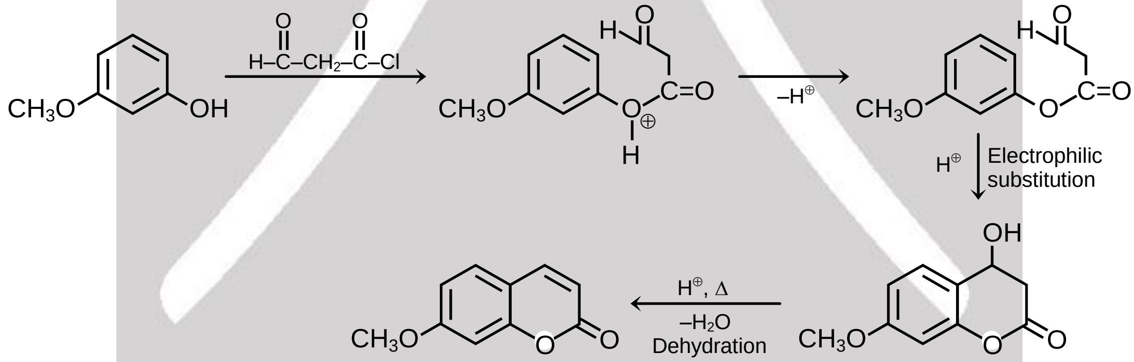
(1) 

(2*) 

(3) 

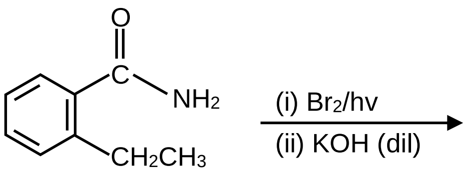
(4) 

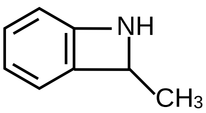
**Sol.**

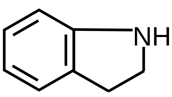


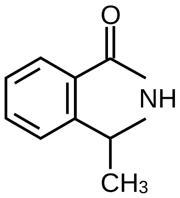
**10.** The major product of the following reaction is : **[JEE(Main) 2019 Online (09-01-19), 4/120]**

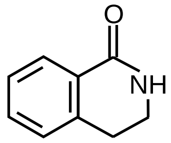
निम्नलिखित अभिक्रिया का मुख्य उत्पाद है: **[JEE(Main) 2019 Online (09-01-19), 4/120]**

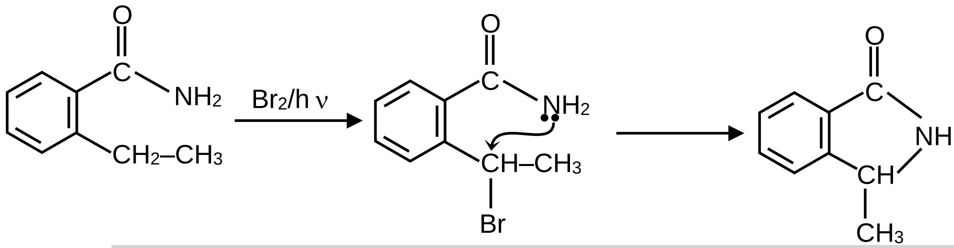


(1) 

(2) 

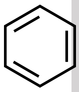
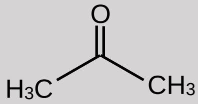
(3*) 

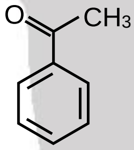

(4) 


**Sol.** 

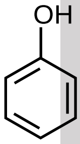

**11.** The products formed in the reaction of cumene with $O_2$ followed by treatment with dil. HCl are:

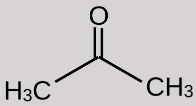
**[JEE(Main) 2019 Online (09-01-19), 4/120]**

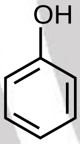
(1)  and 

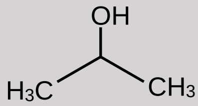

(2) 

and $CH_3$–OH

(3*) 

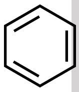
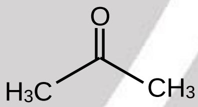
and 

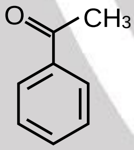

(4) 

and 

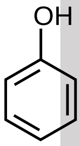

क्यूमीन की $O_2$ के साथ अभिक्रिया करने के तत्पश्चात् तनु HCl के साथ विवेचन करने पर बनने वाले उत्पाद है:

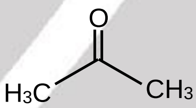
**[JEE(Main) 2019 Online (09-01-19), 4/120]**

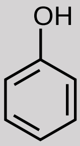
(1)  तथा 

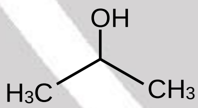

(2) 

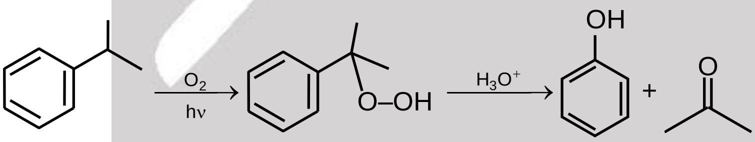
तथा $CH_3$–OH

(3*) 

तथा 


(4) 

तथा 

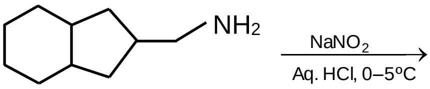

**Sol.** 

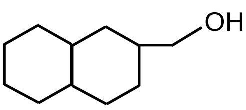

**12.** The major product formed in the reaction given below will be :

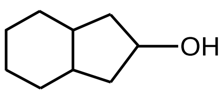
**[JEE(Main) 2019 Online (10-01-19), 4/120]**

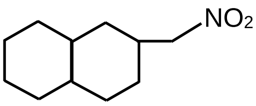
नीचे दी गई अभिक्रिया में बनने वाला मुख्य उत्पाद होगा–

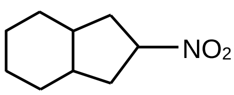
**[JEE(Main) 2019 Online (10-01-19), 4/120]**




(1) 


(2) 

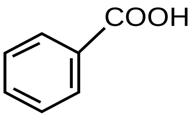

(3) 

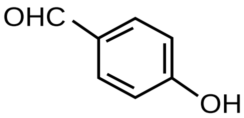

(4) 

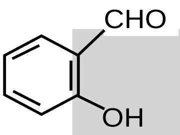

**Ans.** **(BONUS)**

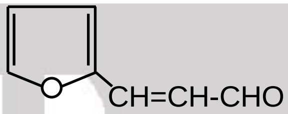
**13.** An aromatic compound ‘A’ having molecular formula $C_7H_6O_2$ on treating with aqueous ammonia and heating forms compounds ‘B’. The compound B on reaction with molecular bromine and potassium hydroxide provides compound ‘C’ having molecular formula $C_6H_7N$. The structure of ‘A’ is:
**[JEE(Main) 2019 Online (10-01-19), 4/120]**

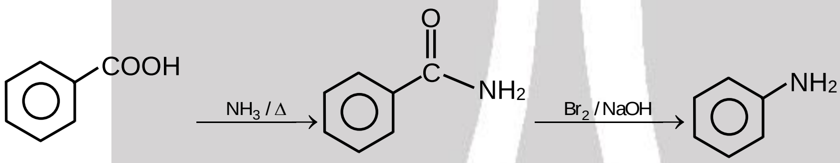
एक कार्बनिक यौगिक ‘A’ जिसका आण्विक सूत्र $C_7H_6O_2$ है, जलीय अमोनिया के साथ गर्म करने पर यौगिक ‘B’ बनाता है। यौगिक 'B' आण्विक ब्रोमीन तथा पोटेशियम हाइड्रॉक्साइड के साथ अभिक्रिया करके यौगिक ‘C’ देता है जिसका आण्विक सूत्र $C_6H_7N$ है। ‘A’ की संरचना है: **[JEE(Main) 2019 Online (10-01-19), 4/120]**

(1*) 


(2) 

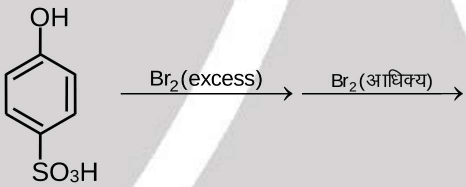

(3) 

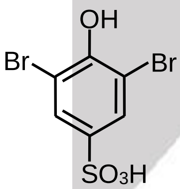

(4) 

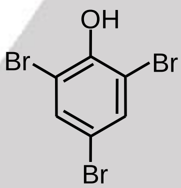

**Sol.** 

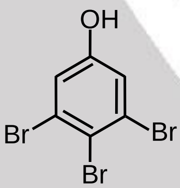
x

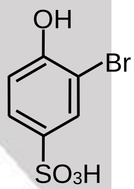
**14.** The major product of the following reaction is: **[JEE(Main) 2019 Online (11-01-19), 4/120]**
निम्नलिखित अभिक्रिया का मुख्य उत्पाद है – **[JEE(Main) 2019 Online (11-01-19), 4/120]**

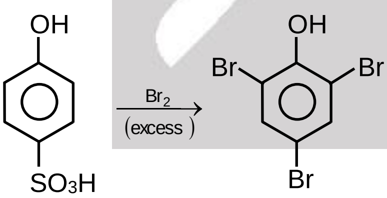



(1) 


(2*) 


(3) 


(4) 


**Sol.** 


It is EAS activated ring. (यह EAS सक्रियत वलय है।)

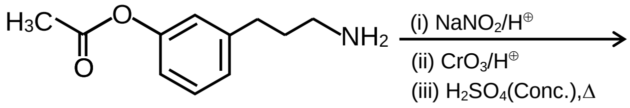
**15.** A compound 'X' on treatment with $Br_2$/NaOH, provided $C_3H_9N$, which gives positive cabylamine test. Compound 'X' is : **[JEE(Main) 2019 Online (11-01-19), 4/120]**
एक यौगिक 'X' को $Br_2$/NaOH के साथ अभिकृत करने पर $C_3H_9N$ दिया जो धनात्मक कार्बिलएमीन जाँच देता है। यौगिक 'X' की संरचना है : **[JEE(Main) 2019 Online (11-01-19), 4/120]**

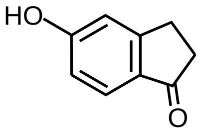
(1) $CH_3COCH_2NHCH_3$
(2) $CH_3CON(CH_3)_2$
(3) $CH_3CH_2COCH_2NH_2$
(4*) $CH_3CH_2CH_2CONH_2$

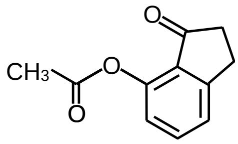
**Sol.** $CH_3CH_2CH_2CONH_2$ (A) $\xrightarrow{Br_2+NaOH}$ (B) ($CH_3CH_2CH_2NH_2$)
Primary amines give positive carbyl amine test
प्राथमिक एमीन धनात्मक कार्बिल एमीन परीक्षण देते है।

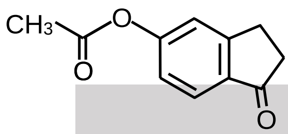
**16.** The major product of the following reaction is: **[JEE(Main) 2019 Online (12-01-19), 4/120]**

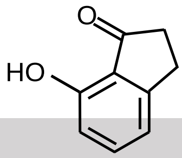
निम्नलिखित अभिक्रिया का मुख्य उत्पाद है : **[JEE(Main) 2019 Online (12-01-19), 4/120]**




(1*) 


(2) 


(3) 


(4) 


**Sol.**