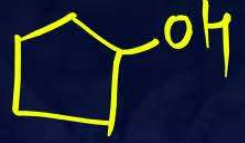
General Introduction

Alcohol

Aliphatic — OH

CH_3-OH



Phenol

Aro — OH

Ether

$R-H \xrightarrow[OAr]{OR} R-OR$ (Alkoxy)

$R-OAr$ (Aryloxy)

Classification of Alcohols

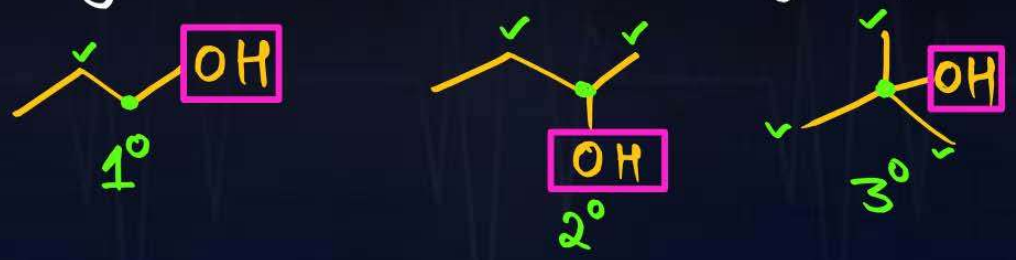
Alcohols: Mono, Di, Tri or Polyhydric alcohols:

'1' OH	2 'OH'	3 'OH'	more than 3
CH_3OH	$CH_2(OH)-CH_2OH$	$CH_2(OH)-CH(OH)-CH_2OH$	

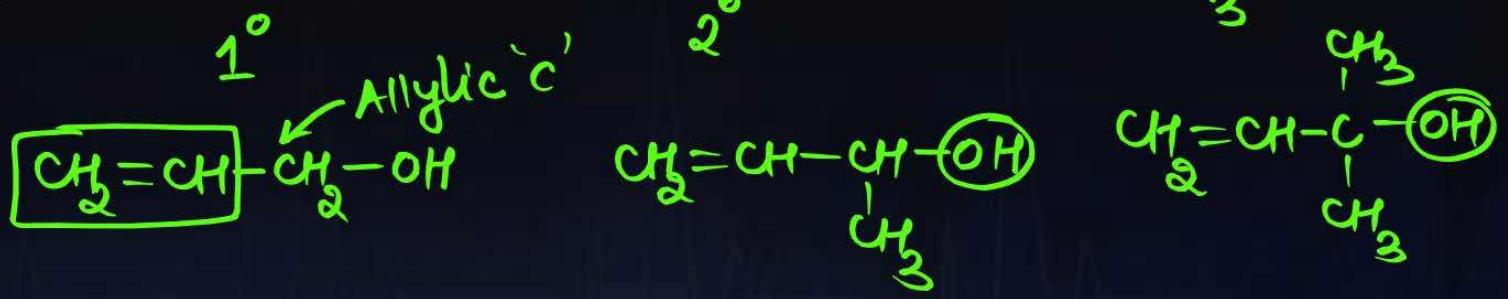
(i) Compounds containing C_{sp3}–OH bond:

A. Primary, Secondary & Tertiary alcohols:

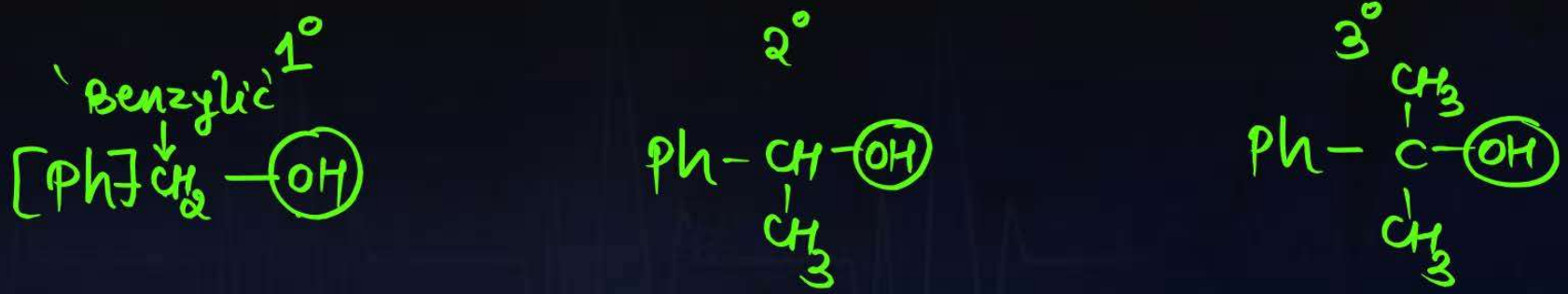
The degree of 'c' at which 'OH' group is attached



B. Allylic alcohols:

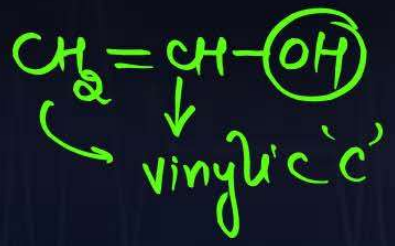


C. Benzylic alcohols:



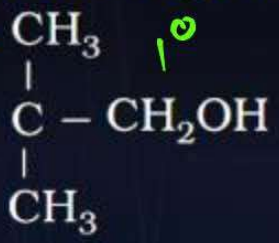
(ii) Compounds containing C_{sp2}–OH bond:

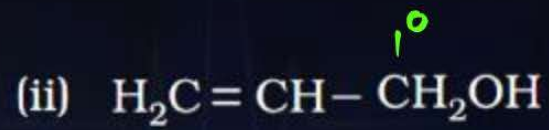
A. Vinylic alcohols:

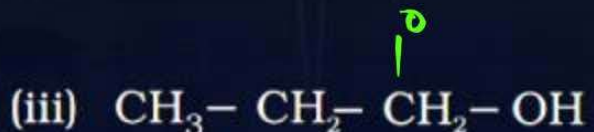


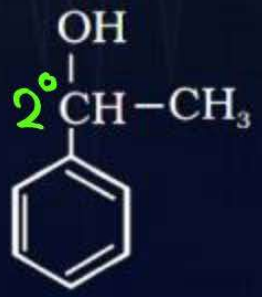
C.Q. 01 (NCERT Exemplar)

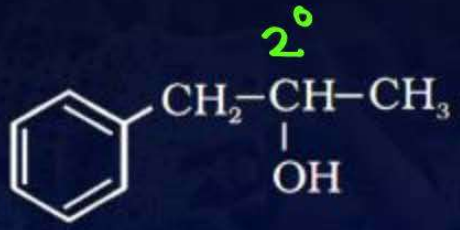
Classify the following as primary, secondary and tertiary alcohols:

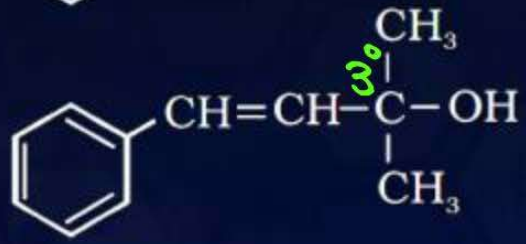
(i) 

(ii) 

(iii) 

(iv) 

(v) 

(vi) 

C.Q. 02 (NCERT Exemplar)

Which of the following is benzylic alcohol?

A $C_6H_5—CH_2—CH_2OH$

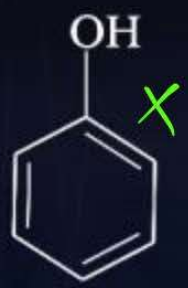
B $C_6H_5—CH_2OH$

C $C_2H_5—\underset{\displaystyle CH_3}{\underset{|}{CH}}—OH$

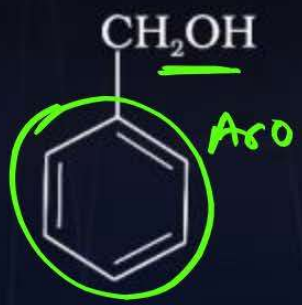
D $C_6H_5—CH_2—\underset{\displaystyle CH_3}{\underset{|}{CH}}—OH$

C.Q. 03 (NCERT Exemplar)

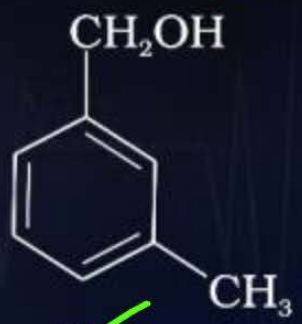
Which of the following compounds are aromatic alcohol?



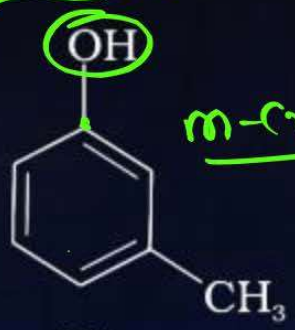
(A)



(B)



(C)



(D)

A A, B, C, D

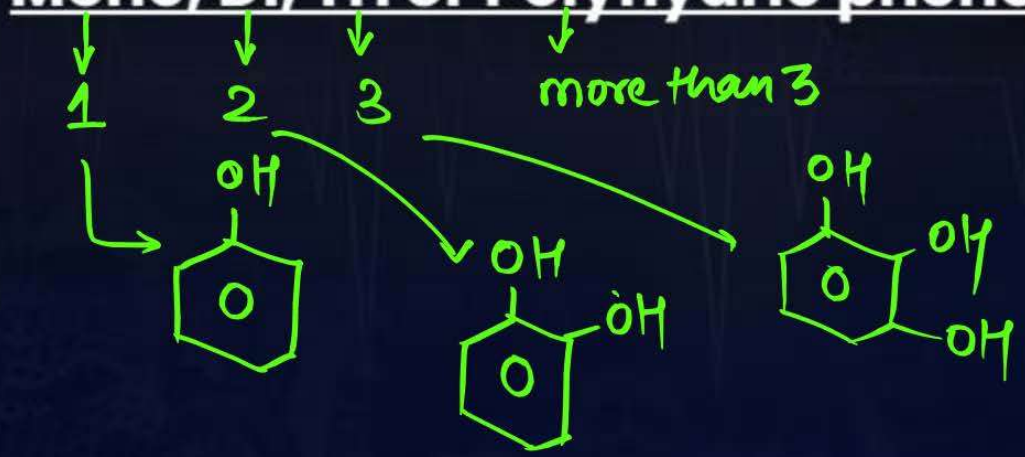
B A, D

C B, C

D A

Classification of Phenols

Mono, Di, Tri or Polyhydric phenols:



Classification of Ethers

A. Simple or symmetrical ethers

$R-O-R$

CH_3-O-CH_3

$Et-O-Et$

B. Mixed or unsymmetrical ethers

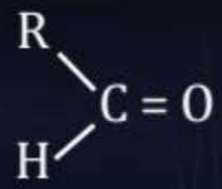
$R-O-R'$

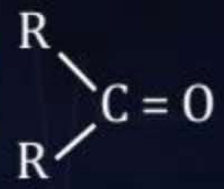
CH_3-O-Et

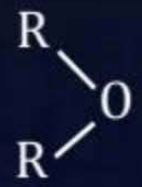
$CH_3-O-CH_2-CH_2-CH_3$

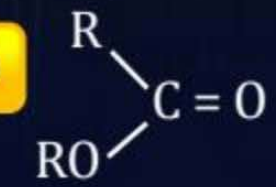
C.Q. 04

Ether is:

A 

B 

C 

D 

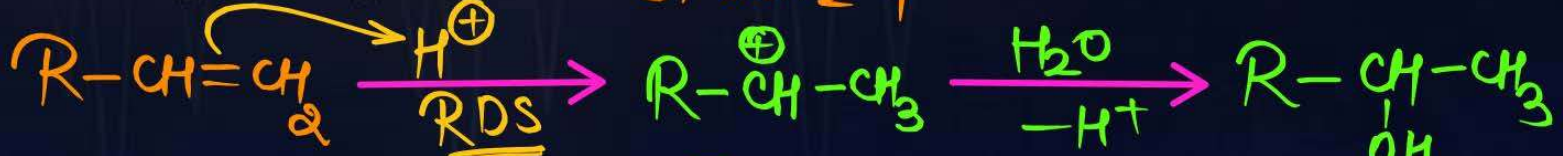
Methods of Preparation of Alcohols

1. From Alkenes:

Reagent :- 1) H^+/H_2O
2) H_3O^+
3) dil H_2SO_4

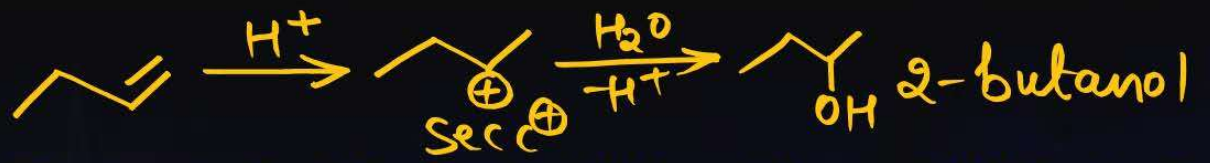
A. By Acid Catalyzed Hydration:

Mech



Rearrange if POS

C.Q. 05 (NCERT Exemplar)



Assertion: Addition reaction of water to but-1-ene in acidic medium yields butan-1-ol.

Reason: Addition of water in acidic medium proceeds through the formation of primary carbocation.

A Assertion and reason both are correct and reason is correct explanation of assertion.

B Assertion and reason both are wrong statements.

C Assertion is correct statement but reason is wrong statement.

D Assertion is wrong statement but reason is correct statement.

C.Q. 06

Identify end products A, B and C of the following reactions:

$$CH_3CH=CH_2 \xrightarrow[(ii)H_2O]{(i)D^+} A;\ CH_3CH=CH_2 \xrightarrow[(ii)D_2O]{(i)H^+} B;\ CH_3CH=CH_2 \xrightarrow[(ii)D_2O]{(i)D^+} C$$

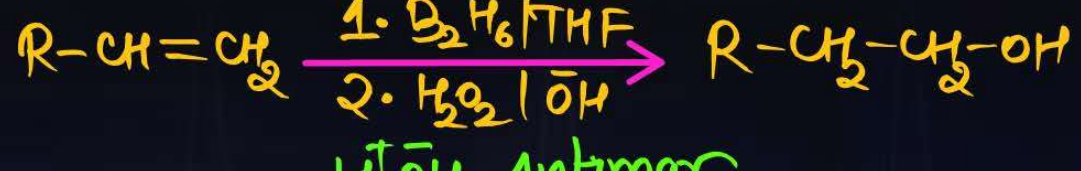
A $CH_3\underset{\displaystyle OH}{\underset{|}{C}}HCH_3$ in all cases

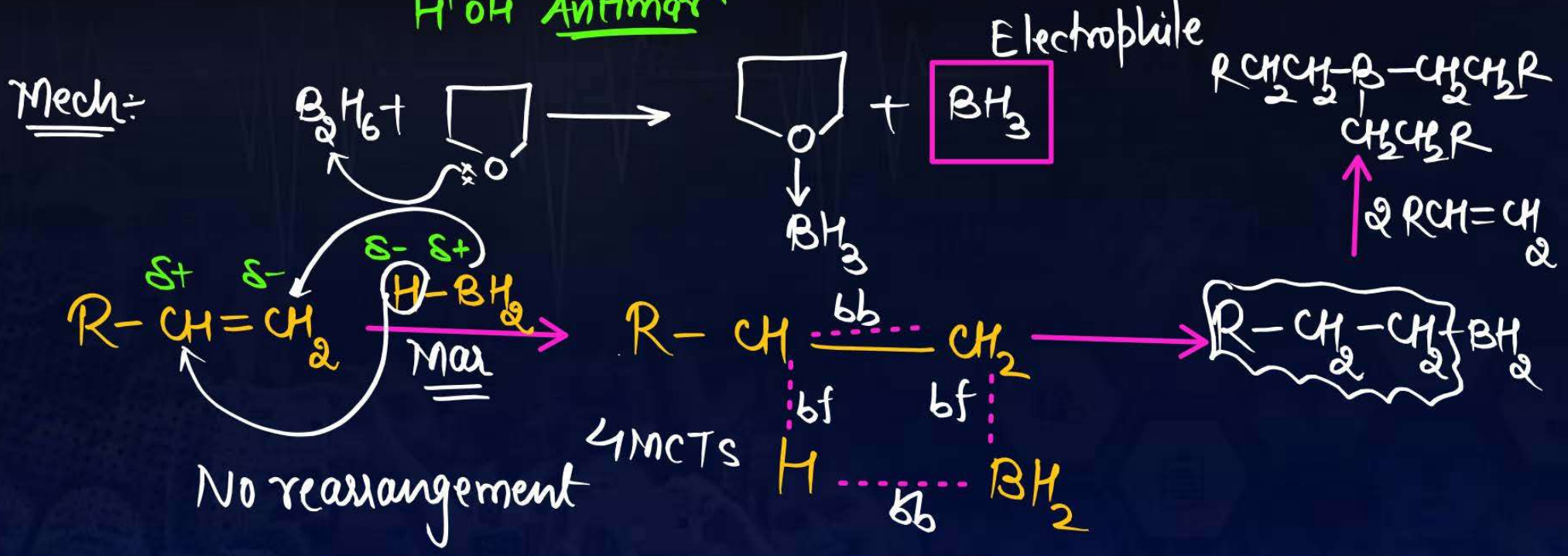
B $CH_3CH(OH)CH_2D$, $CH_3CH(OD)CH_3$, $CH_3CH(OD)CH_2D$

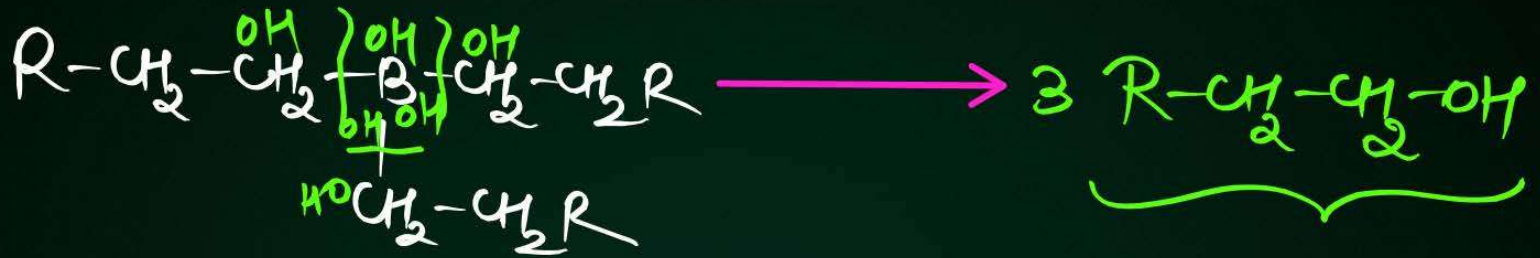
C $CH_3\underset{\displaystyle OD}{\underset{|}{C}}HCH_3$ in all cases

D $CH_3\underset{\displaystyle OD}{\underset{|}{C}}HCH_2D$ in all cases

B. By Hydroboration-Oxidation (HBO):

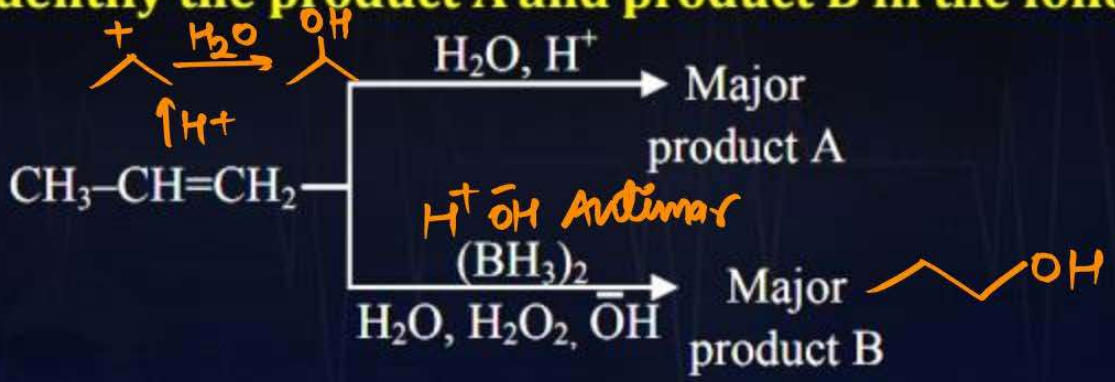






C.Q. 07 (JEE Mains 9th April 2024, Morning Shift)

Identify the product A and product B in the following set of reactions.



A A-$CH_3CH_2CH_2OH$, B-$CH_3CH_2CH_2OH$

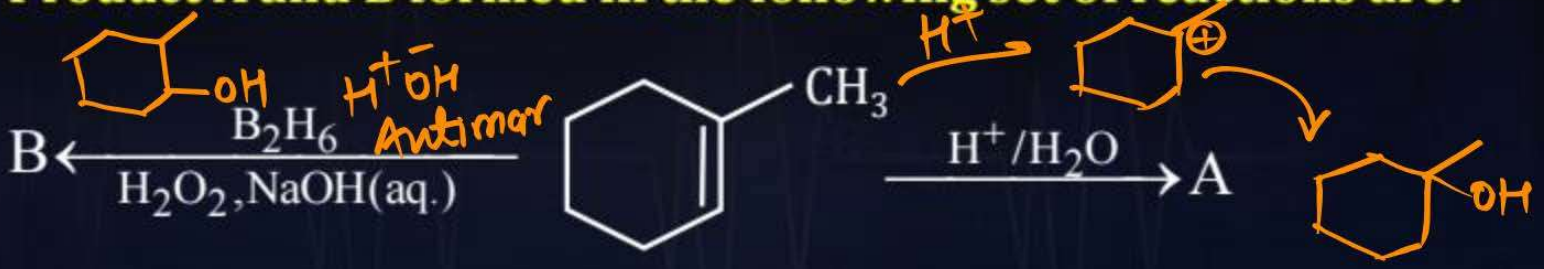
B A-$CH_3CH_2CH_2OH$, B–$CH_3\underset{\underset{OH}{|}}{CH}–CH_3$

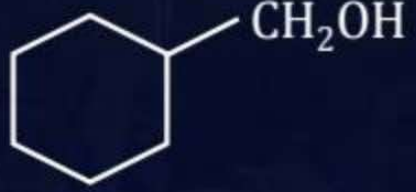
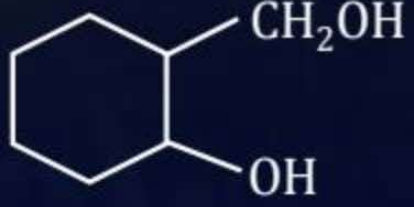
C A-$CH_3–\underset{\underset{OH}{|}}{CH}–CH_3$, B–$CH_3CH_2CH_2OH$

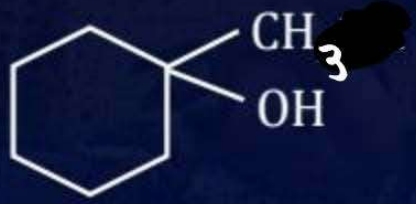
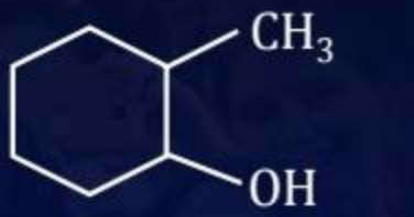
D A-$CH_3CH_2CH_3$, B-$CH_3CH_2CH_3$

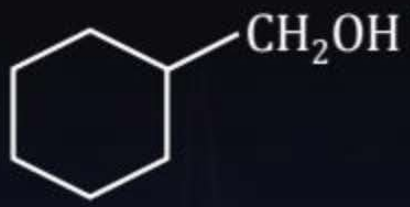
C.Q. 08 (JEE Mains 30th January 2024, Evening Shift)

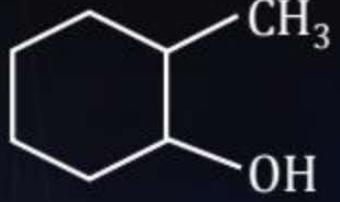
Product A and B formed in the following set of reactions are:

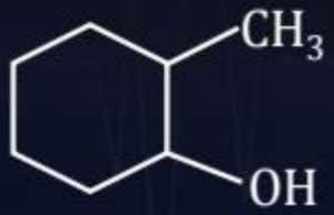


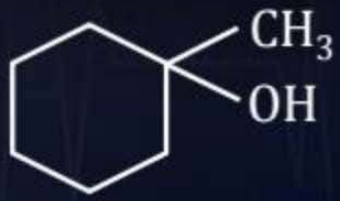
A A =  B = 

B A =  B = 

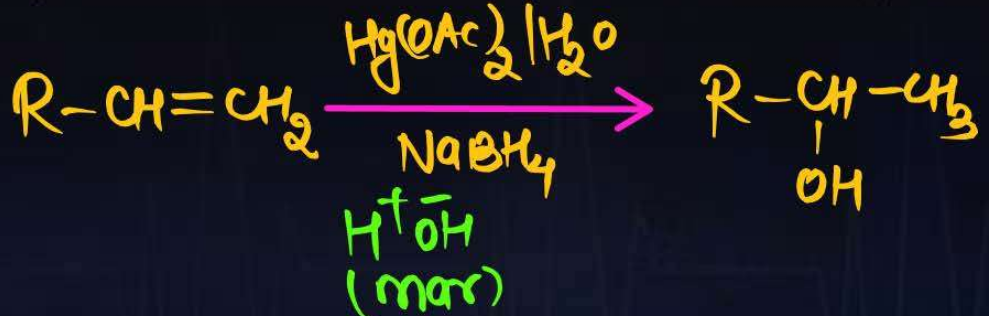
C A = 

B = 

D A = 

B = 

C. By Oxymercuration-Demercuration (OMDM):



Asli khel Revision

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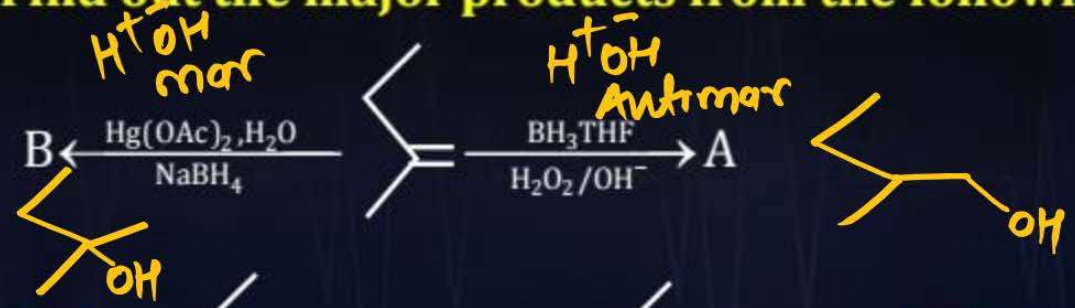
Lak 1.0

Unneed

C.Q. 09 [24 Jan, JEE Mains 2023 (Shift-II)]

Find out the major products from the following reactions.



A A=  , B= 

B A=  , B= 

C A=  , B= 

D A=  , B= 

C.Q. 10 (AIIMS 2003)

Propan-1-ol can be prepared from propene by:

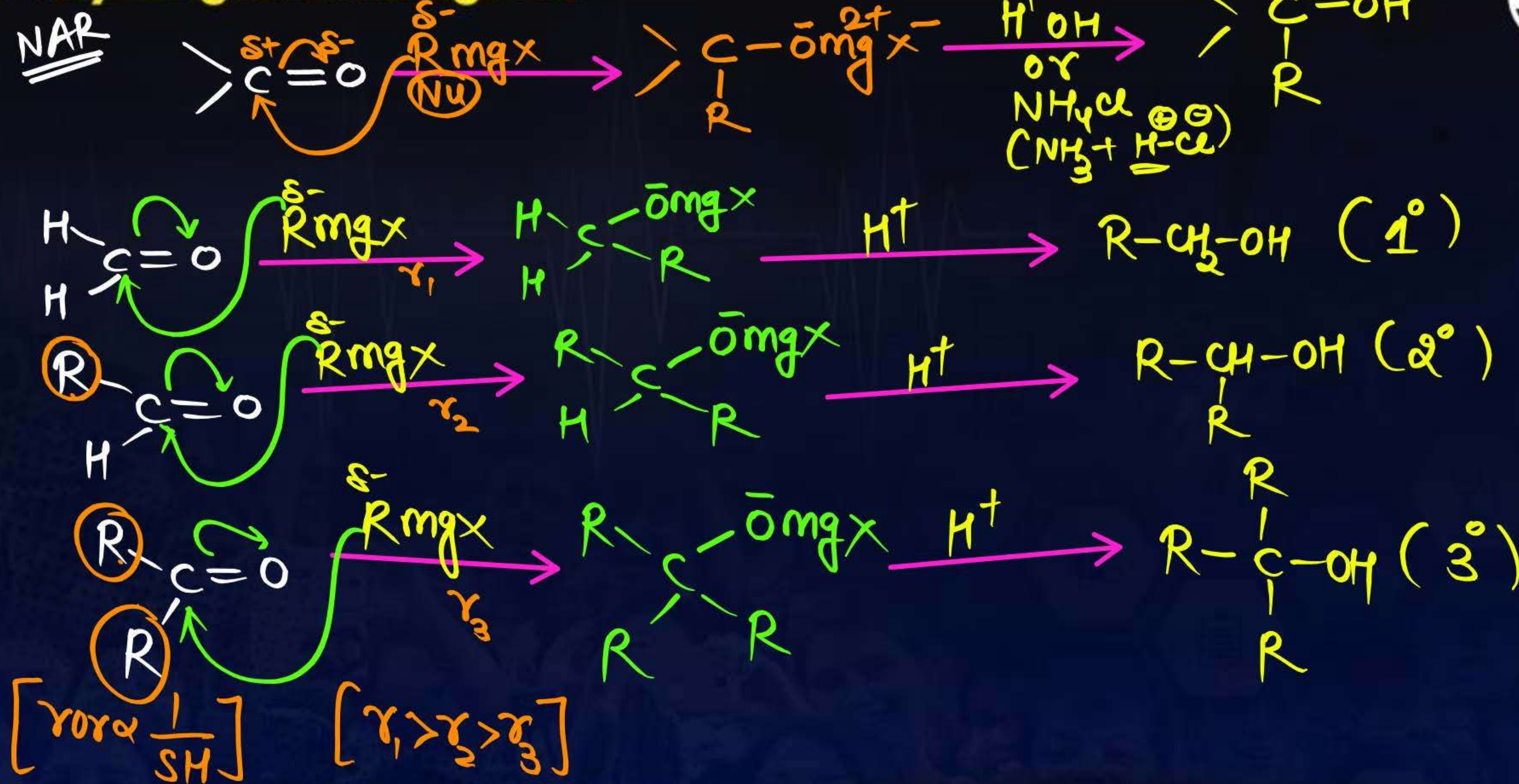
A H_2O/H_2SO_4

B $Hg(OAc)_2/H_2O$ followed by $NaBH_4$

C B_2H_6 followed by H_2O_2

D CH_3CO_2H/H_2SO_4

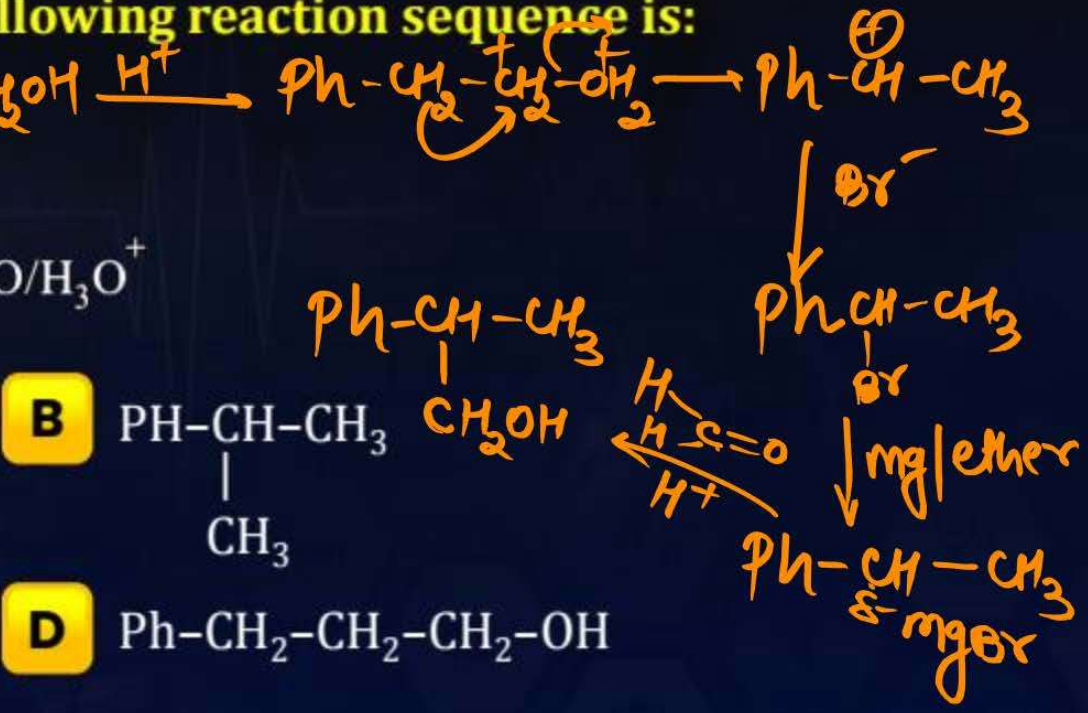
2. By Grignard Reagent:



C.Q. 11 (JEE Mains 27th January 2024, Evening Shift)

The final product A, formed in the following reaction sequence is:

$$Ph{-}CH{=}CH_2 \xrightarrow[\text{(ii) } H_2O_2,\ {}^{\ominus}OH]{\text{(i) } BH_3} \xrightarrow[\text{(iii) HBr}]{\text{(iv) Mg, ether, then HCHO/H}_3O^+} A$$



A $Ph{-}CH_2{-}CH_2{-}CH_3$

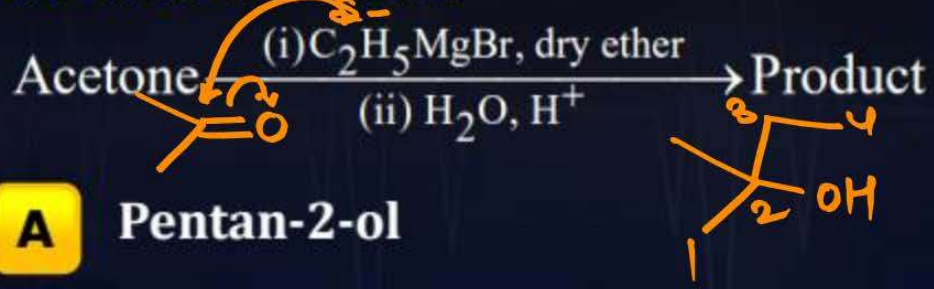
B $PH{-}\underset{\displaystyle CH_3}{\underset{|}{CH}}{-}CH_3$

C $Ph{-}\underset{\displaystyle CH_2OH}{\underset{|}{CH}}{-}CH_3$

D $Ph{-}CH_2{-}CH_2{-}CH_2{-}OH$

C.Q. 12 (NEET 2021)

What is the IUPAC name of the organic compound formed in the following chemical reaction?



A **Pentan-2-ol**

B **Pentan-3-ol**

C **2-methyl butan-2-ol**

D **2-methyl propan-2-ol**

C.Q. 13

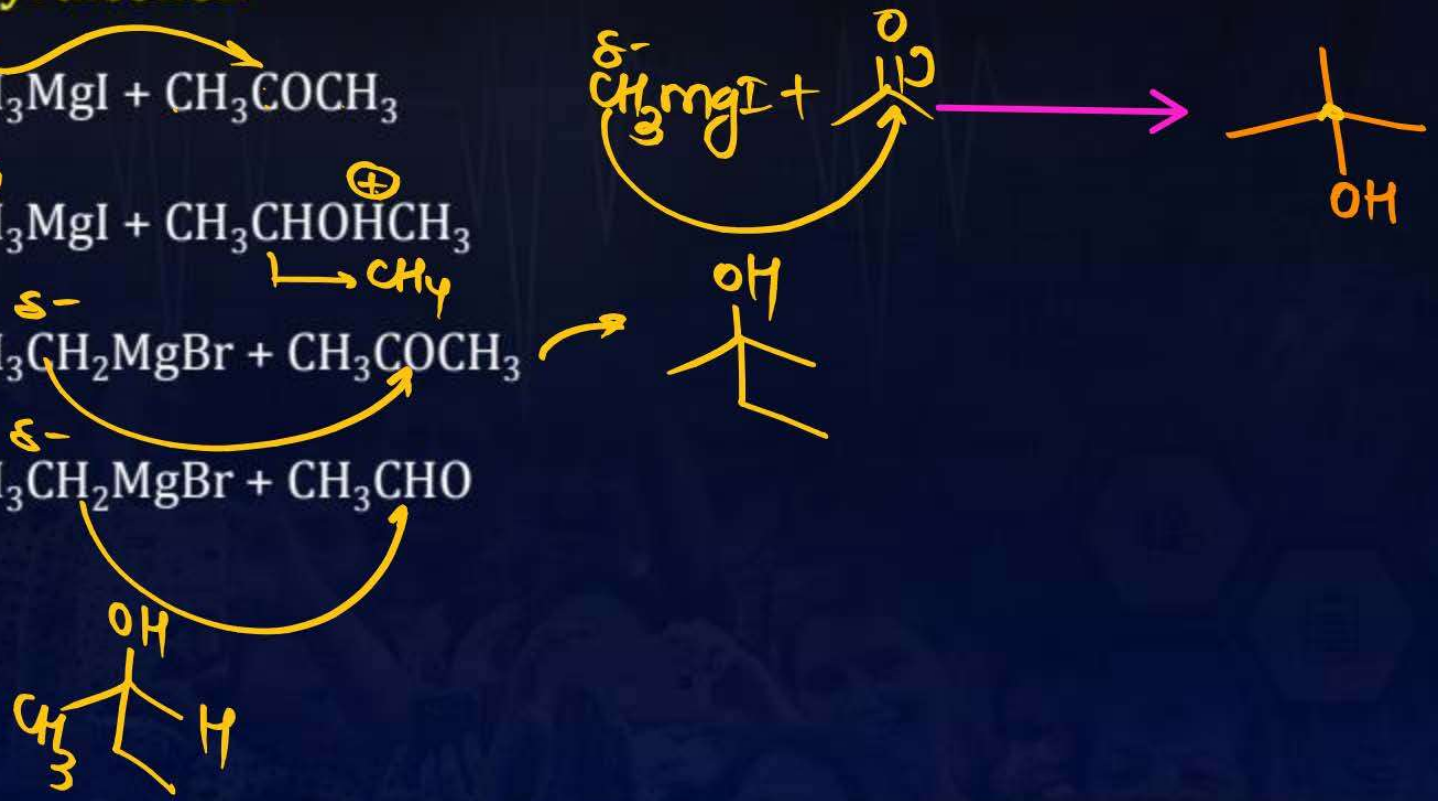
Which of the following are the starting materials for the Grignard's synthesis of *tert.* butyl alcohol?

A $CH_3MgI + CH_3COCH_3$

B $CH_3MgI + CH_3CHOHCH_3$

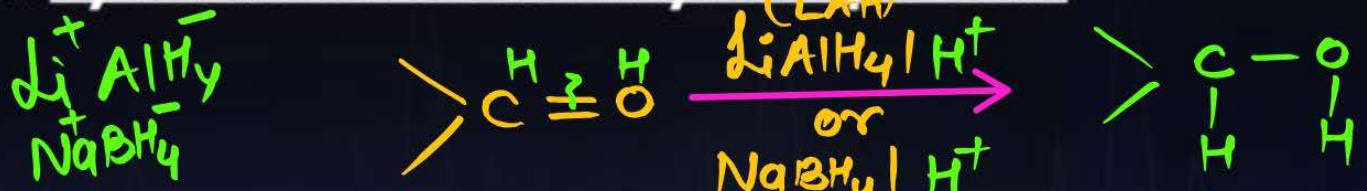
C $CH_3CH_2MgBr + CH_3COCH_3$

D $CH_3CH_2MgBr + CH_3CHO$

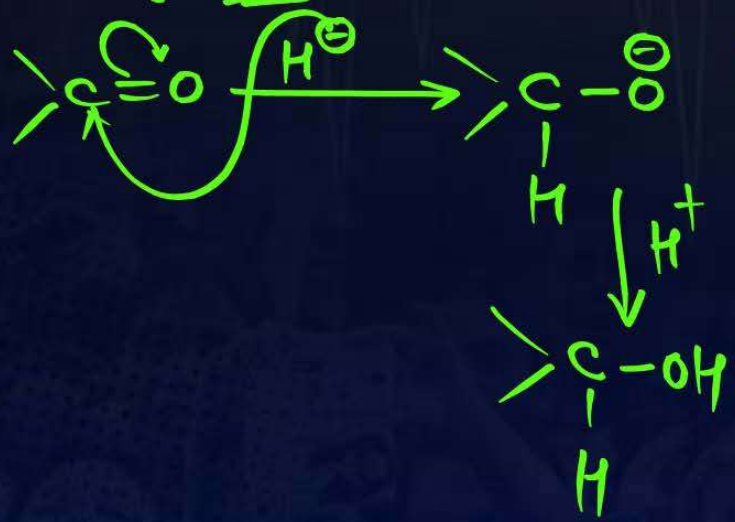


3. By Reduction reactions:

A. By reduction of carbonyl compounds:



Mech of LAH & SBH



C.Q. 14 (NCERT Exemplar)

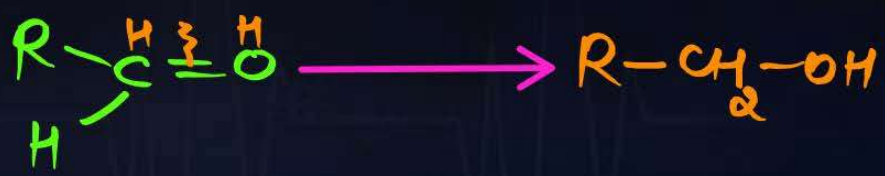
Which of the following is not used to convert RCHO into RCH_2OH?

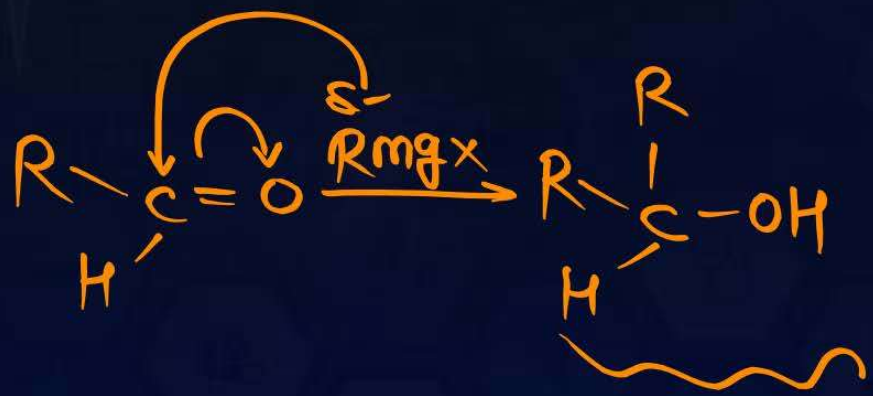
A H_2/Pd

B $LiAlH_4$

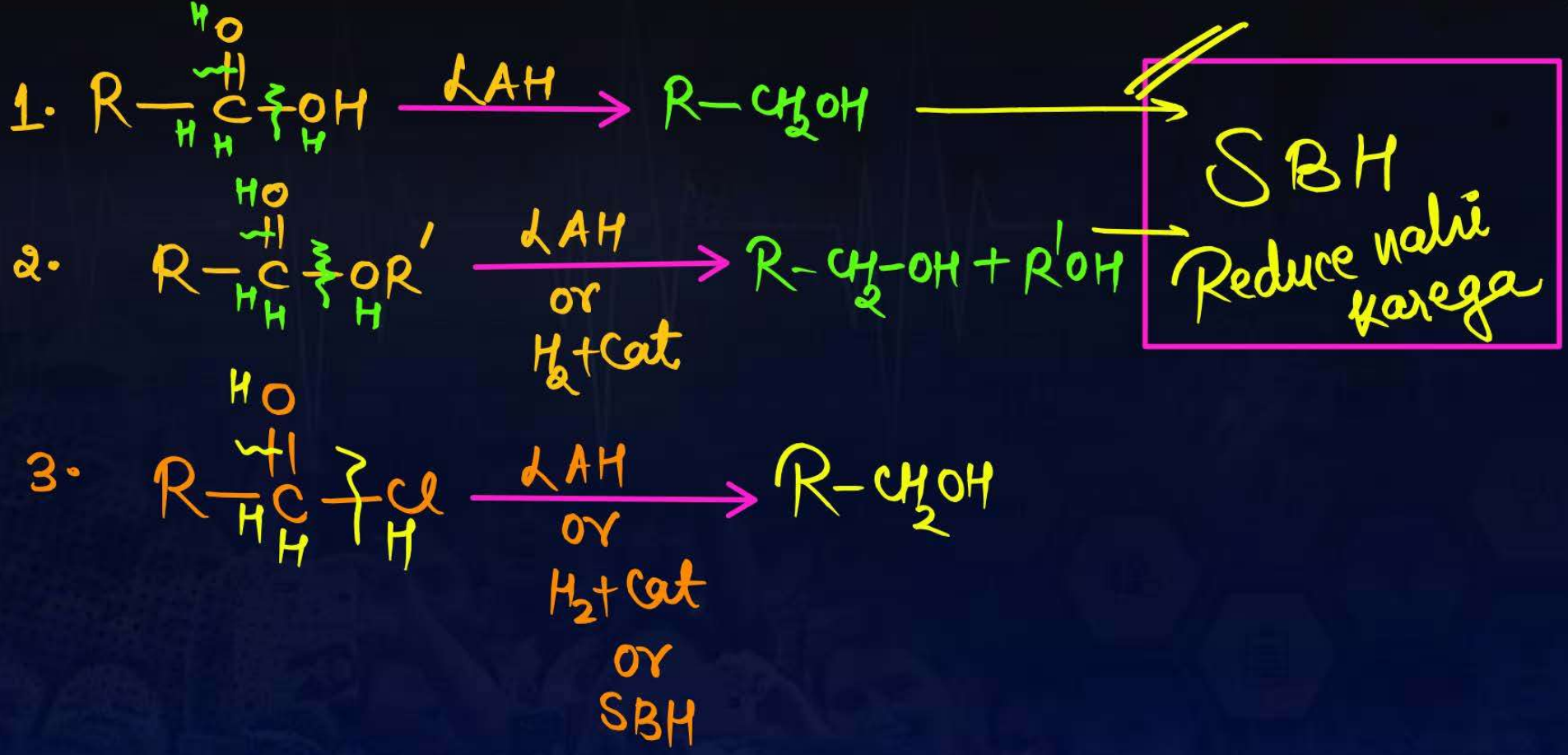
C $NaBH_4$

D Reaction with RMgX followed by hydrolysis



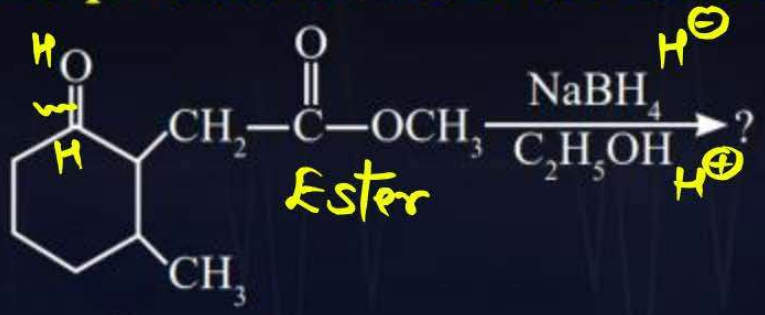


B. By reduction of carboxylic acid, ester and Acid chlorides:

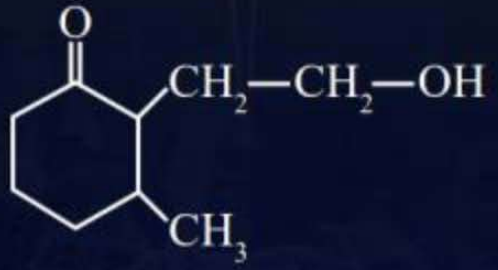


C.Q. 15 (NEET 2021)

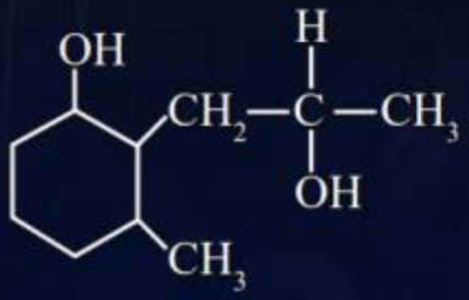
The product formed in the following chemical reaction is:



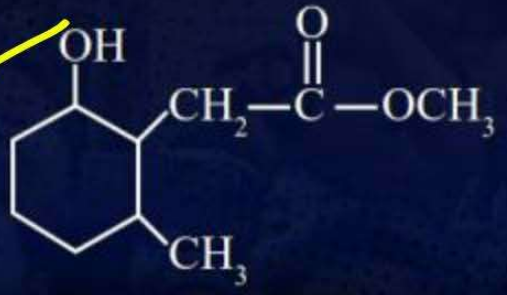
A



B

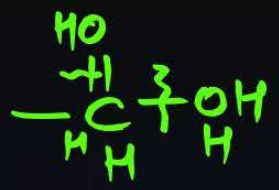


C



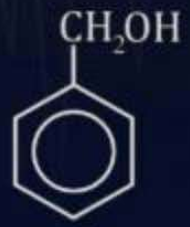
D

C.Q. 16



$\xrightarrow{LiAlH_4}$ A **Product A is:**

A 

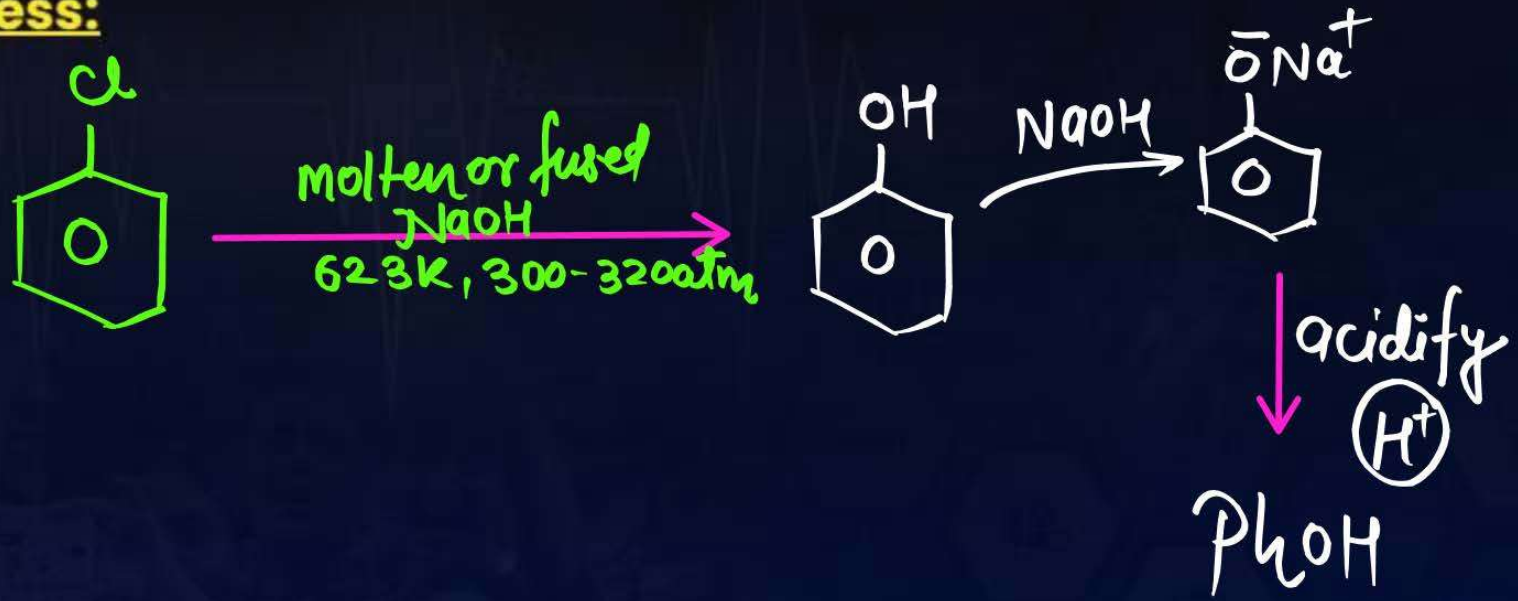
B 

C 

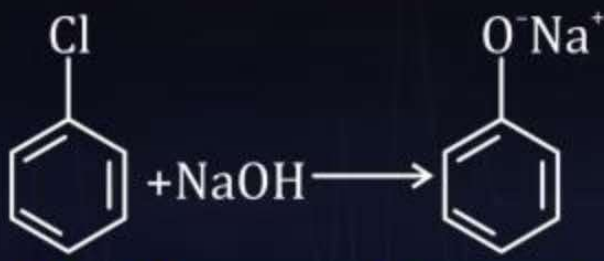
D 

Methods of Preparation of Phenols

1. Dows Process:



C.Q. 17 [17 March, JEE Mains 2021 (Shift-I)]



The above reaction requires which of the following reaction conditions?

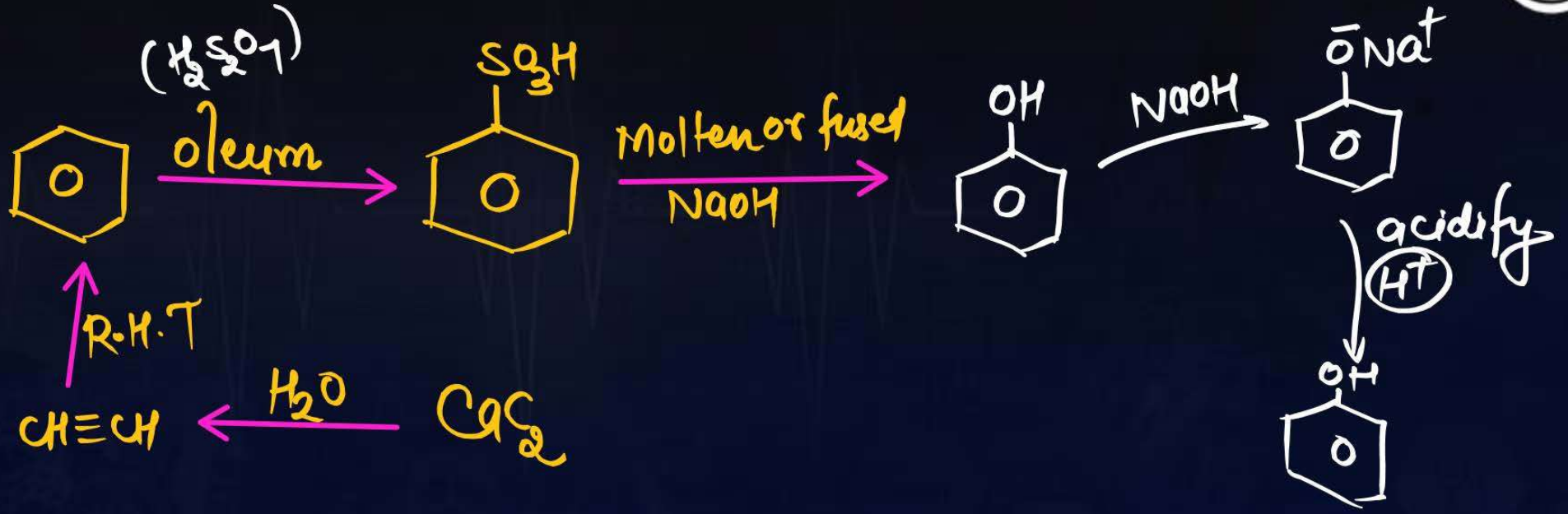
A 573 K, Cu, 300 atm

B 623 K, Cu, 300 atm

C 573 K, 300 atm

D 623 K, 300 atm

2. From Benzene Sulphonic Acid:



C.Q. 18

When sodium benzene sulphonate is fused with sodium hydroxide (solid), the product formed is:

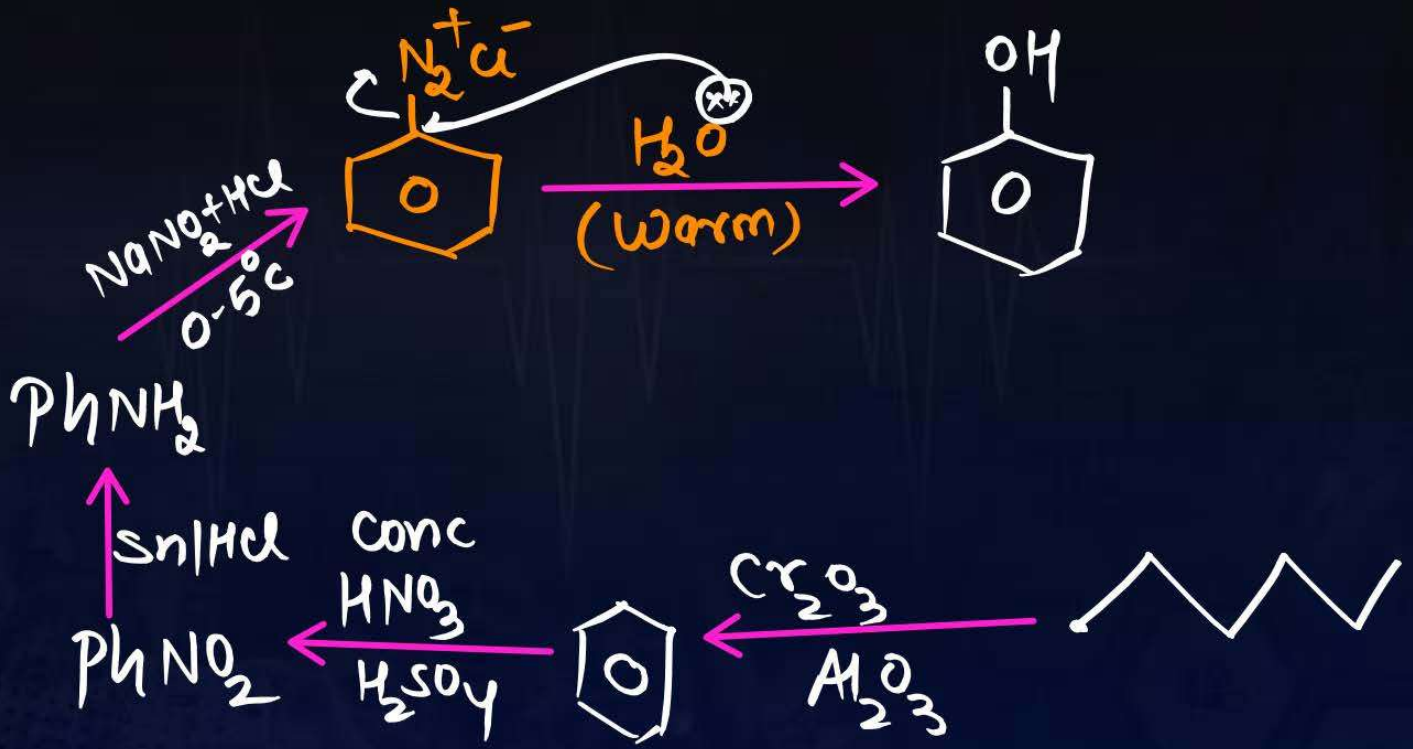
A benzene

B phenol

C benzene triphenol

D none of these

3. From Diazonium salt:



C.Q. 19

Benzene diazonium chloride on hydrolysis gives:

A benzene

B benzyl alcohol

C phenol

D chlorobenzene

C.Q. 20 (NCERT Exemplar)

Which of the following reactions will not yield phenol?

A 

$\xrightarrow[\text{(ii) } H_2O/H^+]{\text{fusion with NaOH at 300 atm}}$

B 

$\xrightarrow[\text{(ii) } H_2O \text{ (Warming)}]{\text{(i) } NaNO_2/HCl}$

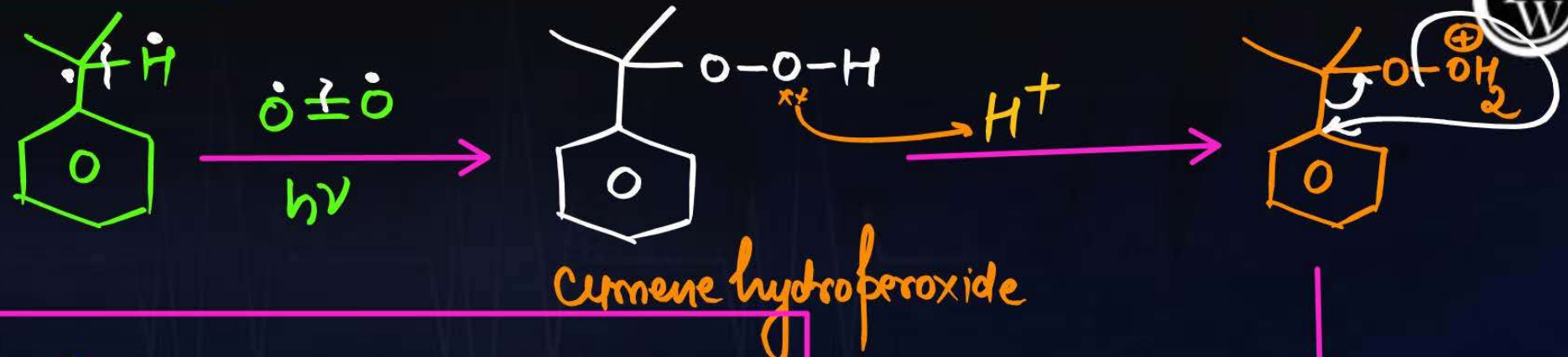
C 

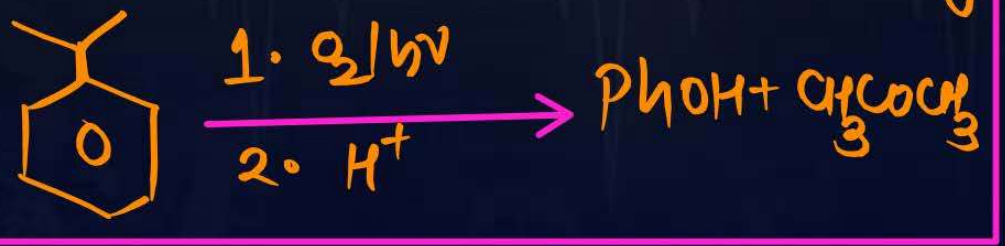
$\xrightarrow[\text{(ii) NaOH, (Heating)}\\ \text{(iii) } H^+]{\text{(i) Oleum}}$

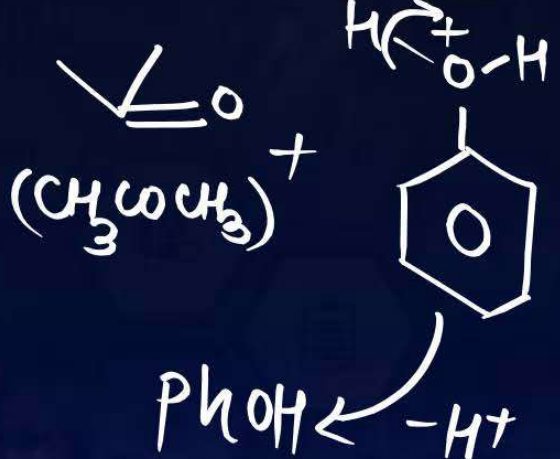
D 

$\xrightarrow[\text{(ii) HCl}]{\text{(i) NaOH (aq.), 298k/1atm}}$

4. From cumene:



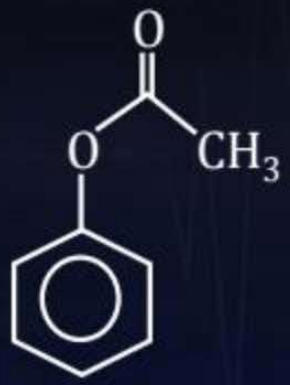




C.Q. 21 [25 Jan, JEE Mains 2023 (Shift-I)]

In the cumene to phenol preparation in presence of air the intermediate is:

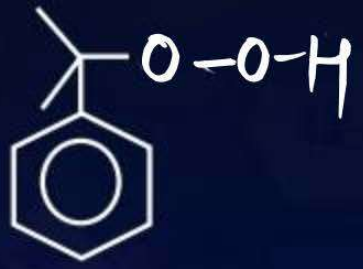
A



B

C

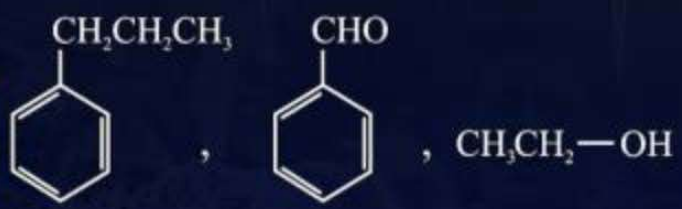
D

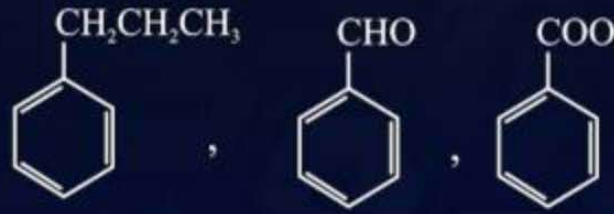


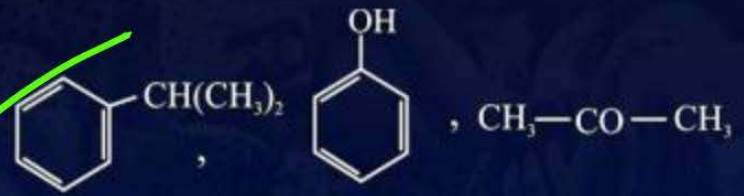
C.Q. 22 (NEET 2018)

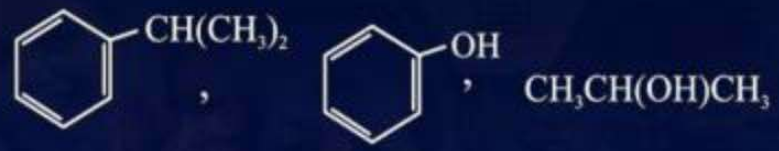
Identify the major products P, Q and R in the following sequence of reactions:

P Q R

A 

B 

C 

D 

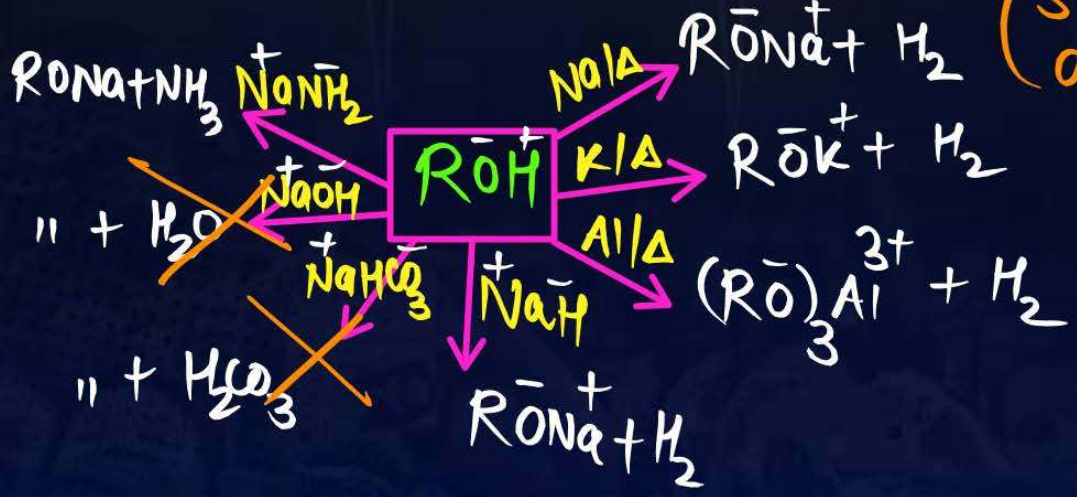
Chemical Properties of Alcohols

1. Acidic Nature of alcohol:

[SA → WA]
[WA ✗ SA]

$R-O-H \rightleftharpoons RO^{\ominus} + H^{\oplus}$ (Stable anion)

A·S α $-I$ α $\frac{1}{+I}$



$CH_3OH + NaOH \rightleftharpoons CH_3ONa + H_2O$

SA WA

C.Q. 23 (AIIMS 2016)

$ClCH_2CH_2OH$ is stronger acid than CH_3CH_2OH because of:

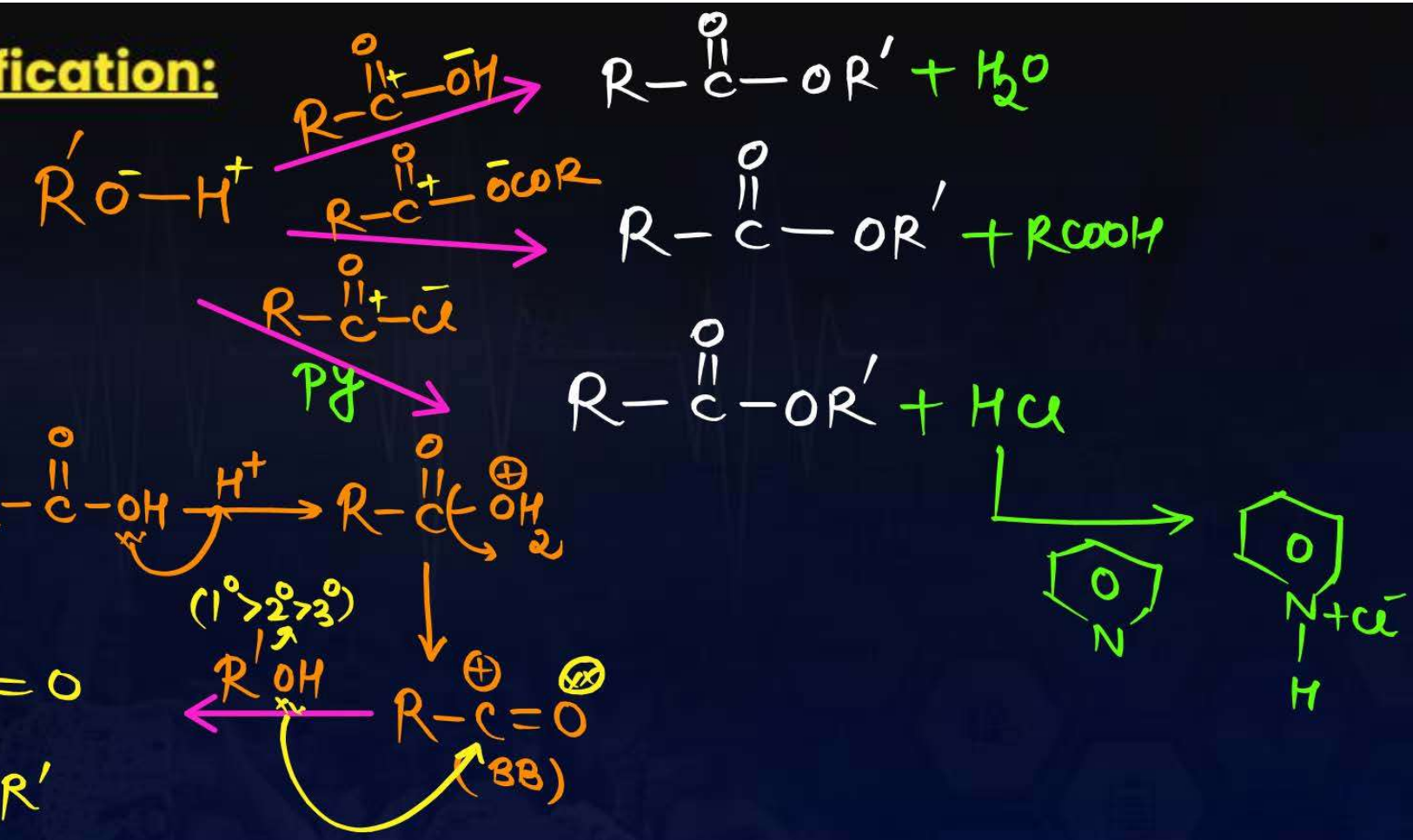
A –I effect of Cl increases negative charge on O atom of alcohol.

B –I effect of Cl disperses negative charge on O atom to produce more stable cation.

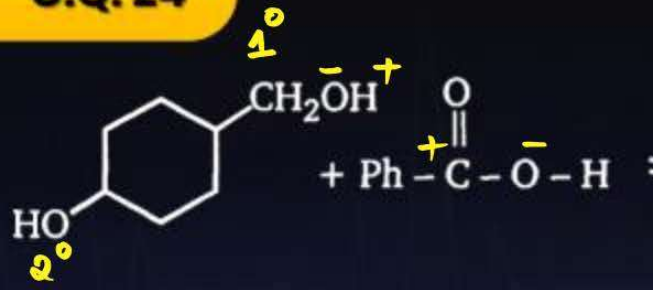
C –I effect of Cl disperses negative charge on O atom to produce more stable anion.

D None of these

2. Esterification:

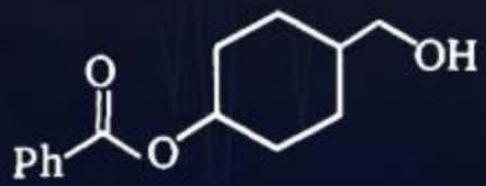


C.Q. 24

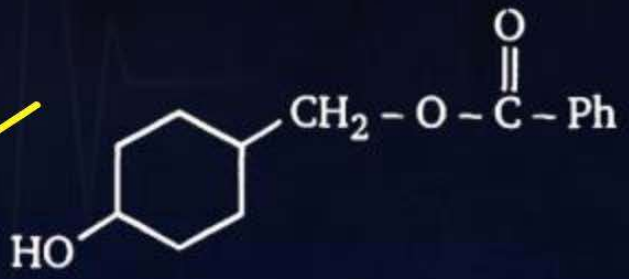


Major product of above esterification reaction is:

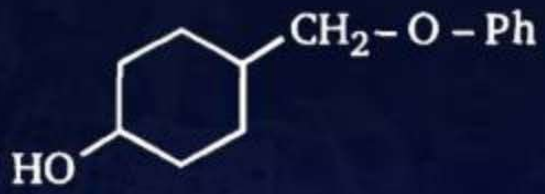
A



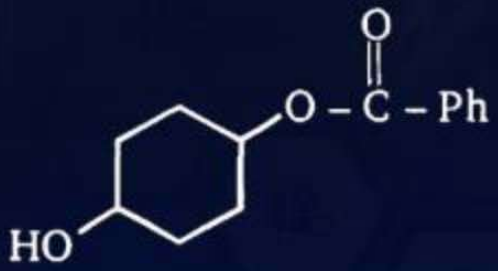
B



C



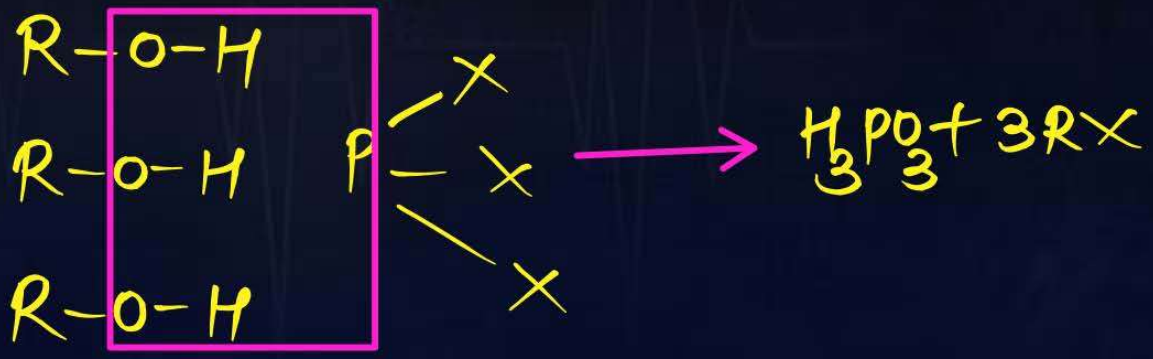
D



3. Reaction with PX_3:

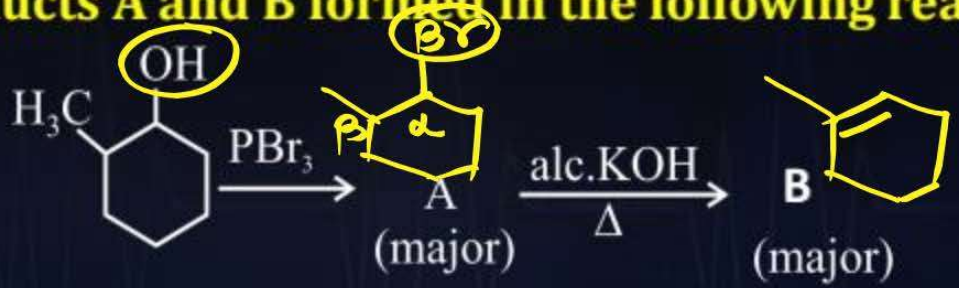
or

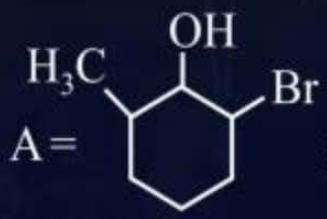
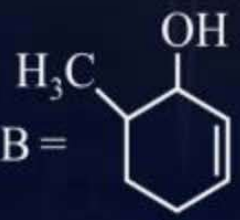
Red P/X_2

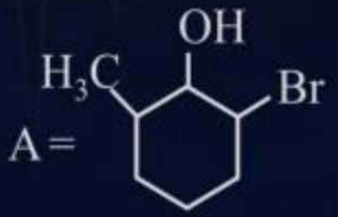
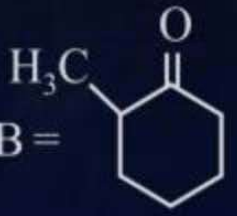


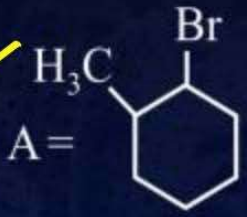
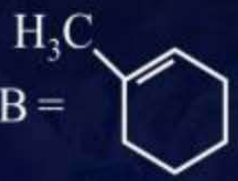
C.Q. 25 (NEET 2024)

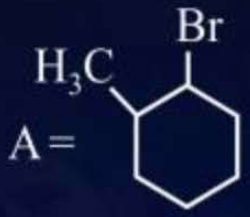
Major products A and B formed in the following reaction sequence are:



A A =  ; B = 

B A =  ; B = 

C A =  ; B = 

D A =  ; B = 

4. Reaction with PX_5:

C.Q. 26 (NEET 2024)

The products A and B obtained in the following reactions respectively are

$3ROH + PCl_3 \rightarrow 3RCl + A$ H_3PO_3

$ROH + PCl_5 \rightarrow RCl + HCl + B$ $POCl_3$

A H_3PO_4 and $POCl_3$

B H_3PO_3 and $POCl_3$

C $POCl_3$ and H_3PO_3

D $POCl_3$ and H_3PO_4

5. Reaction with SOX_2: (Darzens Rxn)

C.Q. 27

Which reaction is termed as Darzen's reaction?

A $ROH + HCl$

B $ROH + PCl_5$

C $ROH + SOCl_2$

D $ROH + PCl_3$

C.Q. 28

When ethyl alcohol (C_2H_5OH) reacts with thionyl chloride, in the presence of pyridine, the product obtained is:

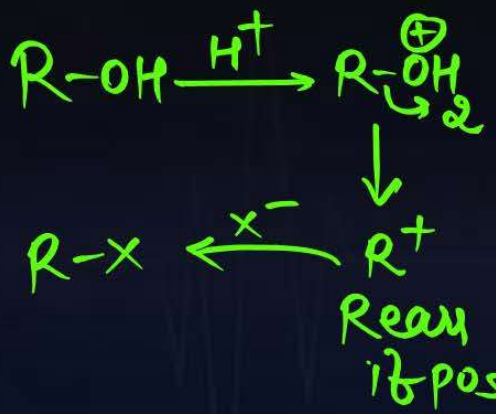
A $CH_3CH_2Cl + HBr$

B $C_2H_6 + HCl + SO_2$

C $CH_3CH_2Cl + H_2O + SO_2$

D $CH_3CH_2Cl + HCl + SO_2$

6. Reaction with HX:



NaBr + H_2SO_4 (HBr)

NaI or KI + H_3PO_4 (HI)

Luca's Test

Conc HCl
Anhy $ZnCl_2$

1° ROH —Lucas reagent→ No turbidity

2° " —" → Min

3° " —" → Sec

C.Q. 29 (NCERT Exemplar)

What is the correct order of reactivity of alcohols in the following reaction?

$$R—OH + HCl \xrightarrow{ZnCl_2} R—Cl + H_2O$$

A $1° > 2° > 3°$

B $1° < 2° > 3°$

C $3° > 2° > 1°$

D $3° > 1° > 2°$

C.Q. 30 (NEET 2022)

Given below are two statements:

Statement-I: In Lucas test, primary, secondary and tertiary alcohols are distinguished on the basis of their reactivity with conc. HCl + anhy. $ZnCl_2$, known as Lucas Reagent.

Statement-II: Primary alcohols are most reactive and immediately produce turbidity at room temperature on reaction with Lucas Reagent. In the light of the above statements, choose the most appropriate answer from the options given below:

A Statement I is incorrect but Statement II is correct.

B Both Statement I and Statement II are correct.

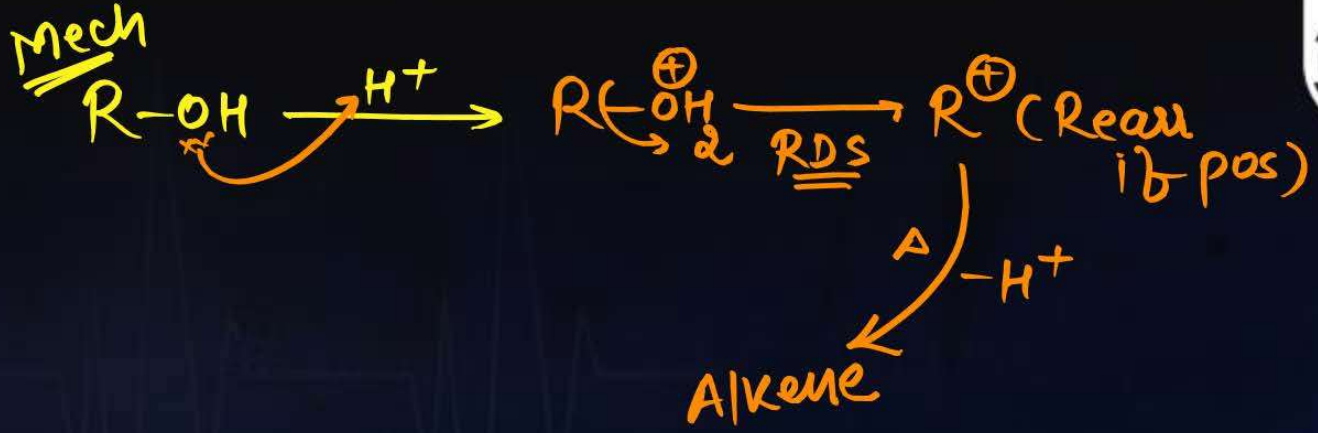
C Both Statement I and Statement II are incorrect.

D Statement I is correct but Statement II is incorrect.

7. Dehydration:

1. H^+/Δ
2. Conc H_2SO_4/Δ

Mech

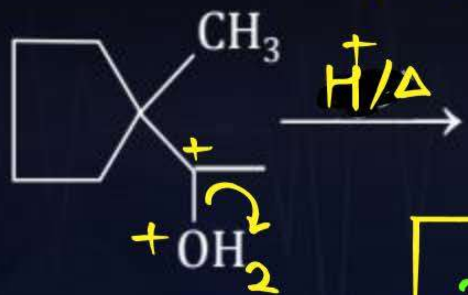


OP Points:

1. Formation of Carbocation.
2. Rearrange If possible
3. R.O.R or Reactivity α Stability of 1st carbocation
4. ROR r = $k[R\text{-}^{+}OH_2]^{1}$
5. E1 mechanism
6. More stable alkene is the major product.

C.Q. 31 [29 Jan, JEE Mains 2023 (Shift-I)]

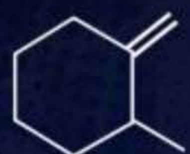
Find out the major product for the following reaction.



Major product

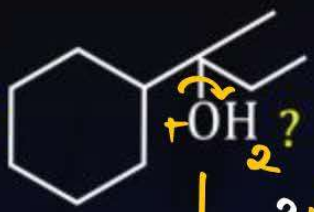
A 

B 

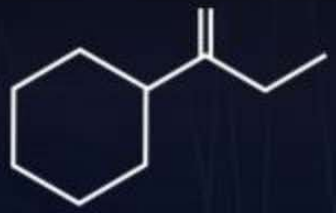
C 

D 

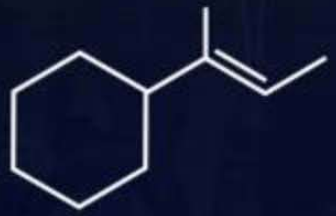
C.Q. 32 (NEET 2015)

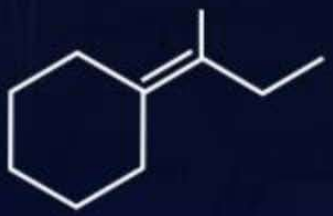
Which of the following is not the product of dehydration of 

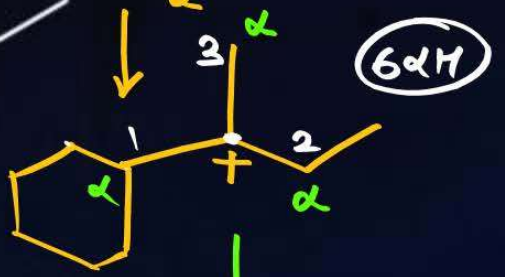
?

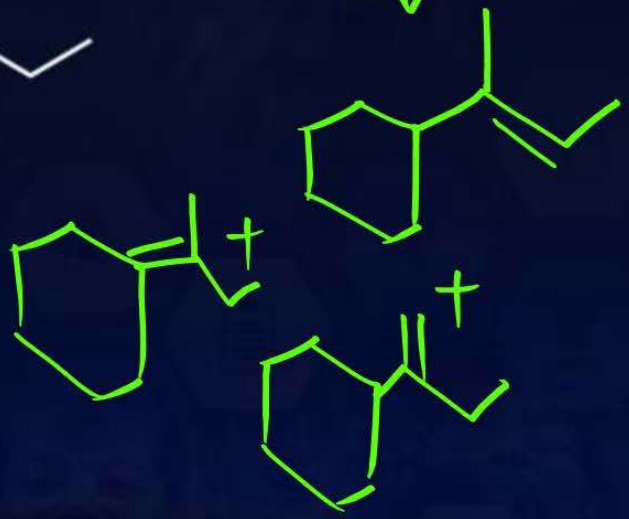
A 

B 

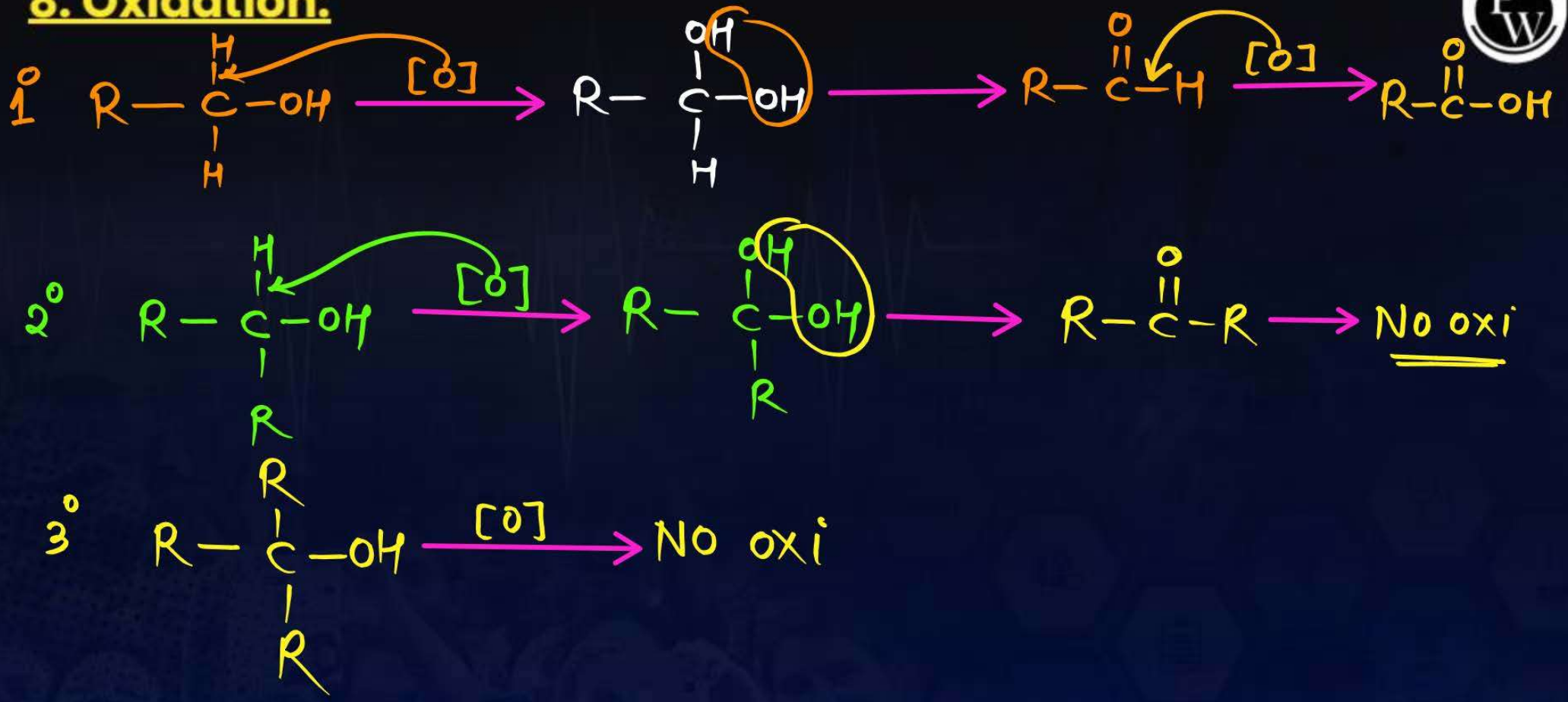
C 

D 



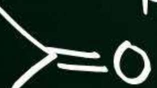


8. Oxidation:


1°
R—C(H)(H)—OH
[O]
R—C(OH)(H)—OH
R—C(=O)—H
[O]
R—C(=O)—OH
2°
R—C(H)(R)—OH
[O]
R—C(OH)(R)—OH
R—C(=O)—R
No oxi
3°
R—C(R)(R)—OH
[O]
No oxi

MOA

$1^\circ \longrightarrow$ Ald
$2^\circ \longrightarrow$ Ket

1. CrO_3 or CrO_3 (anhy)
2. PCC (pyridinium chloro chromate)
   ( + HCl + CrO_3)
3. PDC (pyridinium dichromate)
   () $Cr_2O_7^{2-}$
4. CrO_3 + 
5. CrO_3 + 2 py or CH_2Cl_2

SOA

$1^\circ \longrightarrow$ Acid
$2^\circ \longrightarrow$ Ket

1. $KMnO_4$ (H^+ or Hot)
2. $K_2Cr_2O_7$ (")
3. Alk $KMnO_4$ / Δ then H^+
4. Conc HNO_3
5. $CrO_{3(aq)}$ or H_2CrO_4 ($CrO_3 + H_2O$)
6. $CrO_3 + H_2SO_4$ (Jone's reagent)

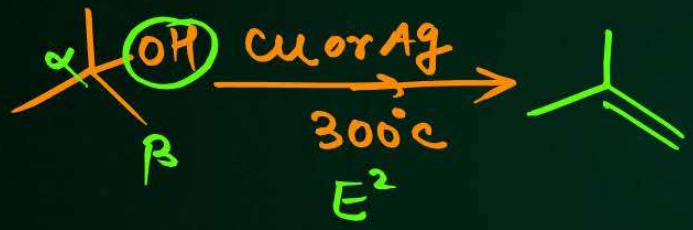
MOA

Cu or Ag | 300°C

$1^{\circ} \longrightarrow$ Ald

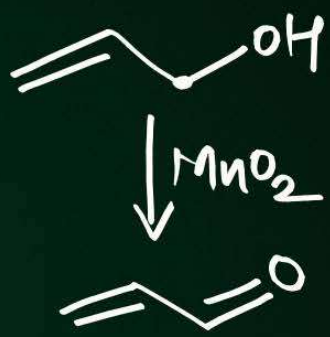
$2^{\circ} \longrightarrow$ ket

$3^{\circ} \longrightarrow$ alkene



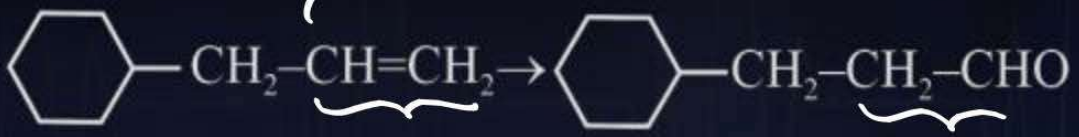
MOA

MnO_2 for allylic & Benzylic Alcohol



C.Q. 33 (NEET 2024)

Identify the correct reagents that would bring about the following transformation.



A (i) BH_3 (ii) $H_2O_2/\overset{\ominus}{O}H$ (iii) alk. $KMnO_4$ (iv) $H_3O^{\oplus}$

B (i) H_2O/H^+ (ii) CrO_3

C (i) H_2O/H^+ (ii) PCC

D (i) BH_3 (ii) $H_2O_2/\overset{\ominus}{O}H$ (iii) PCC

C.Q. 34 (NCERT Exemplar)

Which of the following reagents cannot be used to oxidize primary alcohols to aldehydes?

MOA

A CrO_3 in anhydrous medium.

SOA

B $KMnO_4$ in acidic medium.

MOA

C Pyridinium chlorochromate.

MOA

D Heat in the presence of Cu at 573K.

C.Q. 35

The product of reaction $CH_3CH_2OH \xrightarrow[Cu]{300^\circ C} ?$ is:

A C_2H_6

B CH_3COCH_3

C CH_3COOH

D CH_3CHO

Chemical Properties of Phenols

As PhOH > ROH

$PhO^{\ominus}$ > $RO^{\ominus}$
(Reso) (No reso)

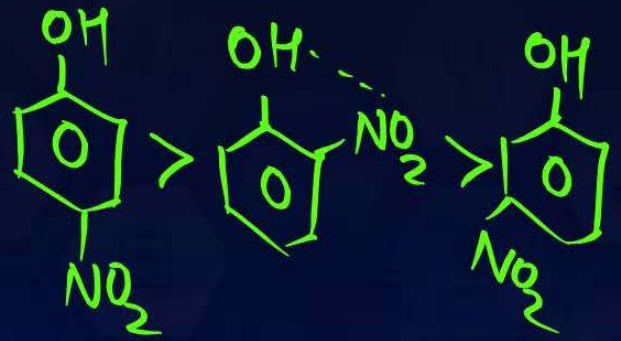
1. Acidic Nature of Phenol:

$$PhOH \rightleftharpoons PhO^{\ominus} + H^{+}$$
(Stable)

[A.S $\propto$ −M, −H, −I $\propto \frac{1}{+M, +H, +I}$]

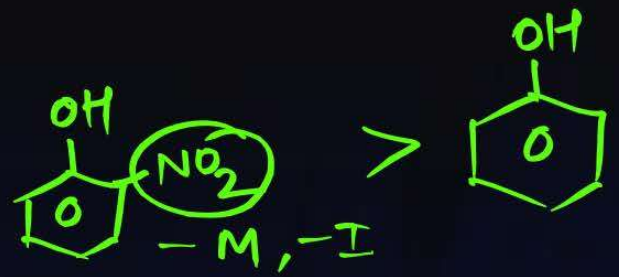
meta Nitrophenols

[P > O > M]



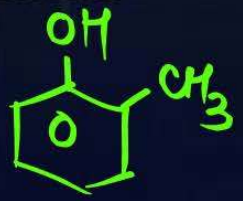
C.Q. 36 (NCERT Exemplar)

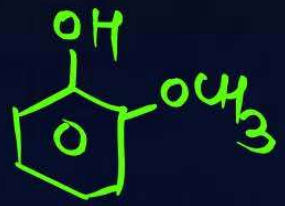
Phenol is less acidic than _____.



A ethanol 

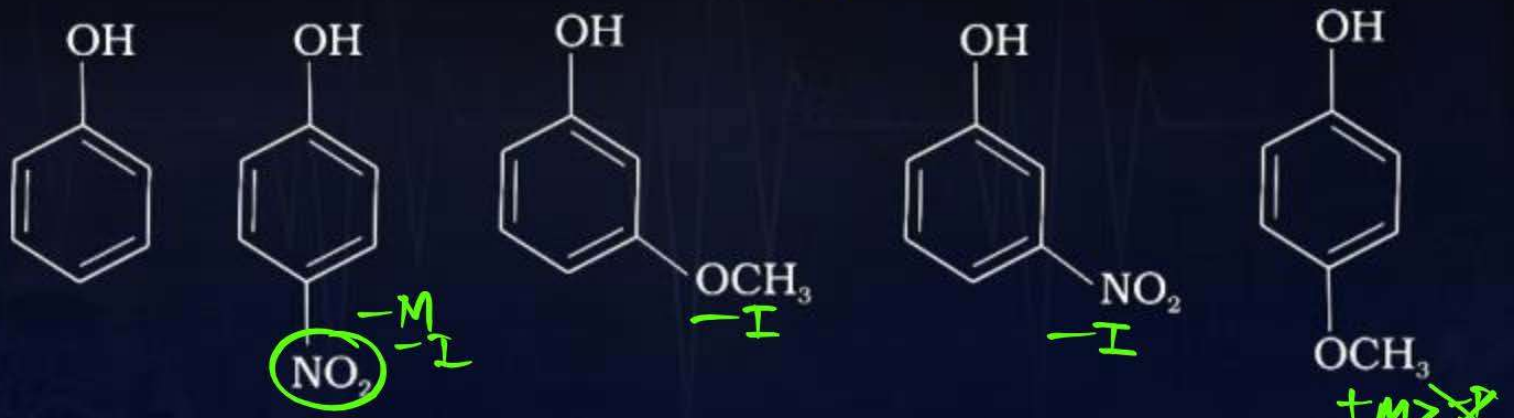
B *o*-nitrophenol

C *o*-methylphenol 

D *o*-methoxyphenol 

C.Q. 37 (NCERT Exemplar)

Mark the correct order of decreasing acidic strength of the following compounds.



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

A e > d > b > a > c

B b > d > c > a > e

C d > e > c > b > a

D e > d > c > b > a

A. Reaction with metals:

$$PhOH \xrightarrow{Na/\Delta} Ph\bar{O}\overset{+}{Na} + H_2$$

$$PhOH \xrightarrow{K/\Delta} Ph\bar{O}\overset{+}{K} + H_2$$ ✓

B. Reaction with NaOH:

$$Ph\overset{-}{O}\overset{+}{H} + \overset{+}{Na}\overset{-}{OH} \longrightarrow PhONa + \underset{WA}{H_2O}$$ ✓

SA

C. Reaction with $NaNH_2$:

$PhOH + NaNH_2 \longrightarrow PhONa + NH_3$ ✓

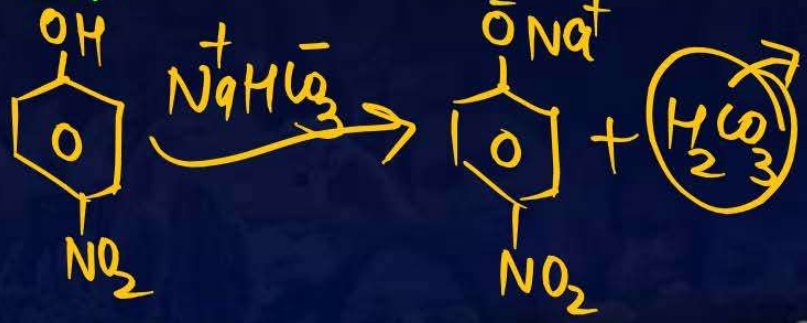
SA → WA

D. Reaction with $NaHCO_3$:

$PhOH + NaHCO_3 \not\longrightarrow PhONa + H_2CO_3$

WA → SA

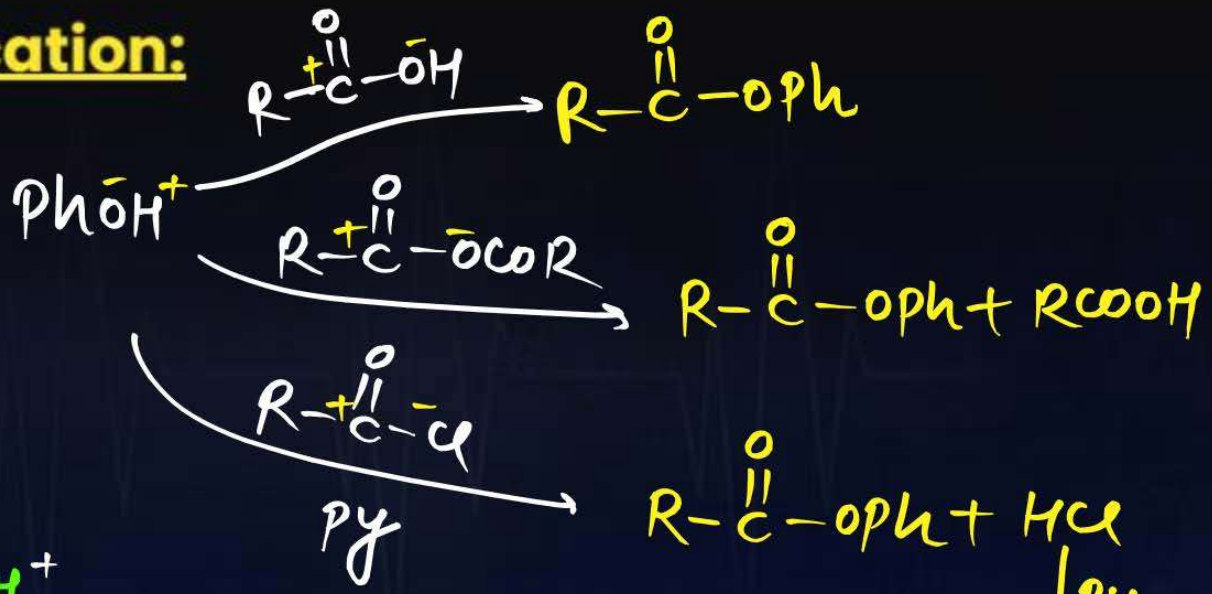
P-nitrophenol



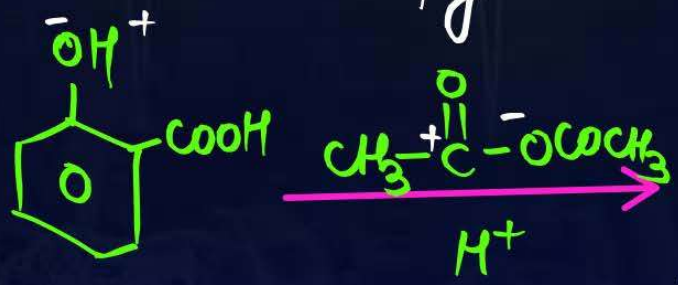
$CO_2 + H_2O$

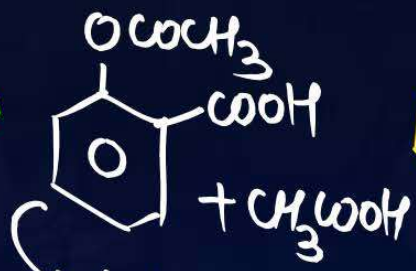
Brisk effervescence

2. Esterification:

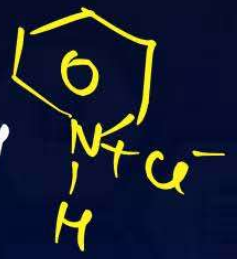


Q





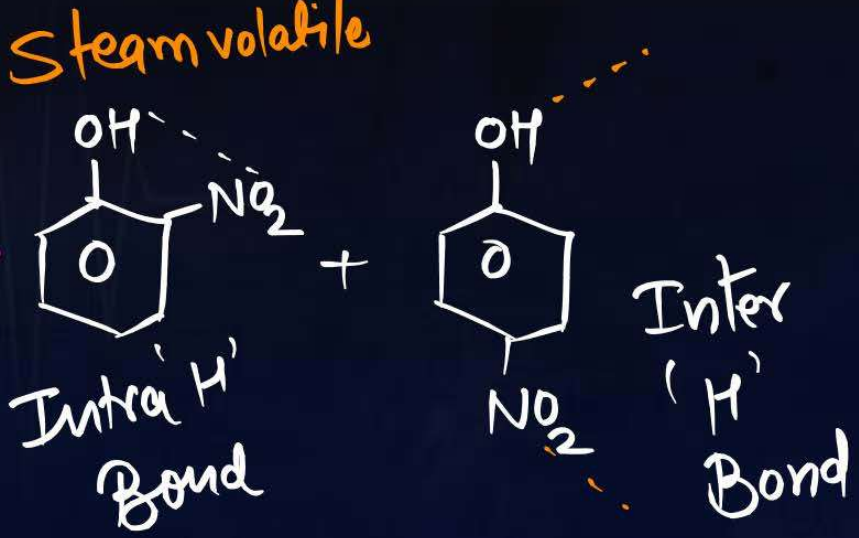
Aspirin



3. Electrophilic Aromatic Substitution reactions:

A. Nitration:

(i) With dilute nitric acid:



B.P $P > O$

V.P
Volatility $P < O$

OP Points:

1. The ortho and para isomers can be separated by steam distillation.
2. o-Nitrophenol is steam volatile due to intramolecular hydrogen bonding while p-nitrophenol is less volatile due to intermolecular hydrogen bonding which cause the association of molecules.

C.Q. 38

Phenol on treatment with dil. HNO_3 gives:

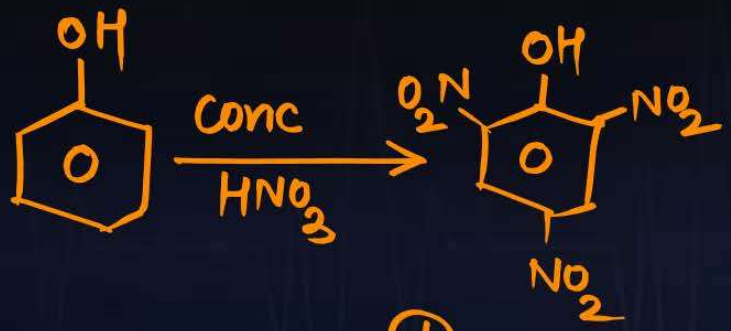
A picric acid

B o-and p-nitrophenols

C o-and m-nitrophenols

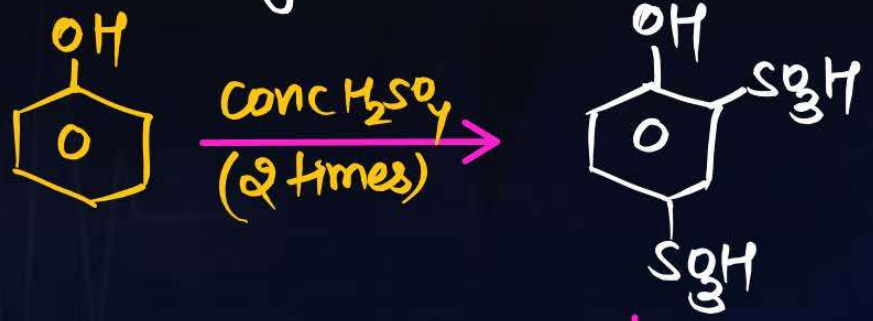
D p-and m-nitrophenols

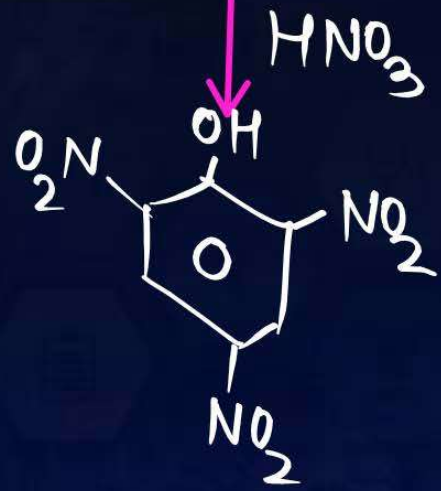
(ii) With Conc. nitric acid:



Picric Acid
(poor yield)

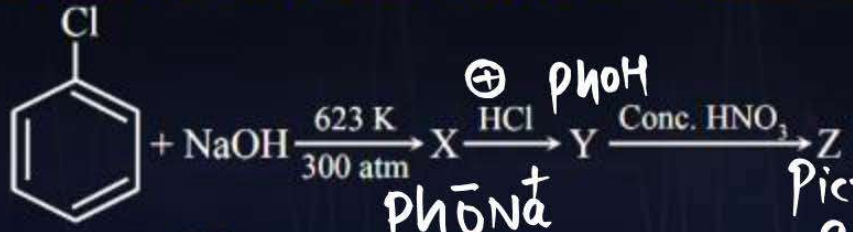
for better yield





C.Q. 39 (JEE Mains 5th April 2024, Morning Shift)

Identify compound (Z) in the following reaction sequence.

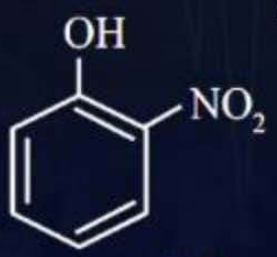


⊕ PhOH

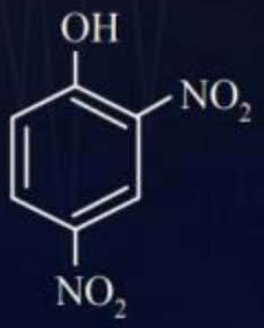
Phōnd

Picric acid

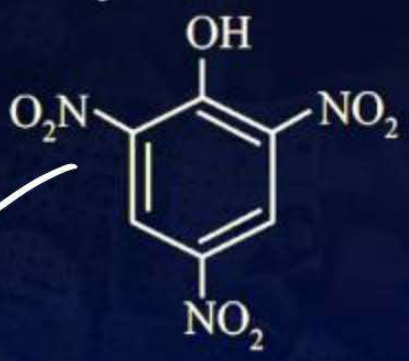
A



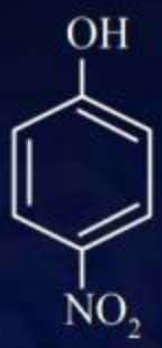
B



C



D



C.Q. 40 (NCERT Exemplar)

Assertion: Phenols give o-and p-nitrophenol on nitration with conc. HNO_3 and H_2SO_4 mixture.
Reason: -OH group in phenol is *o*–, *p*– directing.

A Assertion and reason both are correct and reason is correct explanation of assertion.

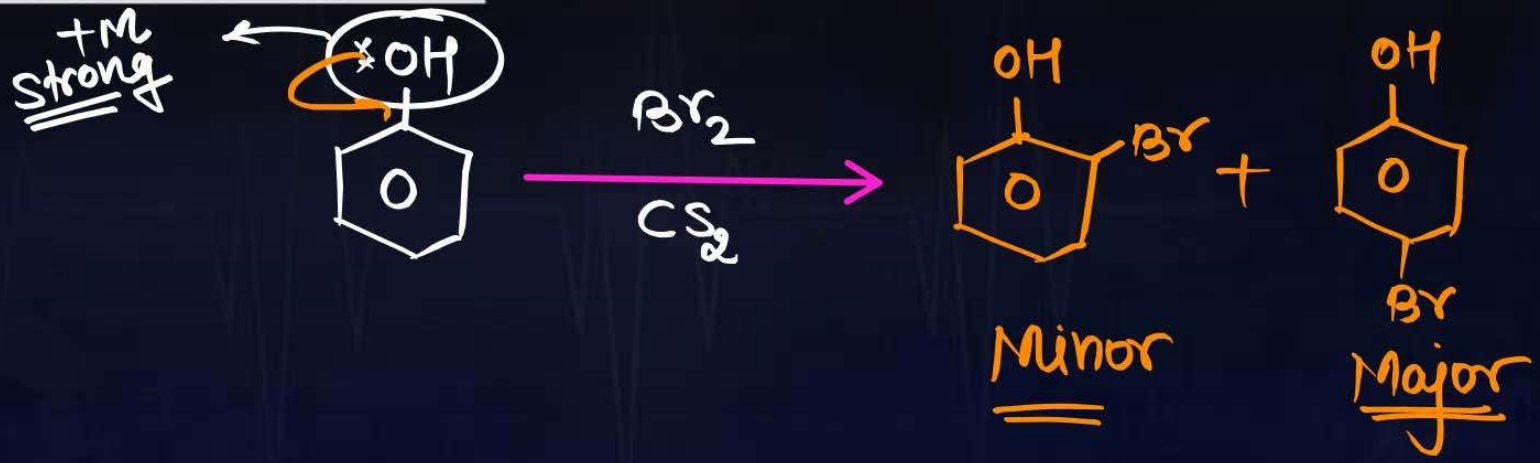
B Assertion and reason both are wrong statements.

C Assertion is correct statement but reason is wrong statement.

D Assertion is wrong statement but reason is correct statement.

B. Halogenation:

(i) Mono bromination:



OP Points:

1. The usual halogenation of benzene takes place in the presence of a Lewis acid, such as $FeBr_3$ which polarises the halogen molecule.

2. In case of phenol, the polarization of bromine molecule takes place even in the absence of Lewis acid.
3. It is due to the highly activating effect of –OH group attached to the benzene ring.

C.Q. 41 (JEE Mains 5th April 2024, Morning Shift)

Given below are two statement:

Statement-I: Bromination of phenol in solvent with low polarity such as $CHCl_3$ or CS_2 requires Lewis acid catalyst.

Statement-II: The Lewis acid catalyst polarises the bromine to generate Br^+.

In the light of the above statements, choose the correct answer from the options given below:

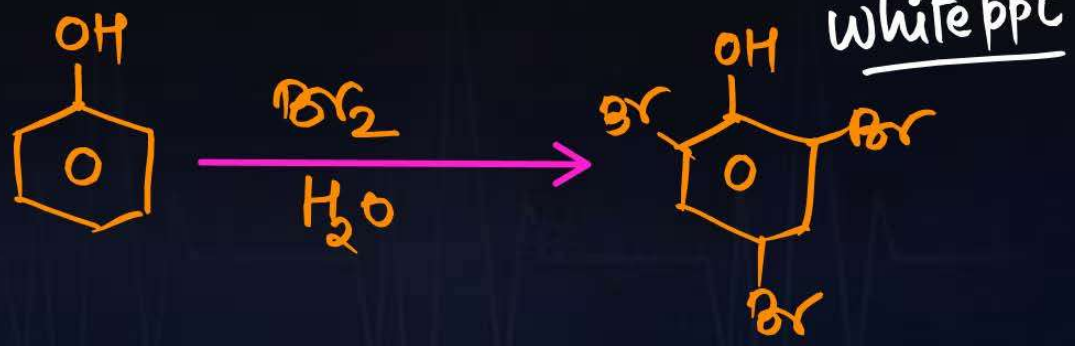
A Statement I is true but Statement II is false.

B Both Statement I and Statement II are true

C Both Statement I and Statement II are false.

D Statement I is false but Statement II is true.

(ii) Tri bromination:



$PhOH + H_2O \rightleftharpoons PhO^{\ominus}$

+M power $-O^{\ominus} > -OH$

Bhayonkar Bhayankar

Kepapa

C.Q. 42 (JEE Mains 2025, 23 January Shift-1)

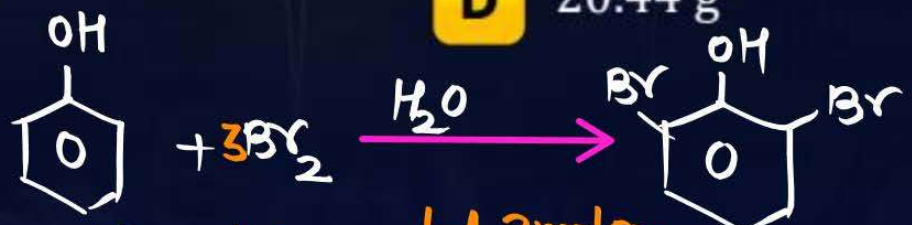
What amount of bromine will be required to convert 2 g of phenol into 2,4,6-tribromophenol? (Given molar mass in g mol^{-1} of C, H, O, Br are 12, 1, 16, 80 respectively)

A 4.0 g

B 10.22 g

C 6.0 g

D 20.44 g



1 mol phenol is reacted with 3 mol Br_2

$94\ gm \rightarrow 3 \times 160$

$2\ gm \rightarrow \frac{2}{94} \times 480$

C.Q. 43

Phenol (1 mole) reacts with bromine water to gives tribromo phenol. The amount of bromine required is:

A 3.0 moles

$PhOH + 3Br_2$

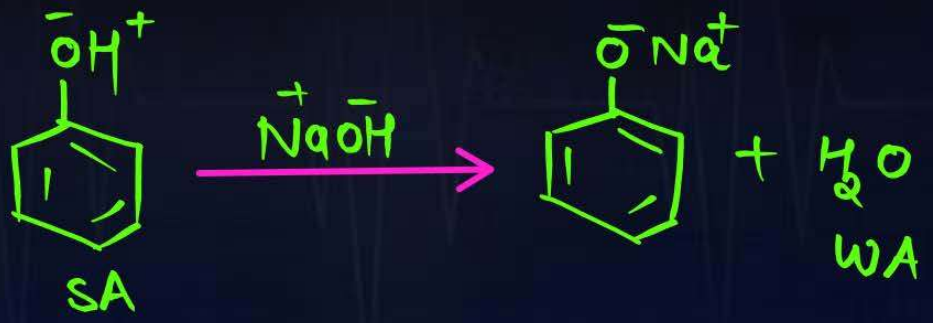
B 1.5 moles

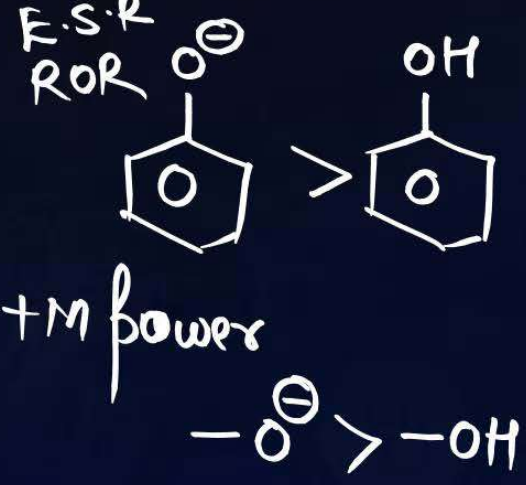
C 4.5 moles

D 6.0 moles

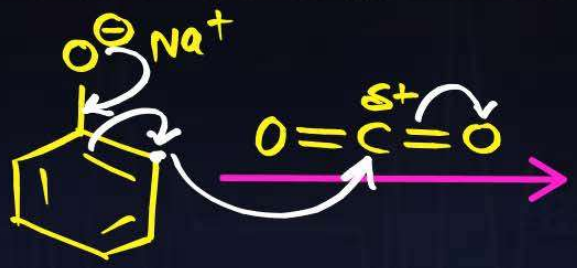
4. Kolbe's reaction:

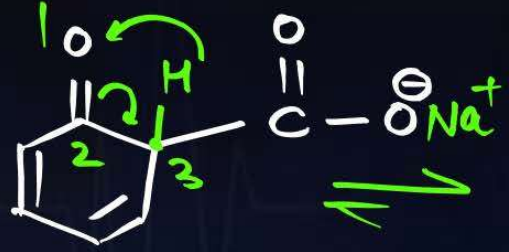
1. The phenoxide ion generated by treating phenol with sodium hydroxide is even more reactive than phenol towards electrophilic aromatic substitution.

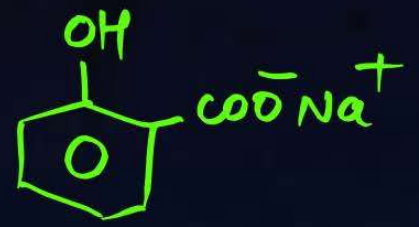




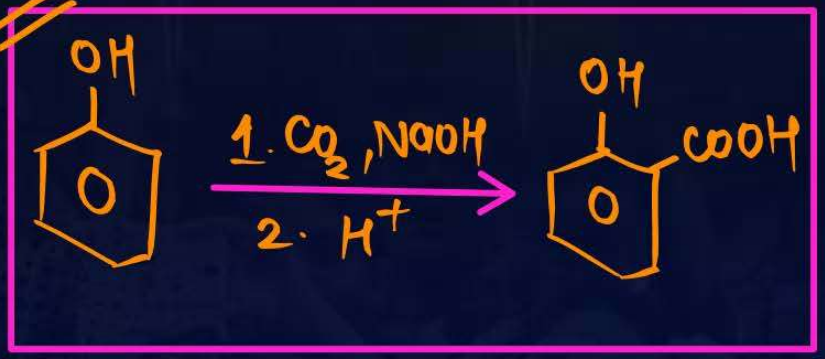
2. Hence, it undergoes electrophilic substitution with carbon dioxide, a weak electrophile. Ortho hydroxybenzoic acid is formed as the main reaction product.

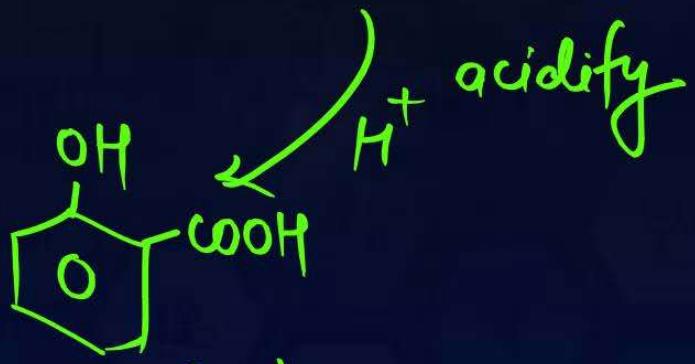






donation of lp $\bar{C} > O^-$





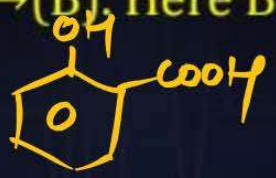
O-Salicylic acid

C.Q. 44 (AIIMS 2017)

In the reaction

Phenol $\xrightarrow{NaOH}$ (A) $\xrightarrow[140°C]{CO_2+HCl}$ (B), Here B is:

PhO⁻Na⁺



A benzaldehyde

B chlorobenzene

C benzoic acid

D salicylic acid

A·S PhOH > EtOH
B·S PhO⁻ < EtO⁻

C.Q. 45 (AIIMS 2015)

Assertion: Phenol undergoes Kolbe reaction, ethanol does not.
Reason: Phenoxide ion is more basic than ethoxide ion.

A If both Assertion and Reason are correct and the Reason is the correct explanation of Assertion.

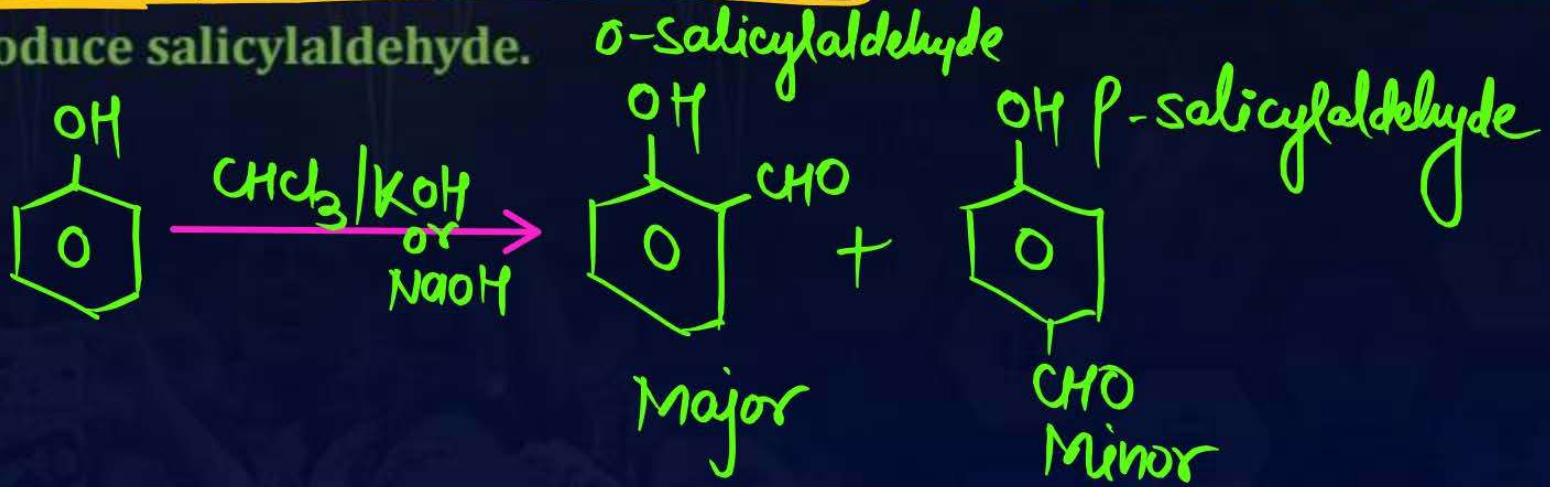
B If both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.

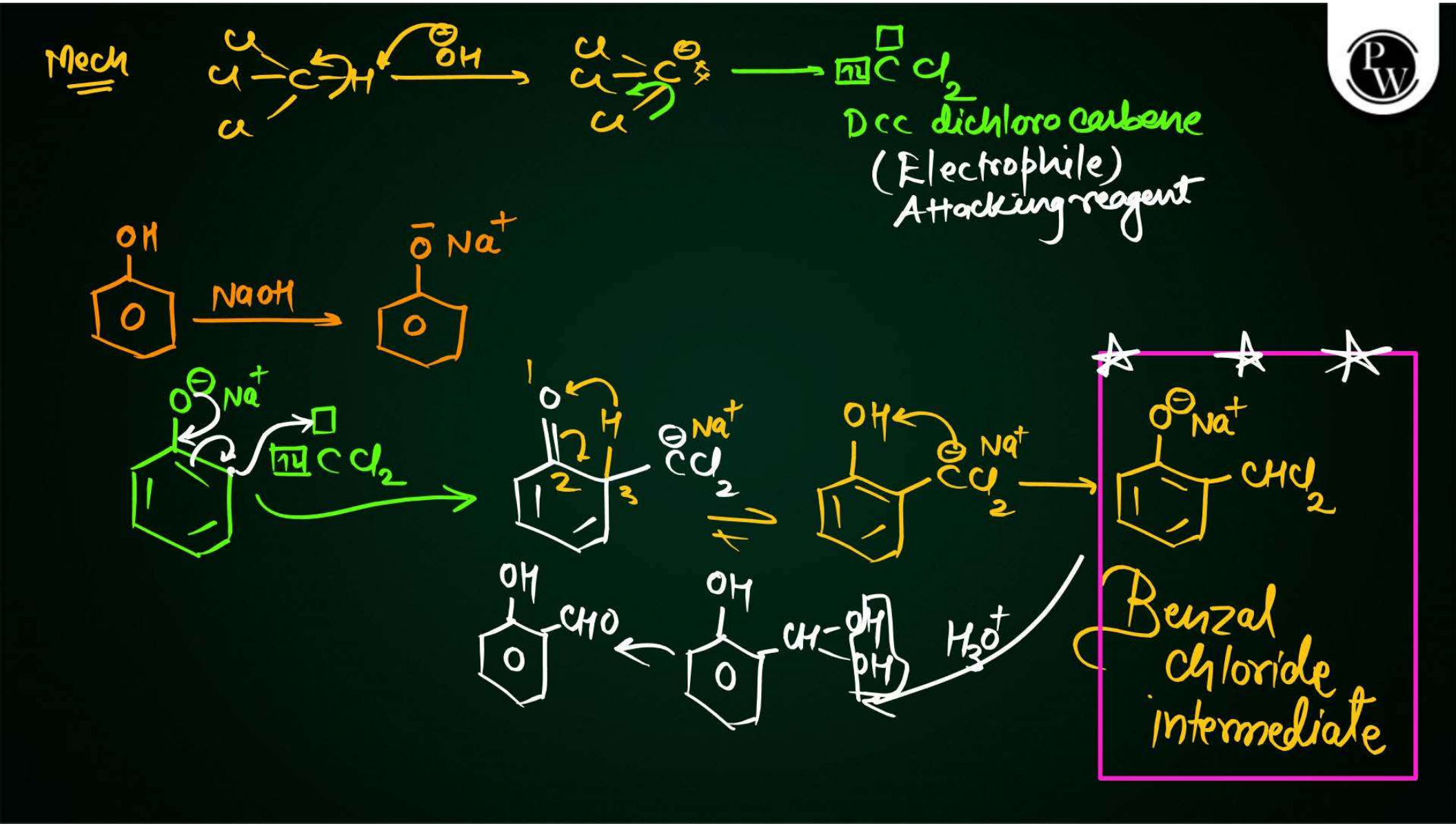
C If Assertion is correct but Reason is incorrect.

D If both the Assertion and Reason are incorrect.

5. Reimer–Tiemann Reaction: [NEET 2025]

1. On treating phenol with chloroform in the presence of sodium hydroxide, –CHO group is introduced at ortho position of benzene ring.
2. This reaction is known as Reimer - Tiemann reaction.
3. The intermediate substituted benzal chloride is hydrolyzed in the presence of alkali to produce salicylaldehyde.

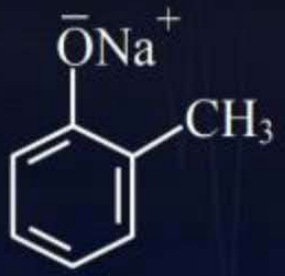



Mech
OH
Dcc dichloro carbene
(Electrophile)
Attacking reagent
NaOH
Benzal
Chloride
intermediate

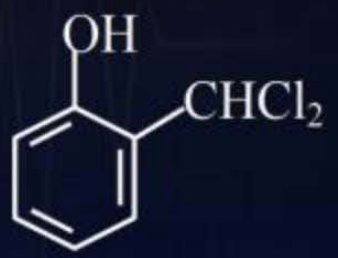
C.Q. 46 (JEE Mains 6th April 2024, Morning Shift)

In Reimer - Tiemann reaction, phenol is converted into salicylaldehyde through an intermediate. The structure of intermediate is _____.

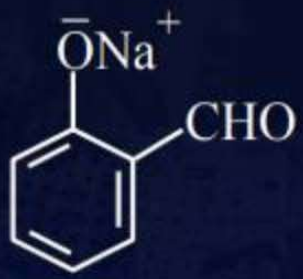
A



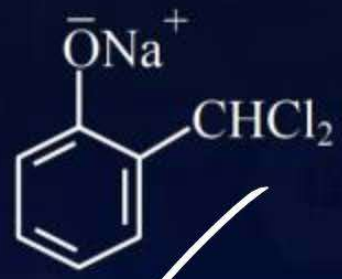
B



C



D



C.Q. 47 (JEE Mains 29th January 2024, Evening Shift)

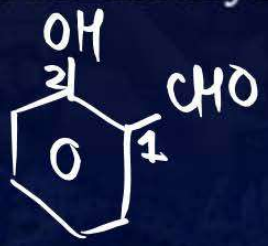
Phenol treated with chloroform in presence of sodium hydroxide, which further hydrolyzed in presence of an acid results

A Salicylic acid

B Benzene-1, 2-diol

C Benzene-1, 3-diol

D 2-Hydroxybenzaldehyde



6. Reaction with zinc dust:

C.Q. 48 (JEE Mains 1st Feb 2024, Evening Shift)

Match List-I with List-II.

List-I (Reactants)	List-II Products
(A) Phenol, Zn/Δ (III)	(I) Salicylaldehyde
(B) Phenol, $CHCl_3$, NaOH, HCl (I)	(II) Salicylic acid
(C) Phenol, CO_2, NaOH, HCl (II)	(III) Benzene
(D) Phenol, Conc. HNO_3 (IV)	(IV) Picric acid

Choose the correct answer from the options given below.

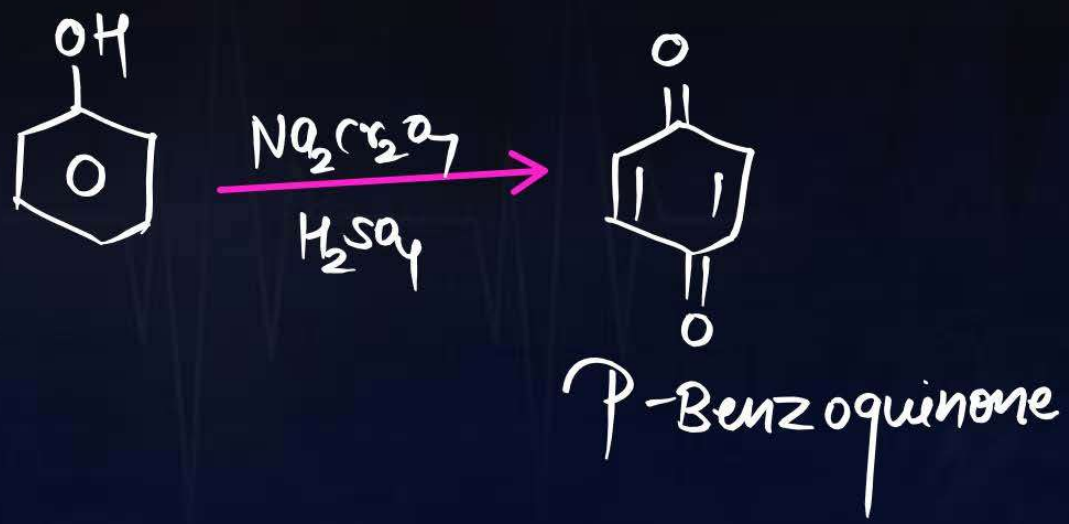
A (A)-(IV), (B)-(II), (C)-(I), (D)-(III)

B (A)-(IV), (B)-(I), (C)-(II), (D)-(III)

C (A)-(III), (B)-(I), (C)-(II), (D)-(IV)

D (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

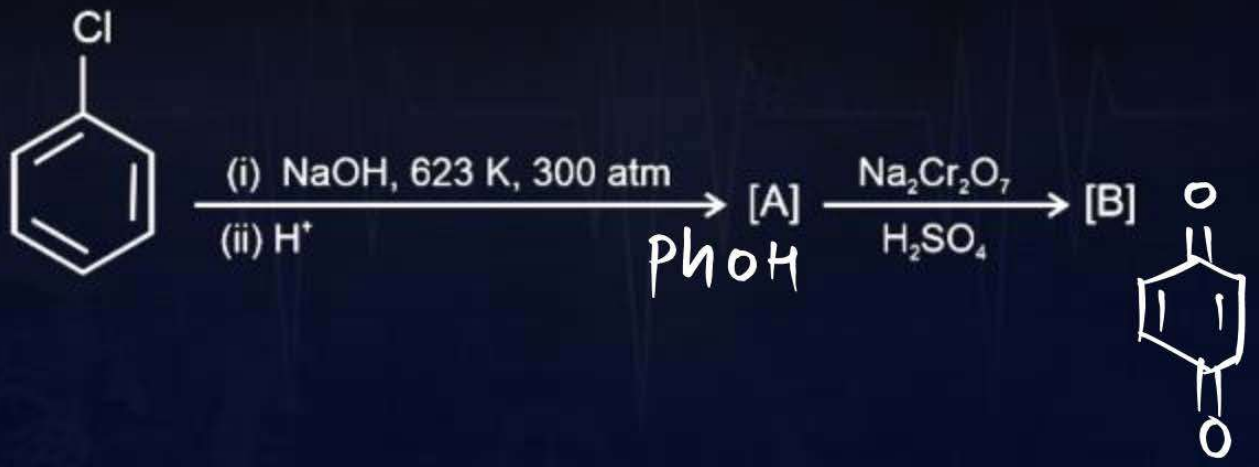
7. Oxidation of Phenol:

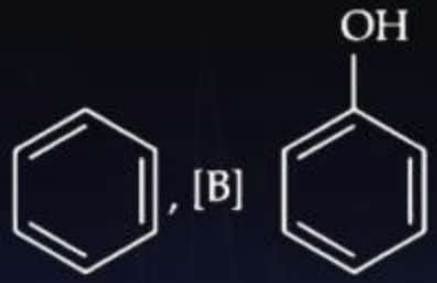


P-Benzoquinone

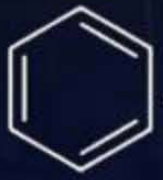
C.Q. 49 (JEE Mains 2025, 23 January Shift-2)

Identify the products [A] and [B], respectively in the following reaction:



A [A]  , [B]

B [A]  , [B] 

C [A]  , [B] 

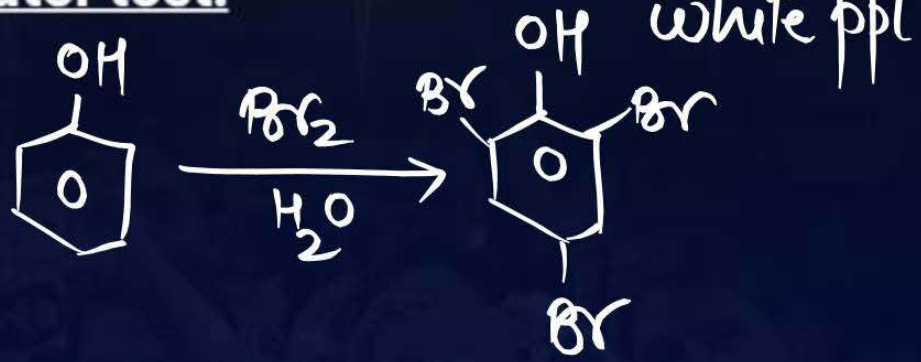
D [A]  , [B] 

8. Test of phenol:

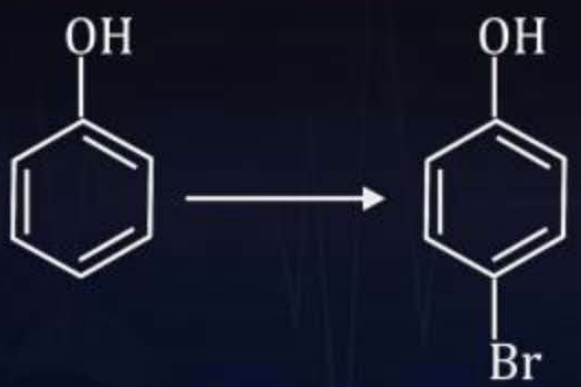
1. Neutral $FeCl_3$ Test:

$$6\,PhOH + FeCl_3 \longrightarrow \underset{\text{Violet}}{[Fe(OPh)_6]^{3-}} + 3HCl + 3H^+$$

2. Bromine water test:



C.Q. 50 [25 July, JEE Mains 2021 (Shift-I)]



(Major Product)

The given reaction can occur in the presence of:

(A) Bromine water

(B) Br_2 in CS_2, 273 K

(C) $Br_2/FeBr_3$

(D) Br_2 in $CHCl_3$, 273 K

Choose the correct answer from the option given below:

A (A) and (C) only

B (B), (C) and (D) only

C (B) and (D) only

D (A), (B) and (D) only

C.Q. 51 (NCERT Exemplar)

Phenol can be distinguished from ethanol by the reactions with _____.

A Br_2/water

B Na

C Neutral $FeCl_3$

D Both (A) & (C)

Methods of Preparation of Ethers

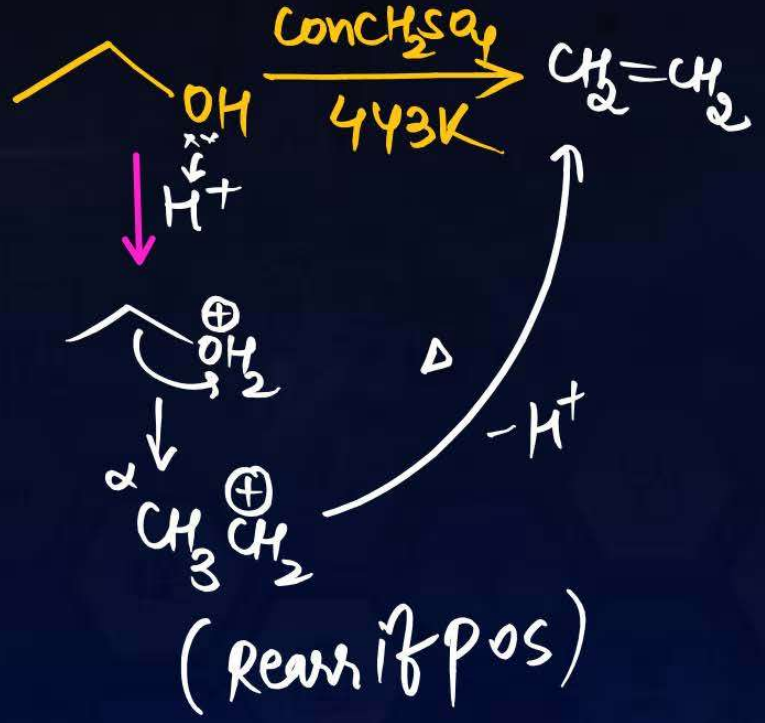
1. By Dehydration of Alcohols:

$$ROH \xrightarrow[413K]{Conc\ H_2SO_4} R-O-R$$

$$R-\boxed{O-H+H}-OR$$

$$EtOH \xrightarrow[413K]{Conc\ H_2SO_4} EtOEt$$

$$Et-\boxed{OH+H}-OEt$$



C.Q. 52

What will be the reactant and reaction condition required for the given reaction?

$CH_3CH_2OH + ? \rightarrow C_2H_5OC_2H_5$

A H_2SO_4, 413 K

B H_2SO_4, 443 K

C HNO_3, 413 K

D HNO_3, 443 K

C.Q. 53

Excess of ethanol when heated with conc. H_2SO_4 at 140°C, the compound obtained is:

273
413K

A ethene

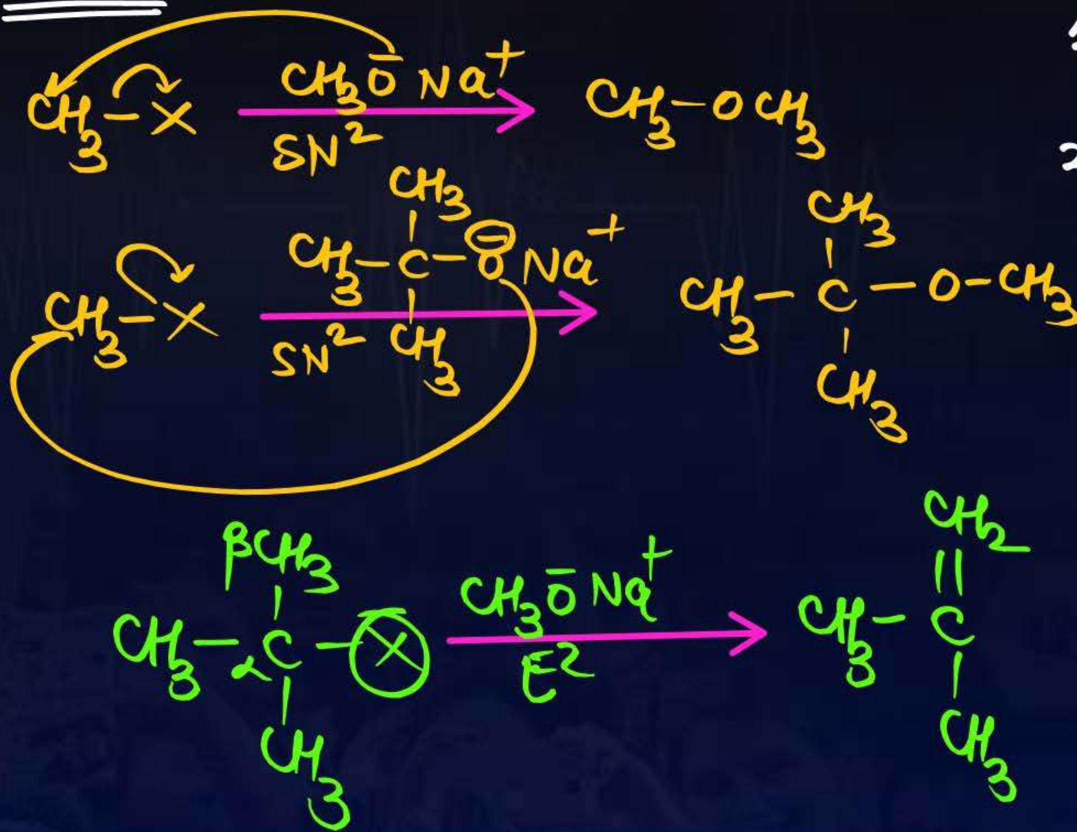
B diethyl sulphate

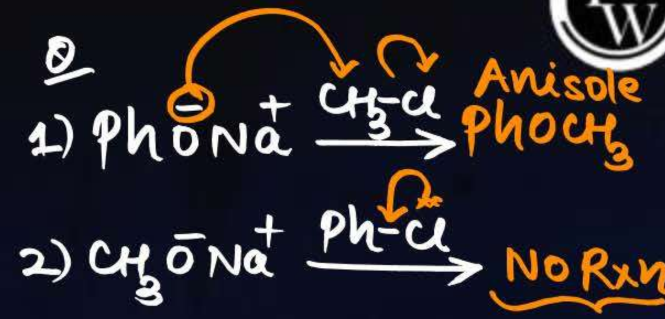
C ethoxy ethane

D ethyl hydrogen sulphate

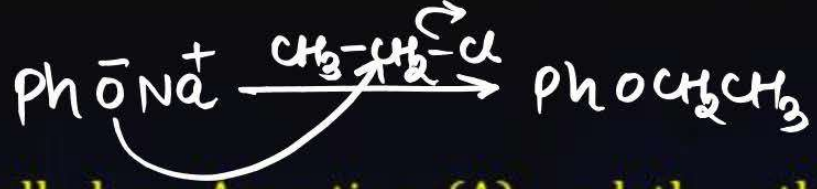
2. Williamson-Ether Synthesis:

S_N2 — $1° > 2° > 3°$ Halide





C.Q. 54 [27 Aug, JEE Mains 2021 (Shift-I)]



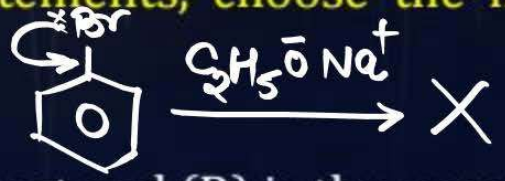
Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R)

Ph–O–CH_2–CH_3

Assertion (A): Synthesis of ethyl phenyl ether may be achieved by Williamson synthesis.

Reason (R): Reaction of bromobenzene with sodium ethoxide yields ethyl phenyl ether.

in the light of the above statements, choose the most appropriate answer from the option given below:



A Both (A) and (R) are correct and (R) is the correct explanation of (A).

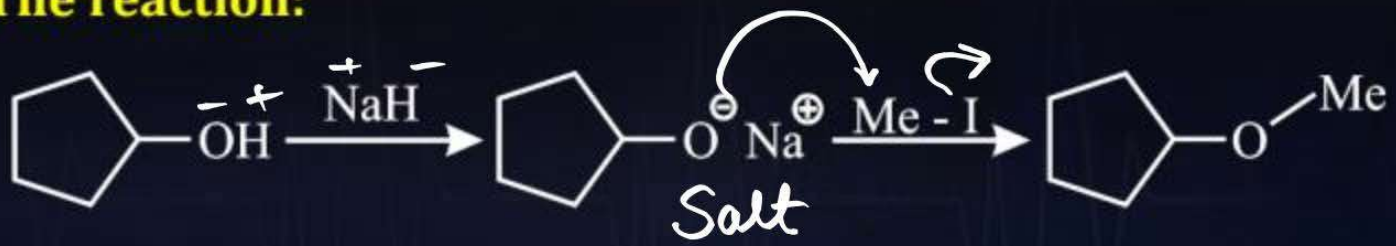
B (A) is correct but (R) is not correct.

C Both (A) and (R) are correct but (R) is NOT the correct explanation of (A).

D (A) is not correct but (R) is correct.

C.Q. 55 (NEET 2016)

The reaction:



can be classified as?

A Williamson alcohol synthesis reaction

B Williamson ether synthesis reaction ✓

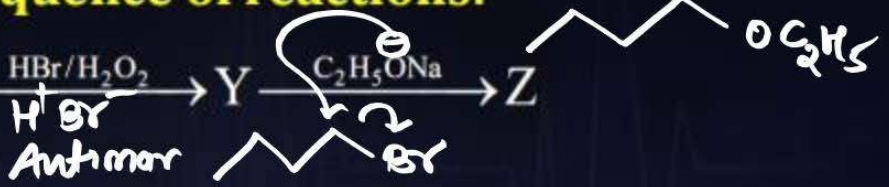
C Alcohol formation reaction

D Dehydration reaction

C.Q. 56 (NEET 2014)

Identify Z in the sequence of reactions:

$$CH_3CH_2CH=CH_2 \xrightarrow{HBr/H_2O_2} Y \xrightarrow{C_2H_5ONa} Z$$



A $(CH_3)_2CH-O-CH_2CH_3$

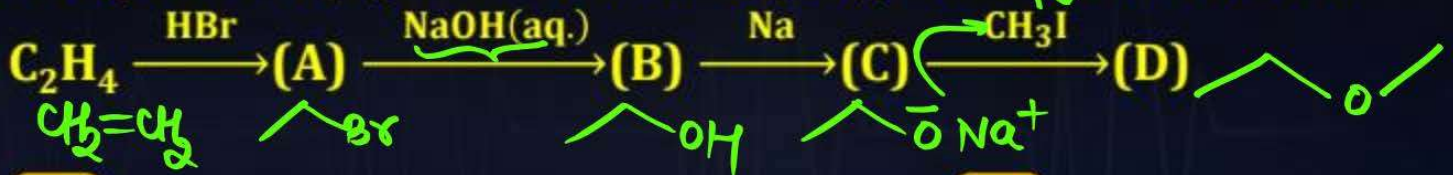
B $CH_3(CH_2)_4-O-CH_3$

C $CH_3CH_2-CH(CH_3)-O-CH_2CH_3$

D $CH_3-(CH_2)_3-O-CH_2CH_3$

C.Q. 57

The product (D) in the following sequence of reaction is:



A butane

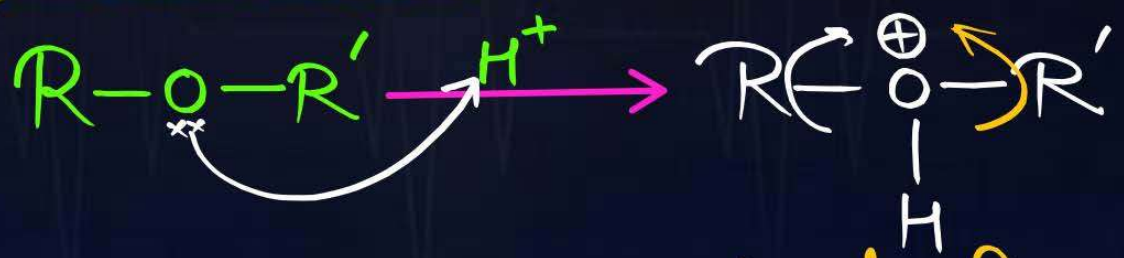
B ethane

C propane

D ethyl methyl ether

Chemical Properties of Ethers

1. Cleavage of C–O bond: A. Reaction with HX [HI > HBr > HCl]



3) agar $C^{\oplus}$ nahi bane toh S_N2

Sochna hai?

R^+, R'^+ 1) main se koi bhi ek side 3° carbocation ban raha hai toh S_N1 banayenge.

2) Ya Resonance stable 1° 2° $C^{\oplus}$ toh S_N1 banayenge.

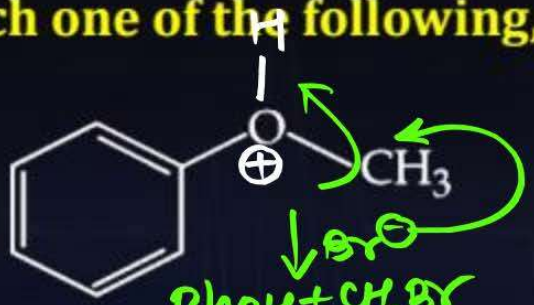
C.Q. 58 (JEE Mains 2025, 29 January Shift-2)

$Me_3C^+ > PhCH_2^+$

9αH

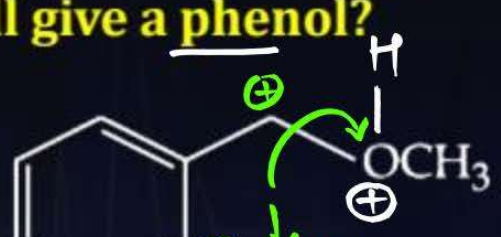
Which one of the following, with HBr will give a phenol?

A



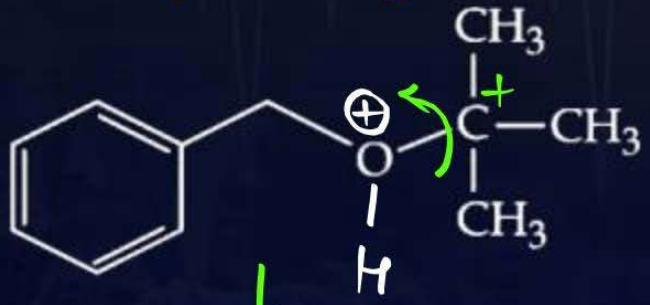
$PhOH + CH_3Br$

B



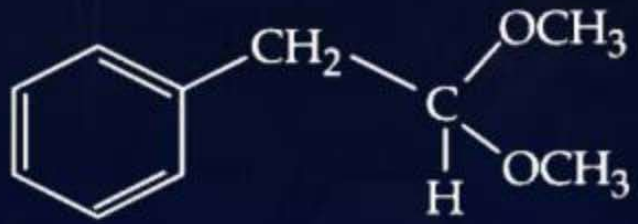
$PhCH_2Br \leftarrow Ph\overset{\oplus}{C}H_2 + CH_3OH$

C



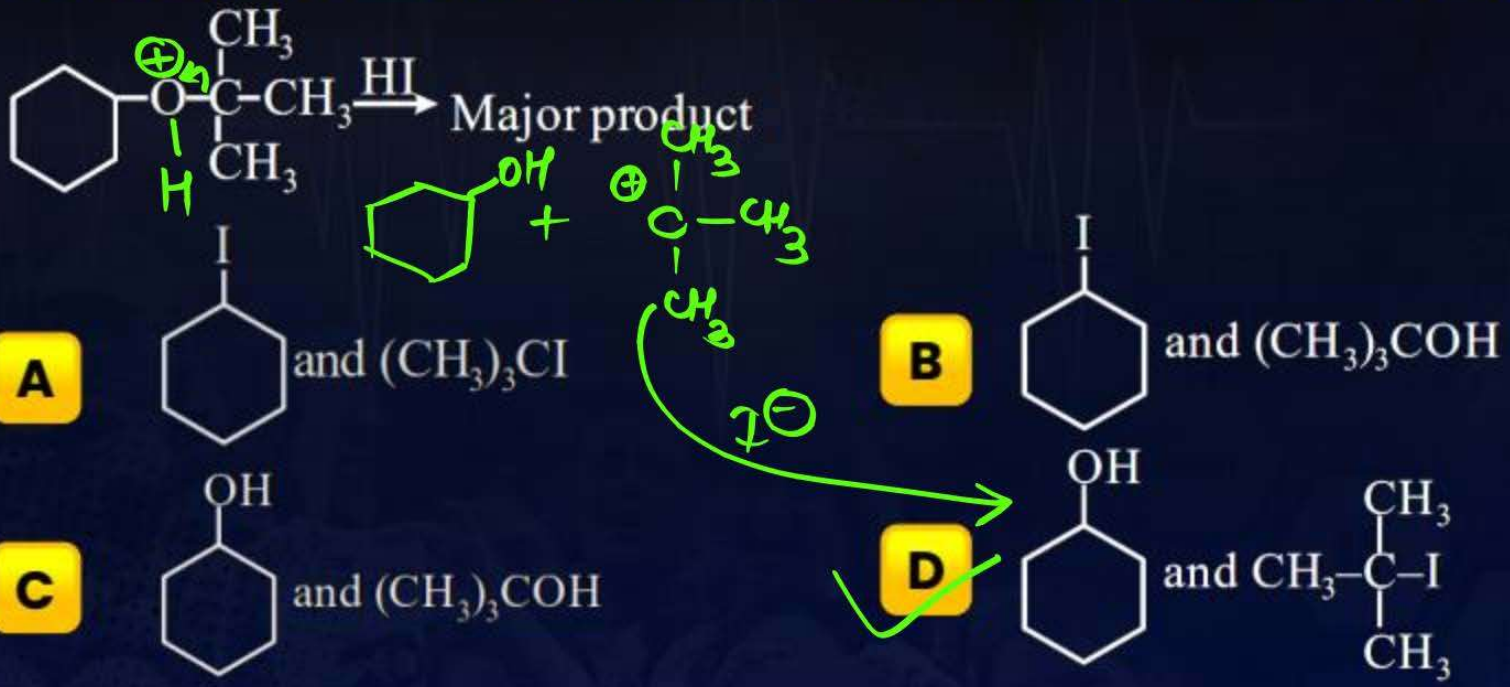
$PhCH_2OH +$ 

D



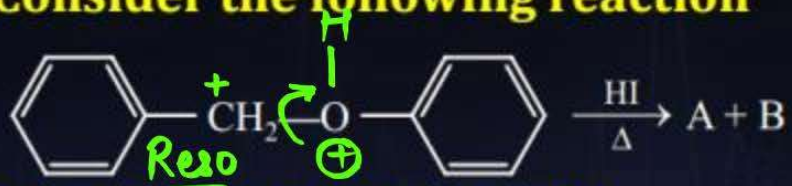
C.Q. 59 (JEE Mains 27th January 2024, Evening Shift)

Major product formed in the following reaction is a mixture of:



C.Q. 60 (NEET 2023)

Consider the following reaction



Identify products A and B.

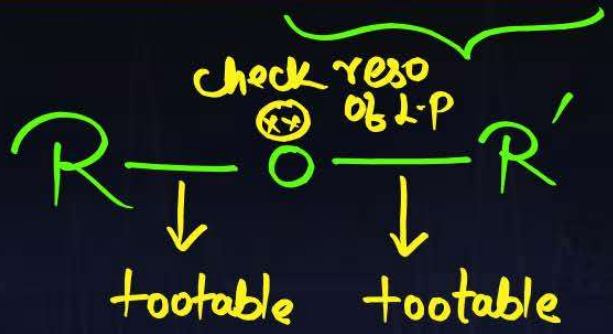
A A =  CH_3 and B =  I

B A =  CH_3 and B =  OH

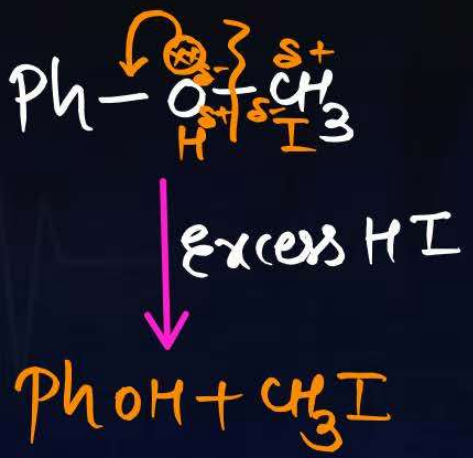
C A =  CH_2OH and B =  I

D A =  CH_2I and B =  OH

B. Reaction with excess HX:



Q



C.Q. 61 (NEET 2019)

The major products C and D formed in the following reaction respectively are:

$$H_3C-CH_2-CH_2-O-C(CH_3)_3 \xrightarrow[\Delta]{\text{excess HI}} C + D$$

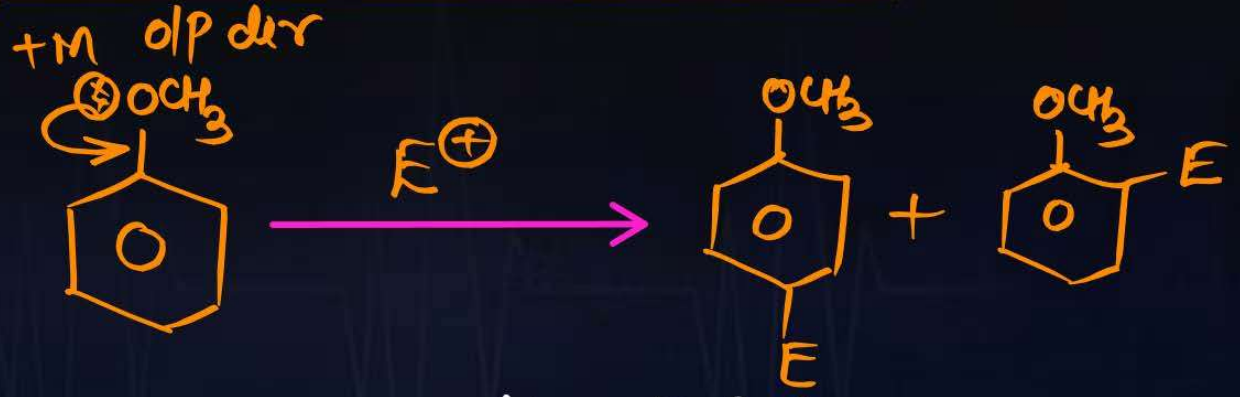
A $H_3C-CH_2-CH_2-OH$ and $HO-C(CH_3)_3$

B $H_3C-CH_2-CH_2-I$ and $I-C(CH_3)_3$

C $H_3C-CH_2-CH_2-OH$ and $I-C(CH_3)_3$

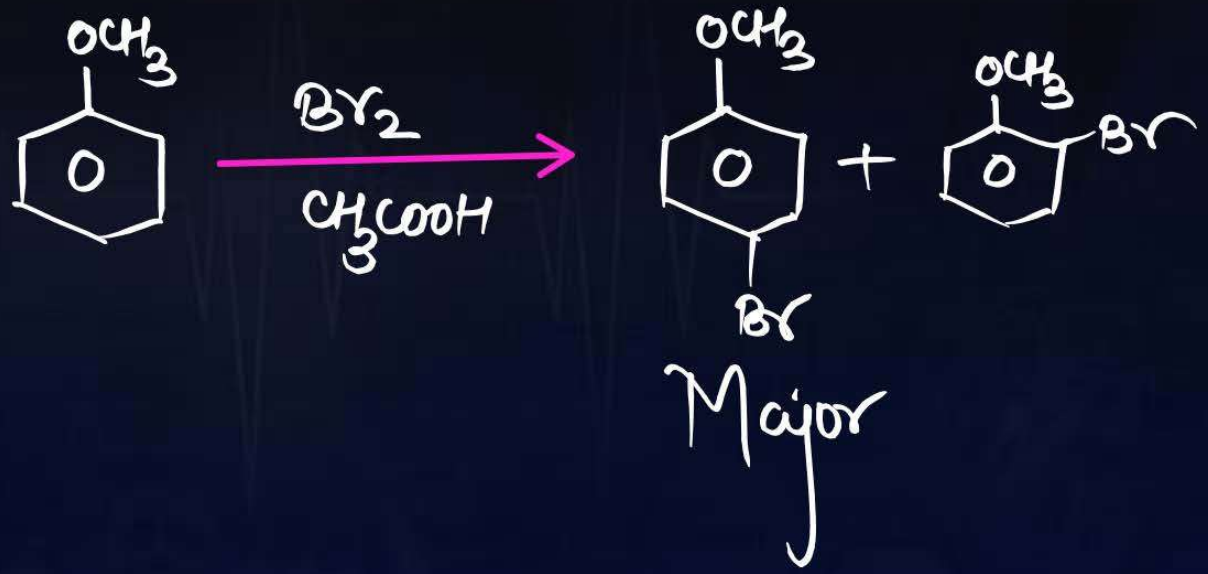
D $H_3C-CH_2-CH_2-I$ and $HO-C(CH_3)_3$

2. Electrophilic Substitution reactions:



Always Major

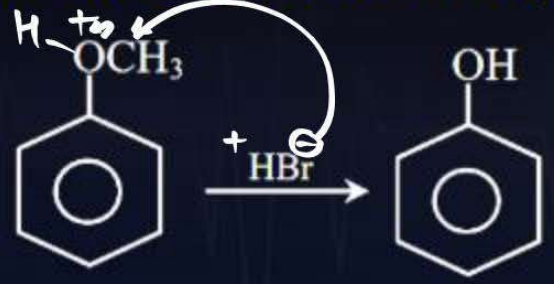
A. Halogenation:



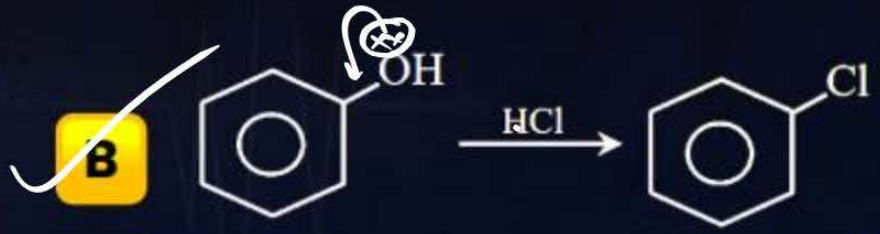
C.Q. 62 (JEE Mains 5th April 2024, Evening Shift)

Which one of the following reactions is NOT possible?

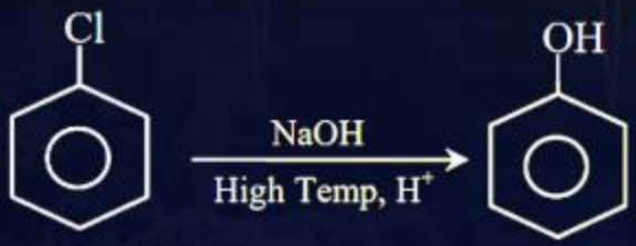
A



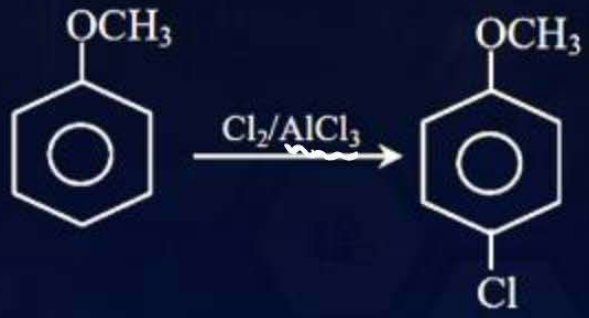
B



C

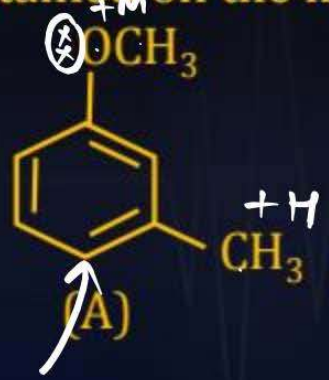


D



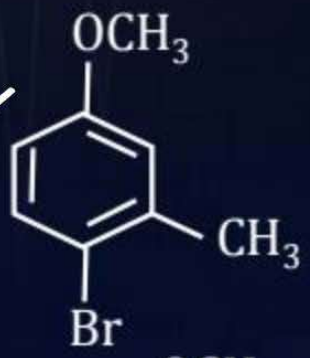
C.Q. 63 (AIIMS 2006)

The major product obtained on the monobromination (with $Br_2/FeBr_3$) of the following compound A is:

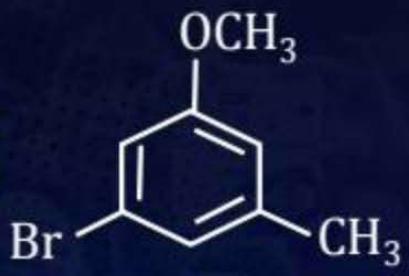


A

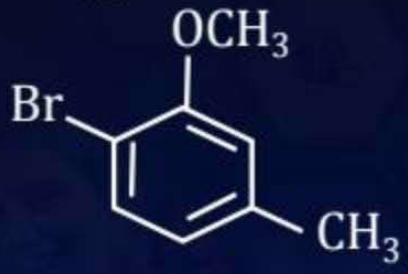
B



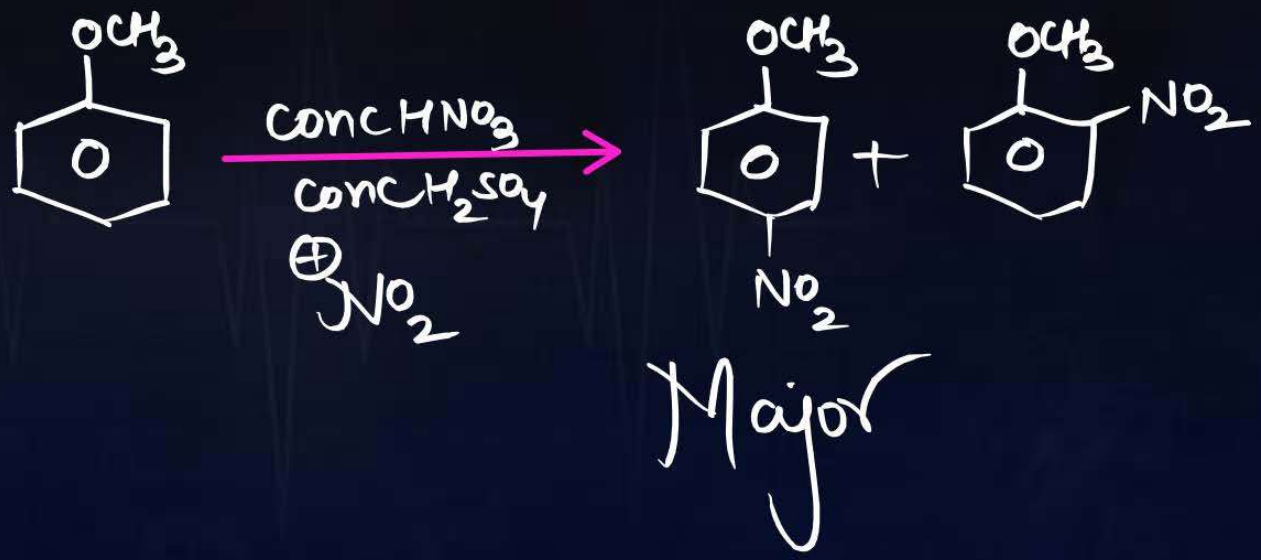
C



D

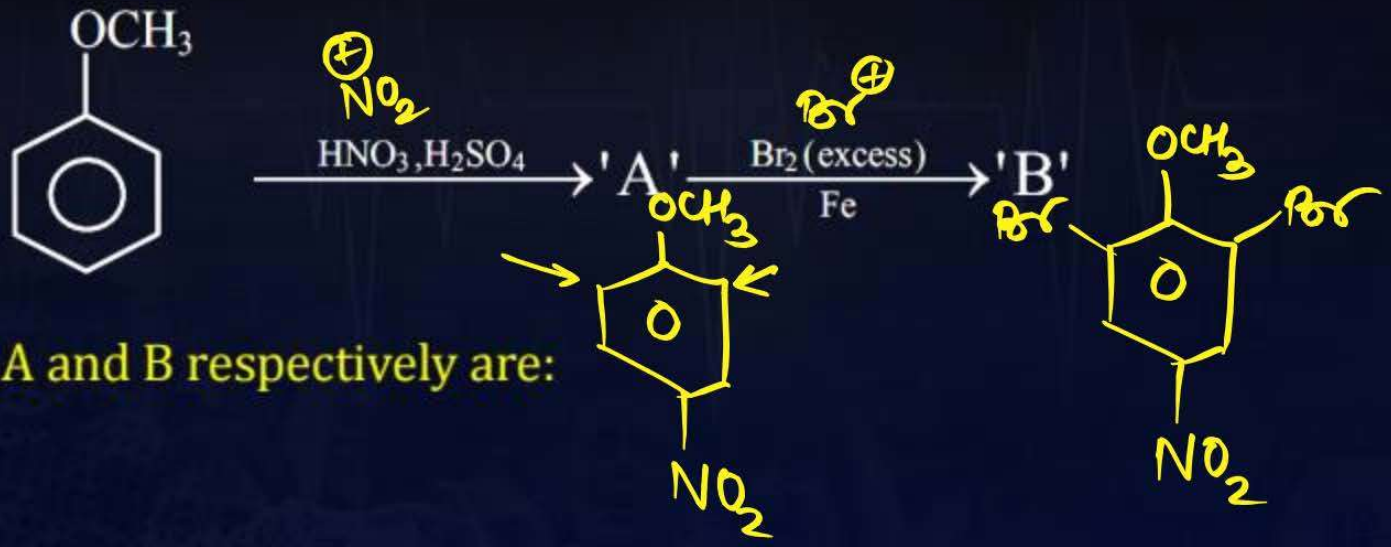


B. Nitration:

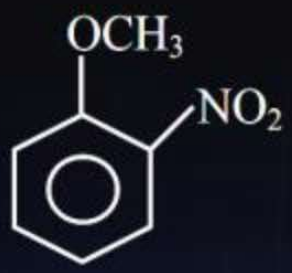
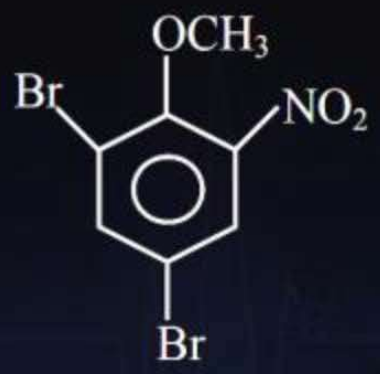


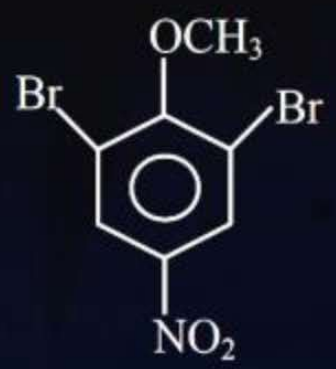
C.Q. 64 (JEE Mains 6th April 2024, Evening Shift)

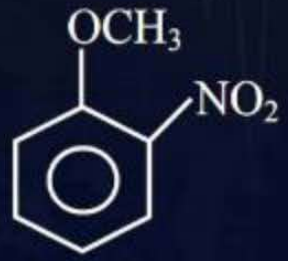
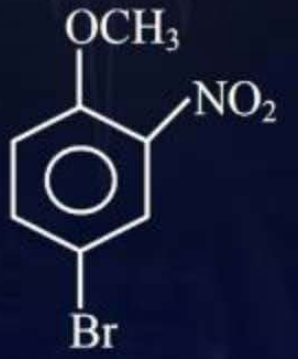
The major products formed:

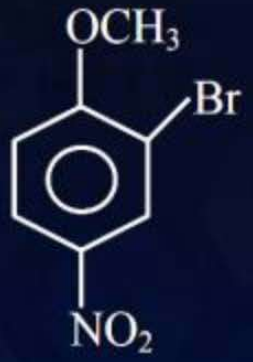


A and B respectively are:

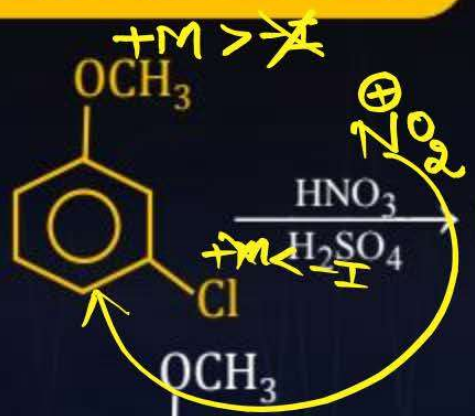
A  and 

B  and 

C  and 

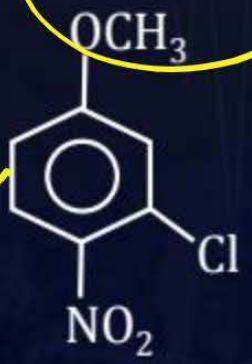
D  and 

C.Q. 65 (AIIMS 2019)

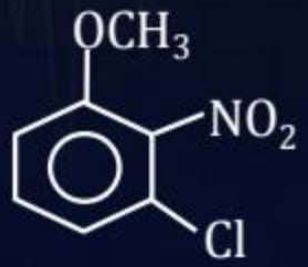


Major Product. Product will be:

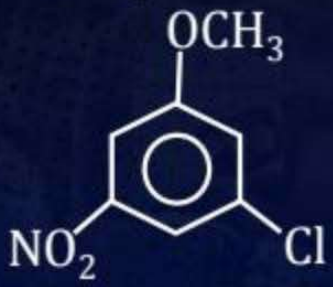
A



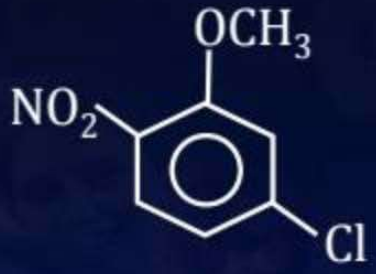
B



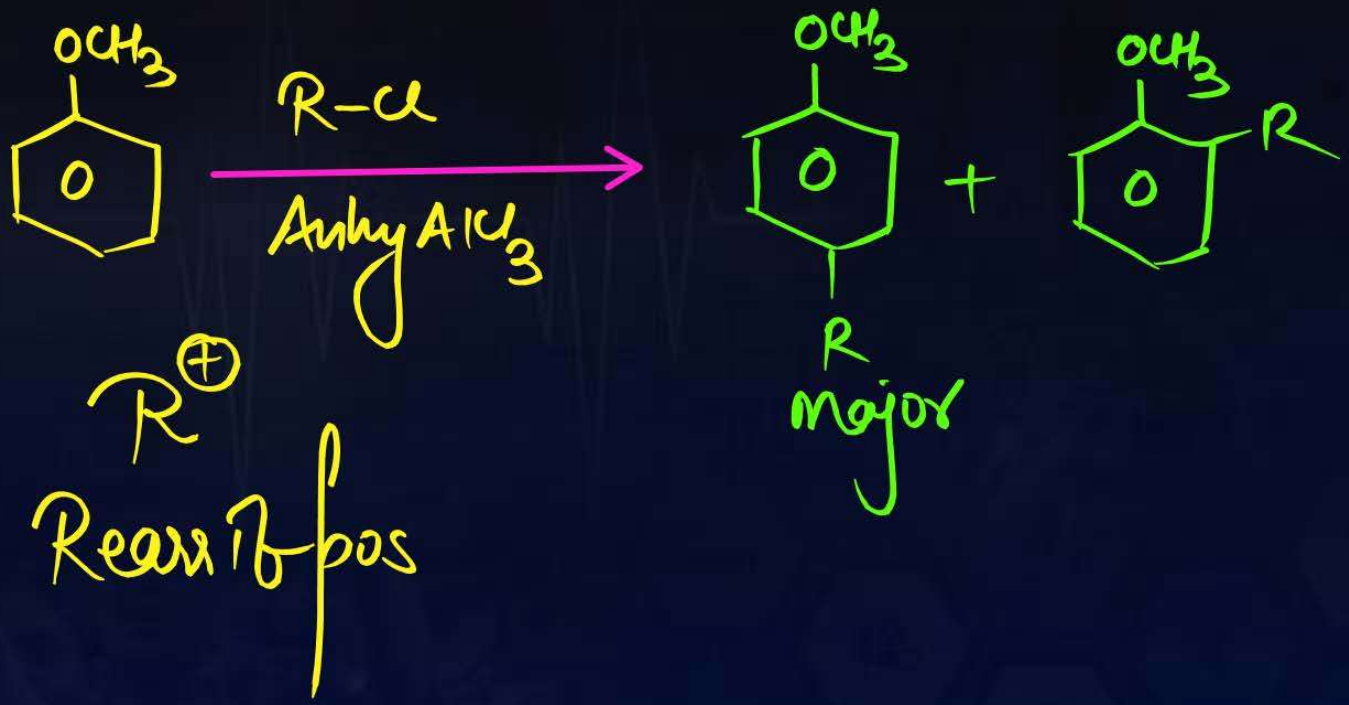
C



D

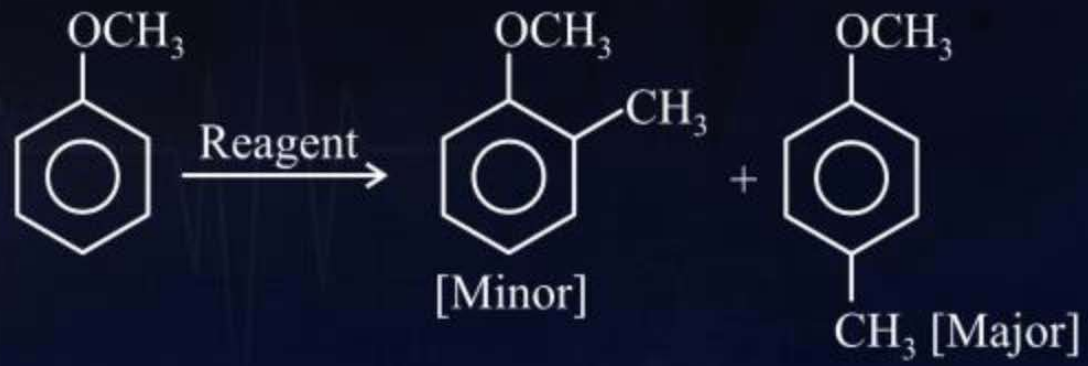


C. Friedel-Crafts Alkylation reaction:



C.Q. 66

Find the reagent in following reaction.



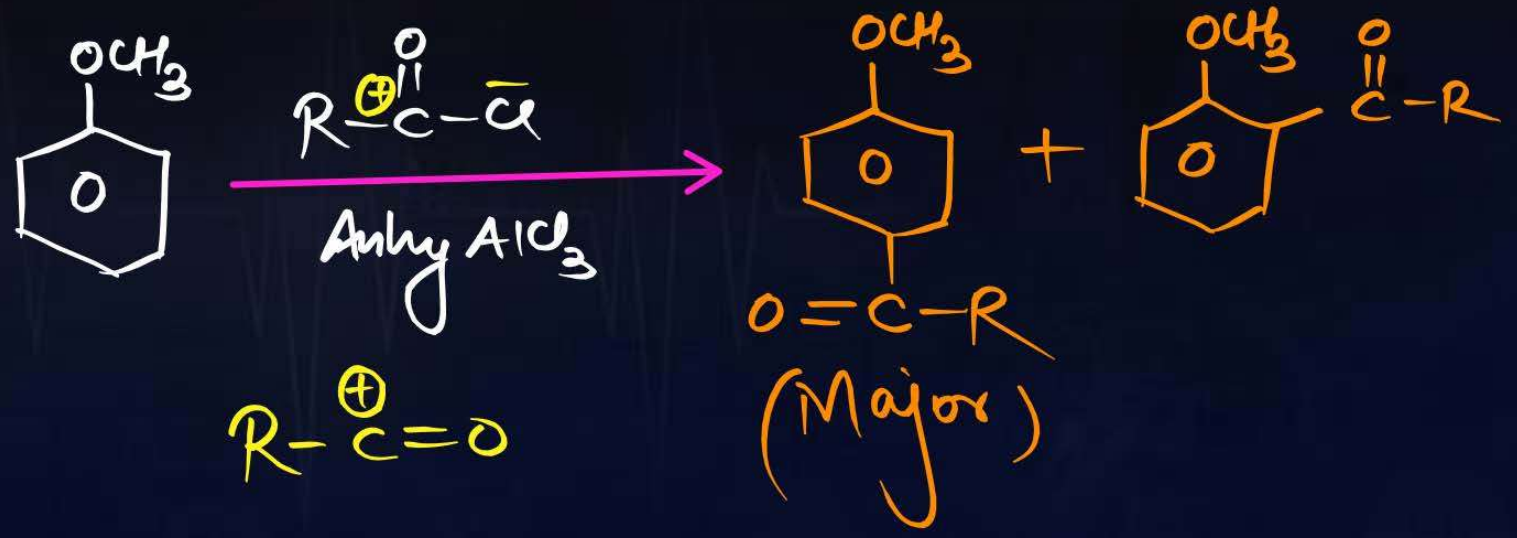
A CH_3Cl/anhydrous $AlCl_3$

B CH_3Cl/Moist $AlCl_3$

C CH_3Cl/Δ

D All of these

D. Friedel-Crafts Acylation reaction:



$R-\overset{\oplus}{C}=O$

No reaction

(BB)

Physical Properties of Alcohols, Phenols & Ethers

1. **Boiling Point**

[BP ∝ M.W]

No of C ↑ BP ↑

approx same MW

$\left[BP \propto \frac{1}{\text{Branch}}\right]$

A, E, P > Hydrocarbons & Haloalkane Haloarene

Hydrogen bonding

2. **Melting Point** ∝ C.L.E

Crystal Lattice energy

3. **Solubility** No. of C ↑ Solubility ↓

C.Q. 67 (JEE Mains 2025, 23 January Shift-2)

Given below are two statements:

Statement-(I): The boiling points of alcohols and phenols increase with increase in the number of C-atoms.

Statement-(II): The boiling points of alcohols and phenols are higher in comparison to other class of compounds such as ethers, haloalkanes.

In the light of the above statements, choose the correct answer from the options given below:

A. Statement I is true but Statement II is false.

B. Both Statement I and Statement II are true.

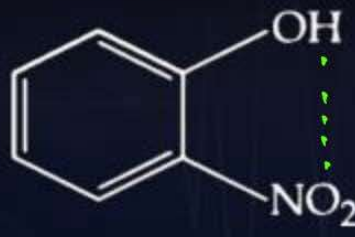
C. Both Statement I and Statement II are false.

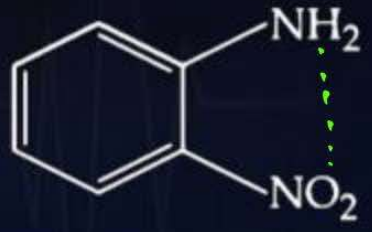
D. Statement I is false but Statement II is true.

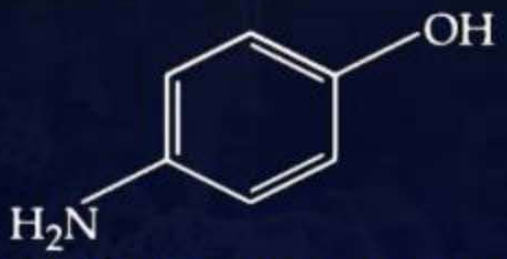
C.Q. 68 (JEE Mains 2025, 29 January Shift-1)

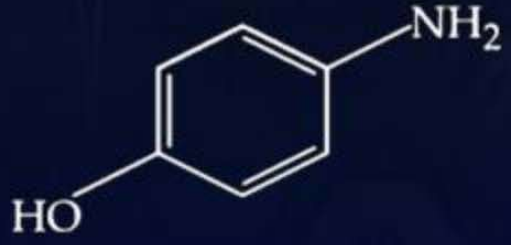
The steam volatile compounds among the following are:

Ortho H Bond

(A) 

(B) 

(C) 

(D) 

Choose the correct answer from the options given below:

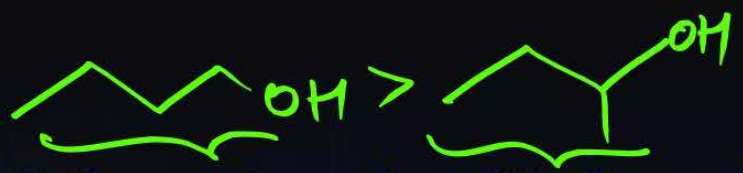
A (A), (B) and (C) Only

B (B) and (D) Only

C (A) and (B) Only

D (A) and (C) Only

C.Q. 69 (NCERT Exemplar)



Arrange the following compounds in increasing order of boiling point.
Propan-1-ol, butan-1-ol, butan-2-ol, pentan-1-ol

A. Propan-1-ol, butan-2-ol, butan-1-ol, pentan-1-ol

B. Propan-1-ol, butan-1-ol, butan-2-ol, pentan-1-ol

C. Pentan-1-ol, butan-2-ol, butan-1-ol, propan-1-ol

D. Pentan-1-ol, butan-1-ol, butan-2-ol, propan-1-ol

Practice Problems

QUESTION-1

Given below are two statements:

Statement-I: The –OH group attached to the benzene ring in phenol activates it towards electrophilic substitution.

Statement-II: The –OH group attached to the benzene ring in phenol directs the electrophiles to meta position in the ring.

In the light of the above statements, choose the correct answer from the options given below:

A Statement I is correct but Statement II is incorrect.

B Statement I is incorrect but Statement II is correct.

C Both Statement I and Statement II are correct.

D Both Statement I and Statement II are incorrect.

QUESTION-2

On heating aqueous solution of benzene diazonium chloride, which of the following is formed?

$PhN_2^+Cl^- \xrightarrow[\text{warm}]{H_2O} PhOH$

A benzene

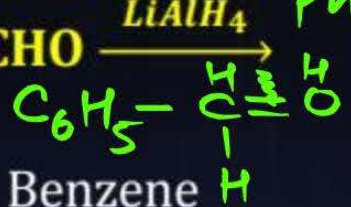
B chlorobenzene

C phenol ✓

D aniline

QUESTION-3

$C_6H_5CHO \xrightarrow{LiAlH_4}$ $PhCH_2OH$



A Benzene

B Benzyl alcohol

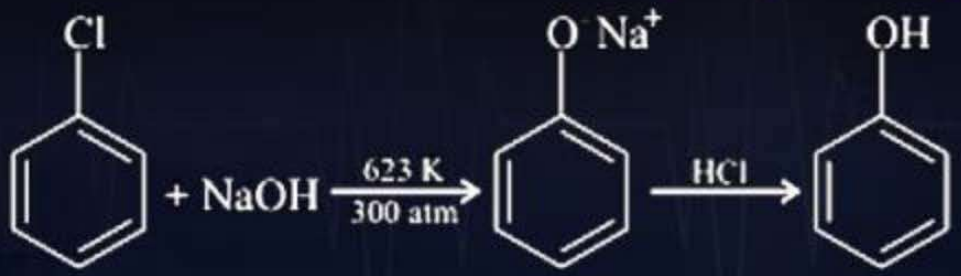
C Phenol

D Hexan-1-ol

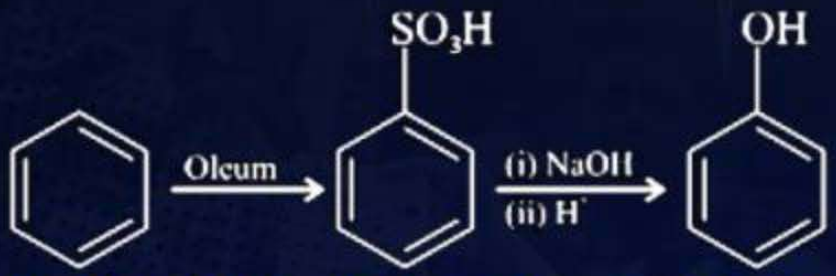
QUESTION-4

Given below are two statements:

Statement-I: Phenol can be prepared by the given reaction



Statement-II: Phenol can be prepared by the given reaction:



In the light of the above statements, choose the correct answer from the options given below:

A Statement I is correct but Statement II is incorrect.

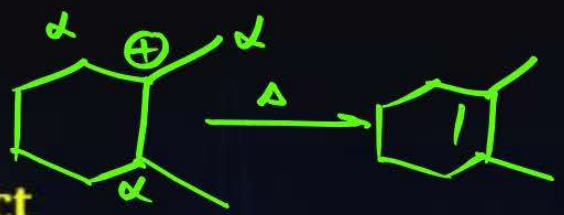
B Statement I is incorrect but Statement II is correct.

C Both Statement I and Statement II are correct.

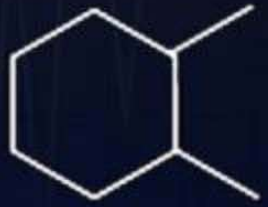
D Both Statement I and Statement II are incorrect.

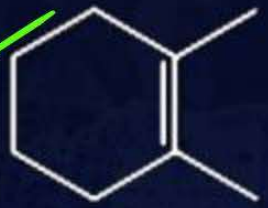
QUESTION-5

$\xrightarrow[\Delta]{H^+}$ Major Product



A 

B 

C 

D 

QUESTION-6

In the following sequence of reactions,

$$CH_3CH_2OH \xrightarrow{P+I_2} A \xrightarrow[\text{ether}]{Mg} B \xrightarrow{HCHO} C \xrightarrow{H_2O} D$$

The compound D is:

A Propanal

B Butanal

C n-Butyl alcohol

D n-Propyl alcohol

QUESTION-7

In the given reaction,

$$CH_3-CH=CH-CH_2-OH \xrightarrow{PCC} \text{Product}$$

Product is:

A $CH_3-CH_2-CH_2-CH_2-OH$

B $CH_3-CH_2-CH_2-CH_3$

C $CH_3-CH=CH-CHO$

D $CH_3-CH=CH-COOH$

QUESTION-8

Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion A: The ortho and para nitrophenols cannot be separated by steam distillation.

Reason R: o-Nitrophenol is steam volatile due to intramolecular hydrogen bonding while p-nitrophenol is less volatile due to intermolecular hydrogen bonding which causes the association of molecules.

In the light of the above statements, choose the correct answer from the options given below:

A A is true but R is false.

B A is false but R is true.

C Both A and R are true and R is the correct explanation of A.

D Both A and R are true but R is NOT the correct explanation of A.

QUESTION-9

Identify 1° alcohol in the following given alcohols;

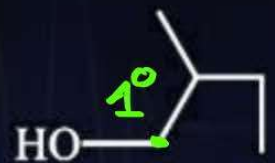
A 1 and 2 only

B 2 and 3 only

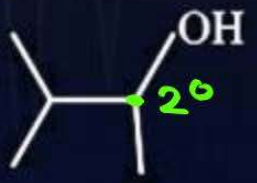
C 1 only

D 1, 2 and 3

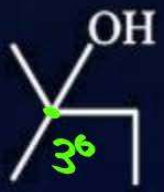
(1)



(2)

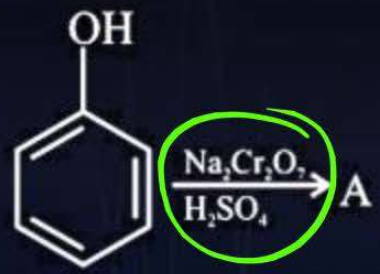


(3)



QUESTION-10

In the given reaction, the product 'A' is:

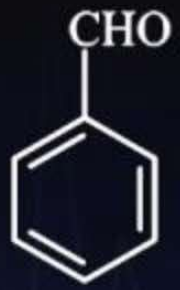


A

B

C

D



QUESTION-11

When phenol is treated with excess bromine water, it gives?

A m-Bromophenol

B o-and m-Bromophenol

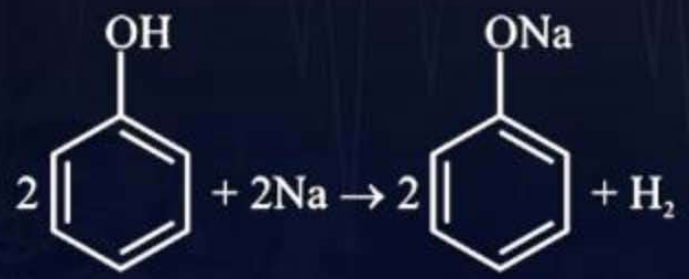
C 2,4-Dibromophenol

D 2,4,6-Tribromophenol

QUESTION-12

Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R)

Assertion (A): Phenols react with active metals such as sodium, potassium and aluminium to yield phenoxides and hydrogen.



Phenol Sodium phenoxide

Reason (R): The above reaction shows that phenols are basic in nature.

In the light of the above statements, choose the correct answer from the options given below:

A A is true but R is false.

B A is false but R is true.

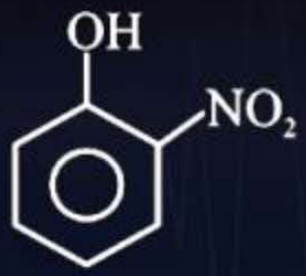
C Both A and R are true and R is the correct explanation of A.

D Both A and R are true but R is NOT the correct explanation of A.

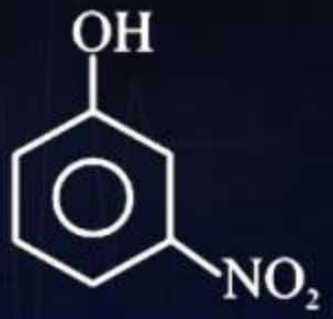
QUESTION-13

Nitration of phenol with conc. nitric acid gives:

A

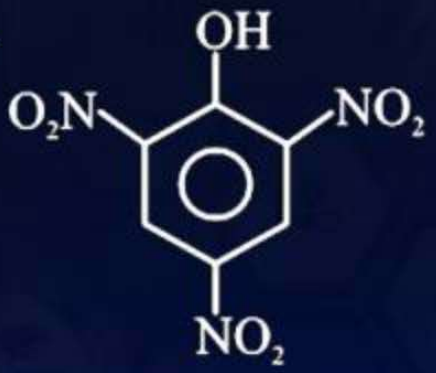


B



C

D



QUESTION-14

Given below are two statements.

Statement-I: Butan-1-ol has higher boiling point than ethoxyethane.

Statement-II: There is hydrogen bonding in butan-1-ol.

In the light of the above statements, choose the correct answer from the options given below:

A Statement I is correct but statement II is incorrect.

B Statement I is incorrect but Statement II is correct.

C Both Statement I and Statement II are correct.

D Both Statement I and Statement II are incorrect.

QUESTION-15

Given below are two statements:

Statement-I: Aldehydes and ketones are reduced to the corresponding alcohols by addition of hydrogen in the presence of catalysts.

Statement-II: Cumene (isopropylbenzene) is oxidized in the presence of air to cumene hydroperoxide. It is converted to phenol and acetone by treating it with dilute acid.

In the light of the above statements, choose the correct answer from the options given below:

A Statement I is correct but Statement II is incorrect.

B Statement I is incorrect but Statement II is correct.

C Both Statement I and Statement II are correct.

D Both Statement I and Statement II are incorrect.

QUESTION-16

Which alcohol produces turbidity with Lucas's reagent most slowly?

A Butan-2-ol

min

B t-Butyl alcohol

Sec

C Isobutyl alcohol

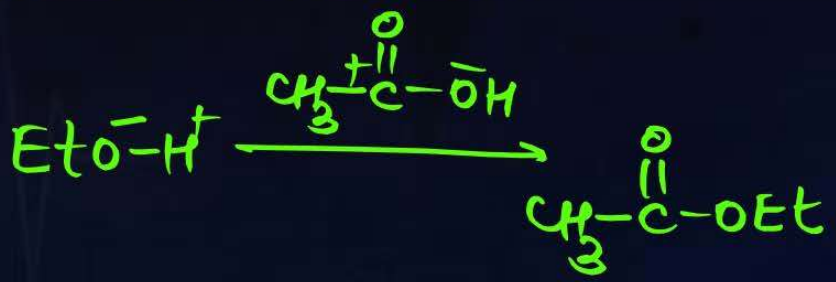
2.T

D Benzyl alcohol

$PhCH_2OH$ Sec

QUESTION-17

When ethyl alcohol reacts with acetic acid, the products formed are:



A Sodium ethoxide + hydrogen

B Ethyl ethanoate + water

C Ethanoic acid

D Butanoic acid

QUESTION-18

On distilling phenol with Zn dust, one gets:

A Toluene

B Benzaldehyde + ZnO

C ZnO + benzene

D Benzoic acid

QUESTION-19

Which of the following is not true in case of reaction with heated copper at 300°C?

A Tertiary alcohol → Ketone

B Secondary alcohol → Ketone

C Primary alcohol → Aldehyde

D Tertiary alcohol → Alkene

QUESTION-20

In Reimer-Tiemann reaction reagent used are:

A $CHCl_3$ and aq. NaOH

B CH_3Cl and aq. NaOH

C CH_3Cl and $POCl_3$

D CH_3Br and alc. NaOH