

Alcohol, Phenols and Ethers

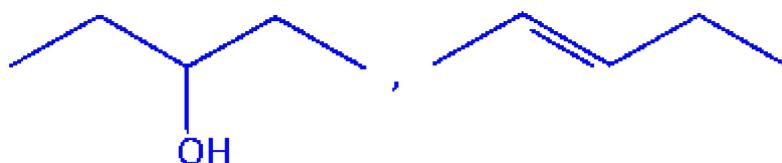
Question1

An alcohol X ($C_5H_{12}O$) on dehydration gives Y (major product). Reaction of Y with HBr gave Z ($C_5H_{11}Br$), major product). Z undergoes nucleophilic substitution in two steps. What are X and Y ?

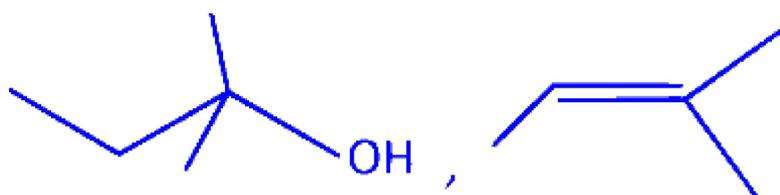
AP EAPCET 2025 - 26th May Morning Shift

Options:

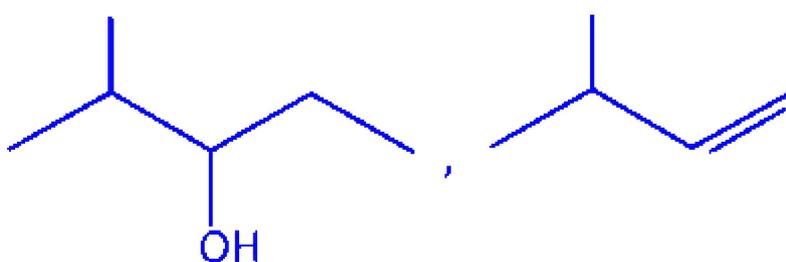
A.



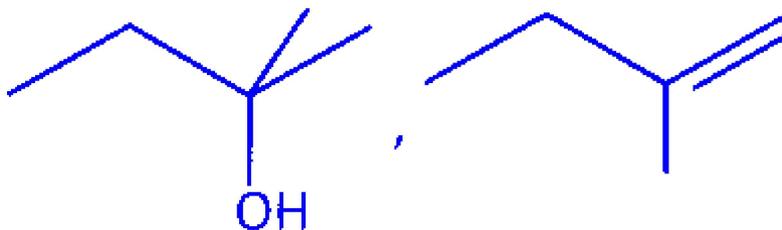
B.



C.



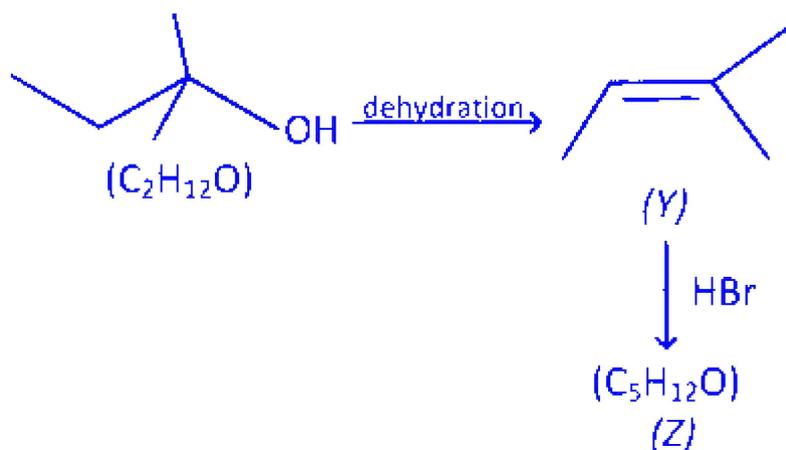
D.



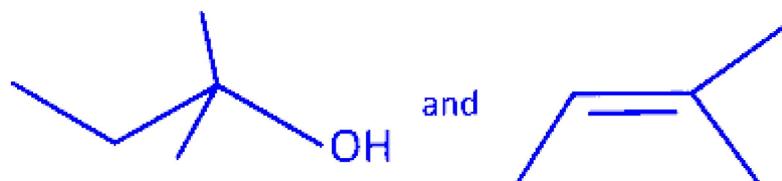
Answer: B

Solution:

The complete reaction sequence is as follows

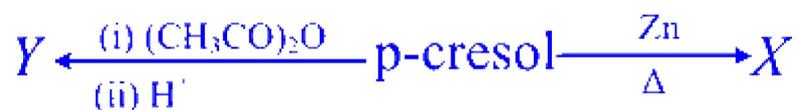


Thus the compound X and Y are



Question2

What are X and Y respectively in the following set of reactions?

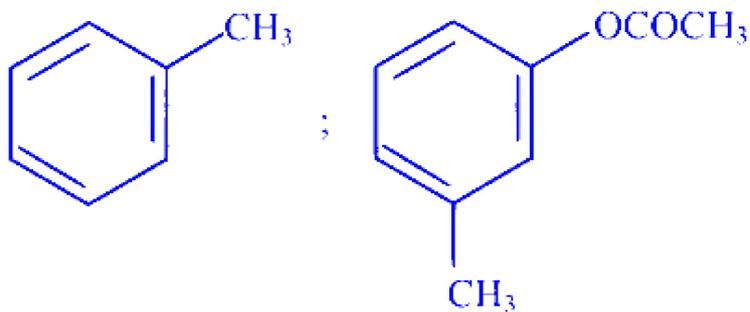


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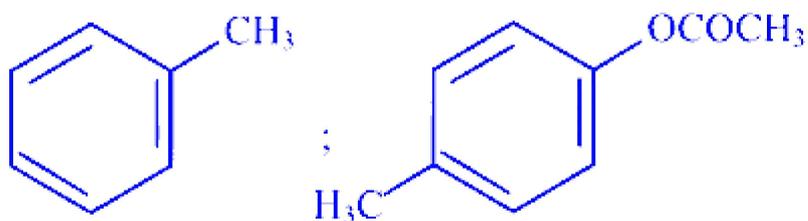
Options:



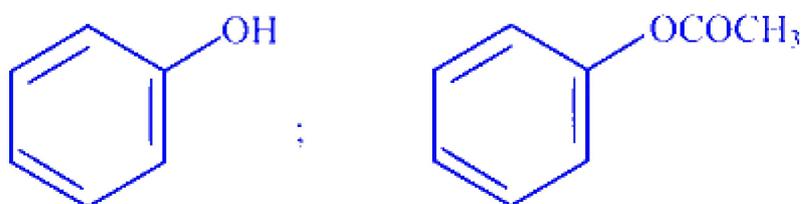
A.



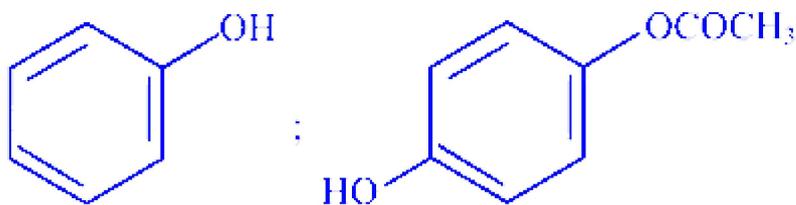
B.



C.



D.

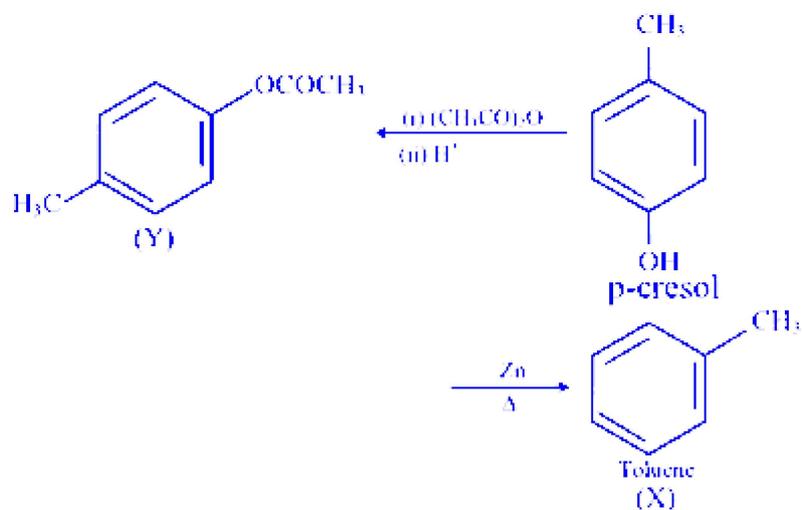


Answer: B

Solution:

The complete reaction sequence is as follows





Question3

Match the following

List-I (Compound)		List-II (pK_a)	
(A)	p-nitrophenol	(I)	15.9
(B)	Phenol	(II)	7.1
(C)	Ethanol	(III)	10.0
(D)	p-cresol	(IV)	10.2
		(N)	8.3

The correct answer is

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Options:

A.

A-II, B-V, C-I, D-III

B.

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

C.



A-V, B-IV, C-II, D-III

D.

A-IV, B-III, C-I, D-V

Answer: B

Solution:

1. **Understand pKa and Acidity:** A lower pKa value indicates a stronger acid.

2. **Analyze each compound:**

- **(C) Ethanol:** Alcohols are generally weak acids. Their acidity is similar to water. The pKa of ethanol is known to be around 16.
 - Looking at List-II, (I) 15.9 is a perfect match for Ethanol.
 - So, **C-I**.
- **(B) Phenol:** Phenol is significantly more acidic than alcohols due to the resonance stabilization of its conjugate base (phenoxide ion). Its pKa is typically around 10.
 - Looking at List-II, (III) 10.0 is a direct match for Phenol.
 - So, **B-III**.
- **(A) p-nitrophenol:** The nitro group (-NO₂) is a strong electron-withdrawing group (EWG) by both inductive (-I) and resonance (-R) effects. When an EWG is at the para position, it strongly stabilizes the phenoxide ion through resonance, making p-nitrophenol much more acidic than phenol. Therefore, its pKa should be significantly lower than 10.
 - Looking at List-II, (II) 7.1 and (V) 8.3 are options below 10.0. The nitro group typically lowers the pKa of phenol by about 2-3 units. So, $10.0 - 2.9 = 7.1$.
 - Thus, (II) 7.1 is an excellent match for p-nitrophenol.
 - So, **A-II**.
- **(D) p-cresol:** p-cresol is 4-methylphenol. The methyl group (-CH₃) is an electron-donating group (EDG) due to hyperconjugation and inductive effect (+I). EDGs destabilize the phenoxide ion, making p-cresol slightly less acidic than phenol. Therefore, its pKa should be slightly higher than phenol's pKa (10.0).
 - Looking at List-II, we have (IV) 10.2 left. This value is slightly higher than 10.0 (phenol), which is consistent with the presence of an EDG.
 - So, **D-IV**.

3. **Consolidate the matches:**

- (A) p-nitrophenol - (II) 7.1
- (B) Phenol - (III) 10.0
- (C) Ethanol - (I) 15.9

- (D) p-cresol - (IV) 10.2

4. Check the options:

- Option A: A-II, B-V, C-I, D-III (Incorrect, B is 8.3, D is 10.0)
- **Option B: A-II, B-III, C-I, D-IV (This perfectly matches our derived pairs.)**
- Option C: A-V, B-IV, C-II, D-III (Incorrect, C is 7.1)
- Option D: A-IV, B-III, C-I, D-V (Incorrect, A is 10.2, D is 8.3)

Therefore, Option B is the correct answer.

The final answer is B

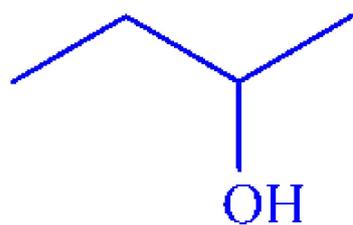
Question4

An alcohol X ($C_4H_{10}O$) on dehydration gave alkene (C_4H_8) as major product, which on bromination followed by treatment with Y gave alkyne C_4H_6 . Alkyne C_4H_6 , does not react with sodium metal. What are X and Y ?

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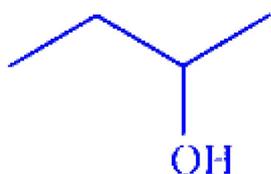
Options:

A.



; alc. KOH

B.



; (i) alc. KOH (ii) NaNH₂

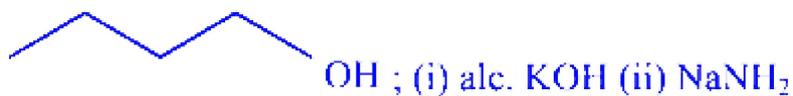
C.



OH ; alc. KOH



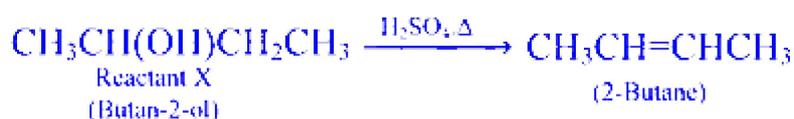
D.



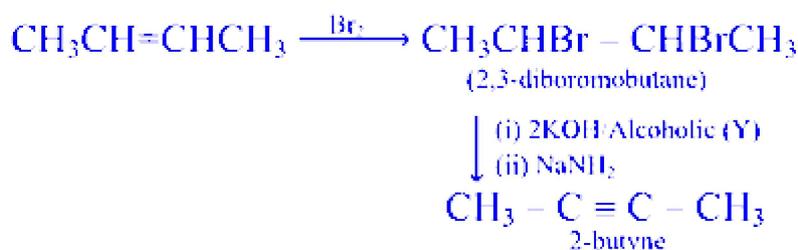
Answer: B

Solution:

The complete mechanism of reaction is,



Bromination of alkene



X = Butan-2-ol, Y = KOH

Question5

The correct statement regarding X and Y formed in the following reaction is



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Options:

A.

X undergoes substitution by S_N2 mechanism

B.

X undergoes substitution with water in two steps

C.

Y gets converted to corresponding chloride with conc. HCl_{at} room temperature

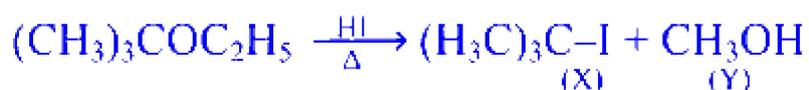
D.

Reaction of Y with Cu/573 K gives ketone

Answer: B

Solution:

The complete reaction involved is



Thus, X undergoes substitution with water in two steps.

Question6

The correct order of boiling points of the compounds given below is

(A) methoxy ethane

(B) propan-1-ol

(C) propanal

(D) propanone

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Options:

A.

$C > B > A > D$



B.

$B > D > C > A$

C.

$B > C > D > A$

D.

$C > A > B > D$

Answer: B

Solution:

The correct order of boiling point is,

$B > D > C > A$

Alcohol has highest boiling point due to hydrogen bonding.

Order is,

Alcohol > Ketone > Aldehyde > Ether

Question7

The number of primary (1°), secondary (2°) and tertiary (3°) alcohols possible for the formula $C_5H_{12}O$ respectively are

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Options:

A.

3, 3, 2

B.

4, 2, 2

C.

4, 3, 1



D.

3, 4, 1

Answer: C

Solution:

There are 4 primary alcohol for $C_5H_{12}O$ they are pentan-1-ol, 2-methylbutan-1-ol, 3-methylbutan-1-ol and 2,2-dimethylpropan-1-ol There are 3 secondary alcohol possible for $C_5H_{12}O$ which are pentan-2-ol, pentan-3-ol and methylbutan-2-ol. Only one tertiary alcohol possible for $C_5H_{12}O$ which is 2-methylbutan-2-ol.

Question8

In which of the following intramolecular H -bonding is absent?

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Options:

A.

Salicylic acid

B.

Salicylaldehyde

C.

Quinol

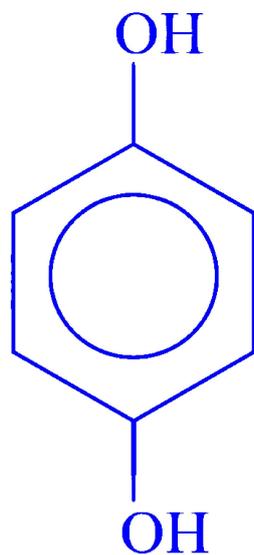
D.

Catechol

Answer: C

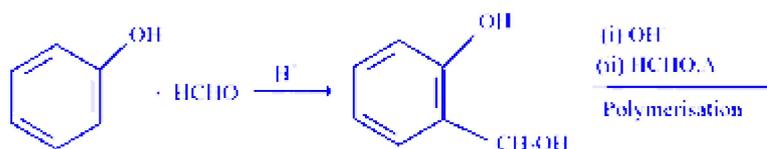
Solution:

In quinol, intramolecular hydrogen bonding is absent



Question9

The *X* formed in the following reaction sequence and its structural type are respectively.



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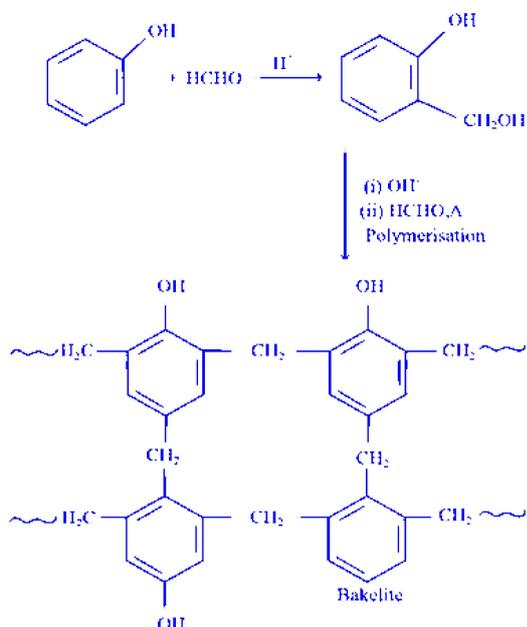
Options:

- A. Novolac - linear polymer
- B. Bakelite - cross linked polymer
- C. Novolac - cross linked polymer
- D. Bakelite - linear polymer

Answer: B

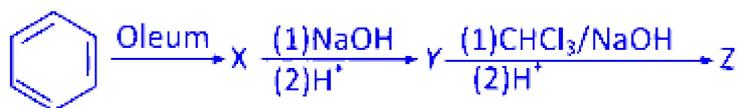
Solution:





Question10

What is the major product ' Z ' in the following reaction sequence?



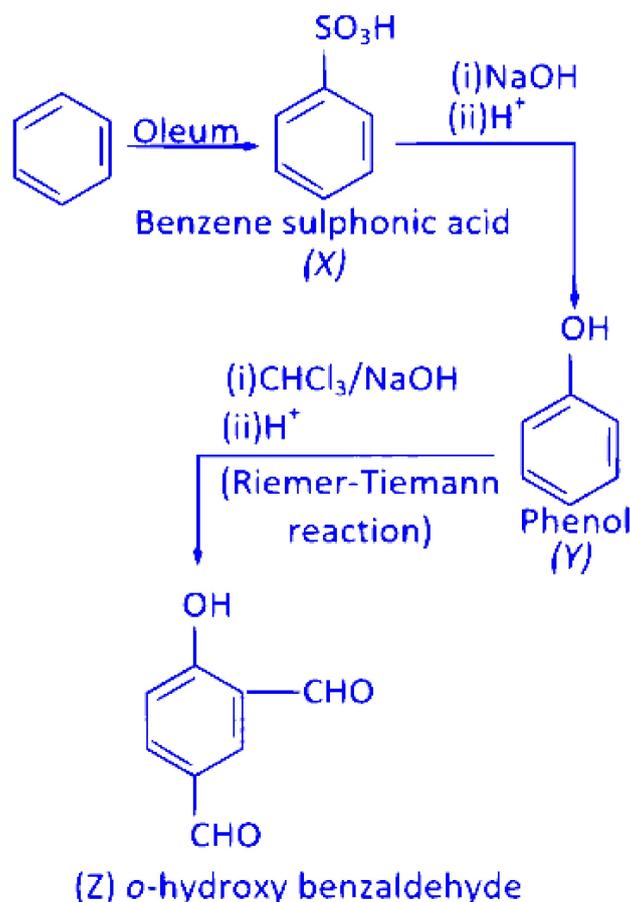
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Options:

- A. o- hydroxy benzaldehyde
- B. p-hydroxy benzaldehyde
- C. o - hydroxy benzoic acid
- D. p-hydroxy benzoic acid

Answer: A

Solution:

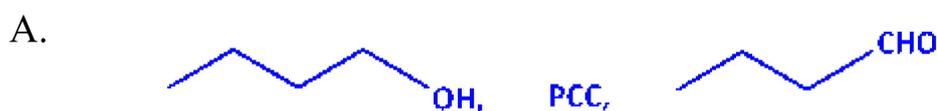


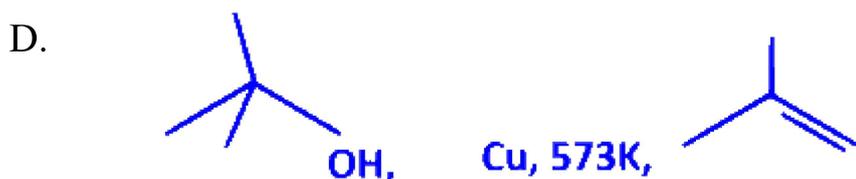
Question 11

An alcohol X ($\text{C}_4\text{H}_{10}\text{O}$) does not give turbidity with conc. HCl and ZnCl_2 at room temperature. X on reaction with reagent Y gives Z . What are X , Y and Z respectively?

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Options:

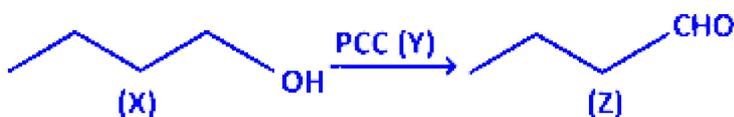




Answer: A

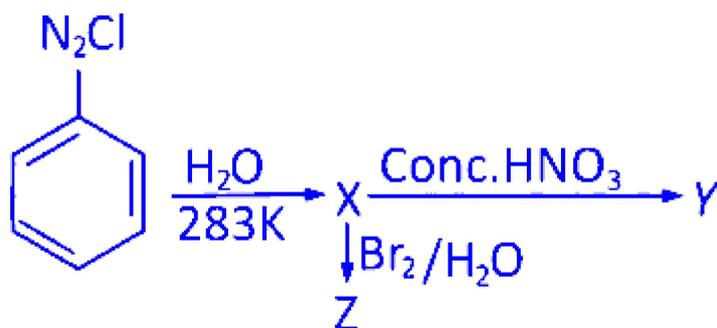
Solution:

Since the alcohol X does not give turbidity with conc. HCl and ZnCl_2 at room temperature. Thus, the X is primary alcohol. The required reaction is as follows.



Question12

Consider the following reactions,



Y and Z respectively are



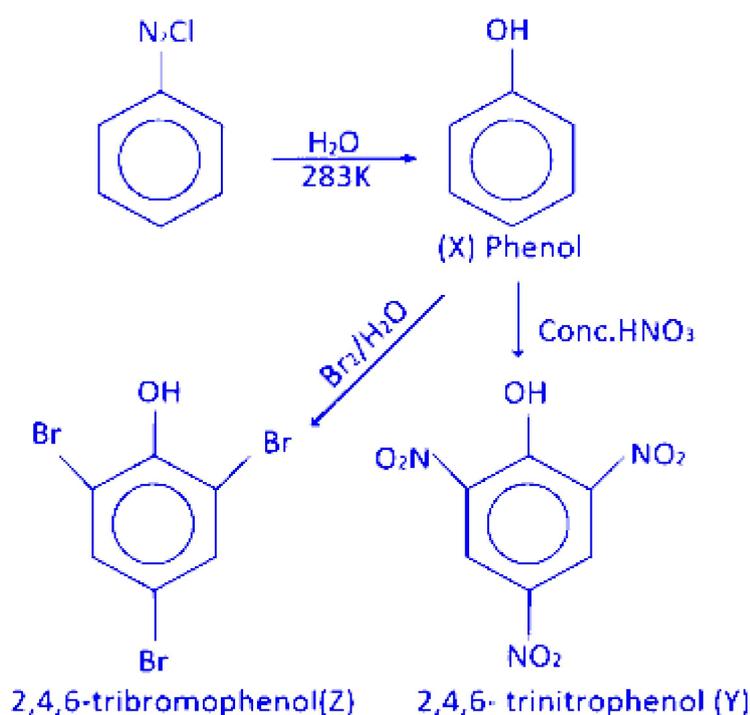
AP EAPCET 2024 - 20th May Morning Shift

Options:

- A. Picric acid (2, 4, 6-trinitrophenol), 2, 4, 6-tribromophenol
- B. *o*-nitrophenol, *p*-bromophenol
- C. *p*-nitrophenol *o*-bromophenol
- D. 2, 4-dinitrophenol, 2-4 dibromophenol

Answer: A

Solution:



Thus, the compounds Y and Z are 2, 4, 6-trinitrophenol (picric acid) and 2, 4, 6-tribromophenol.

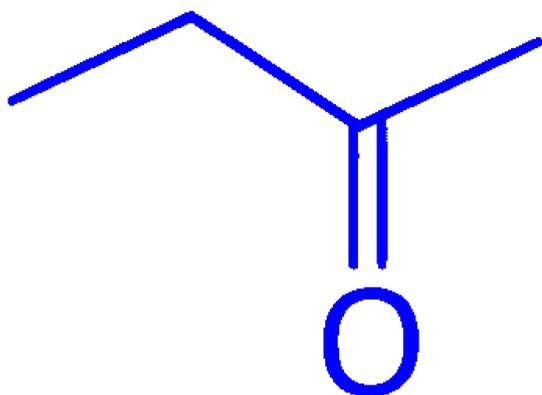
Question13

An alcohol X ($\text{C}_4\text{H}_{10}\text{O}$) reacts with conc. HCl at room temperature to give Y ($\text{C}_4\text{H}_9\text{Cl}$). Reaction of X with copper at 573 K gave Z. What is Z ?

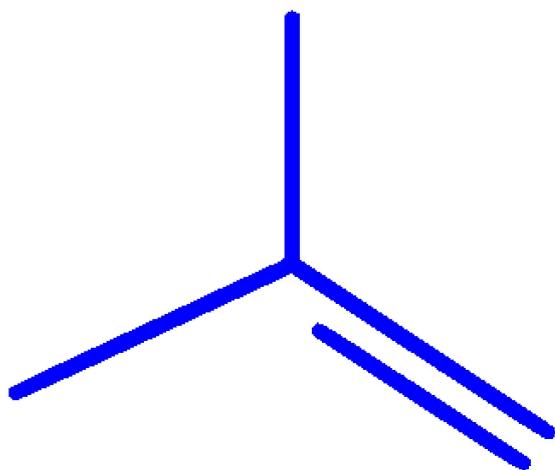
AP EAPCET 2024 - 19th May Evening Shift

Options:

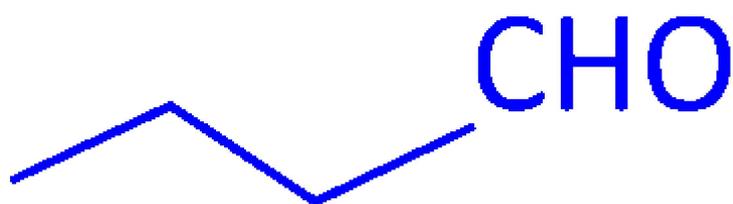
A.



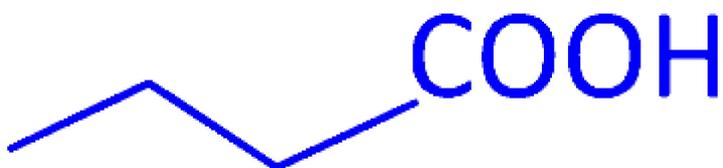
B.



C.



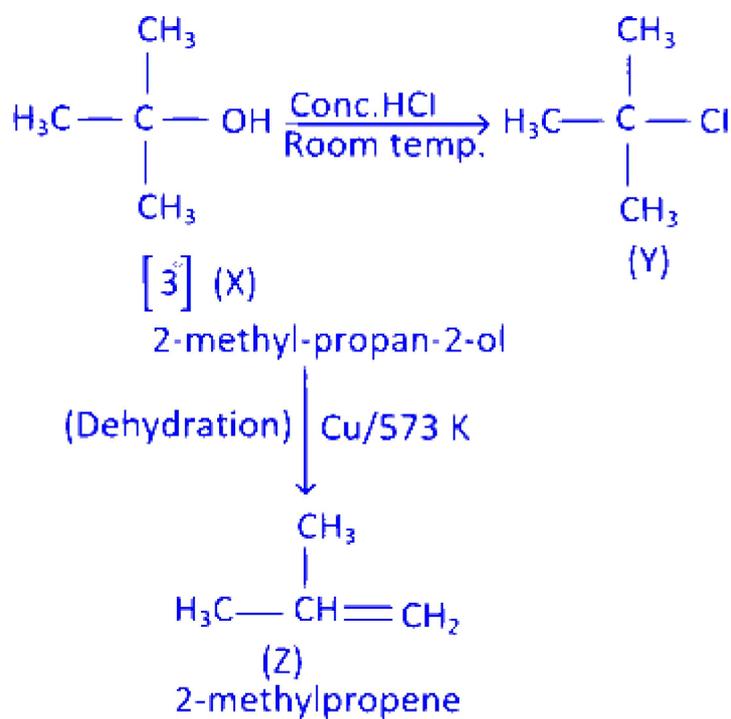
D.

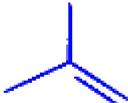


Answer: B



Solution:



Thus, the compound Z is 

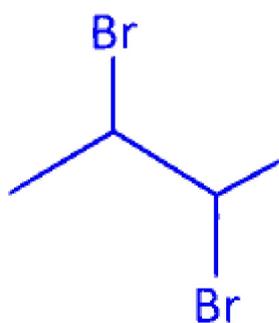
Question14

A dibromide X ($\text{C}_4\text{H}_4\text{Br}_2$) on dehydrohalogenation gave Y which on reduction with Z gave non-polar isomer of C_4H_8 . What are X and Z respectively?

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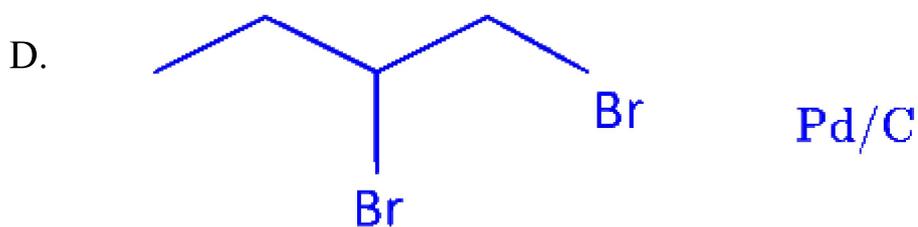
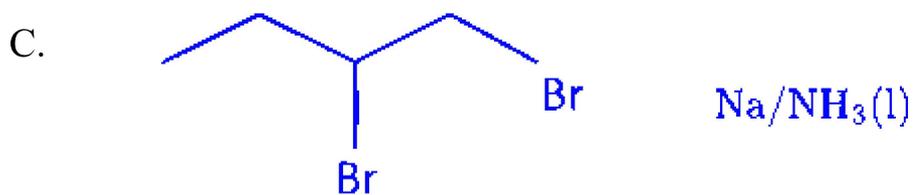
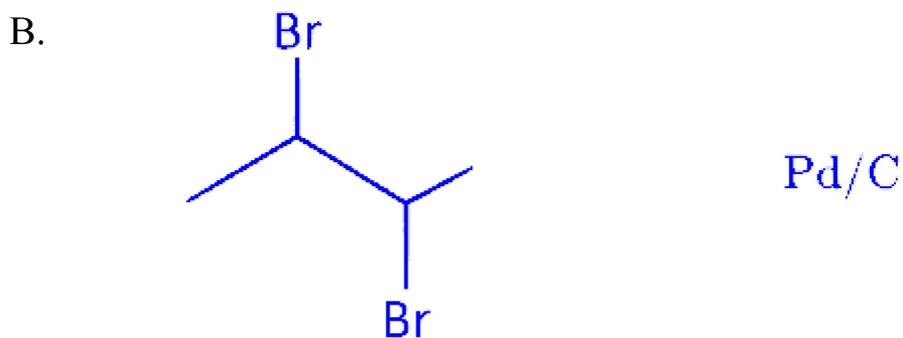
Options:

A.



$\text{Na}/\text{NH}_3(\text{l})$

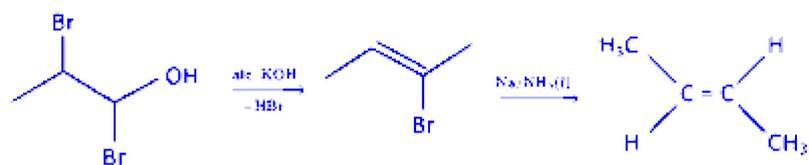




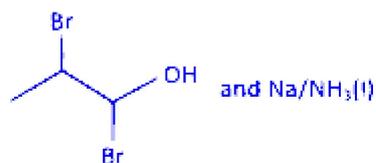
Answer: A

Solution:

The reaction involved is as follows.

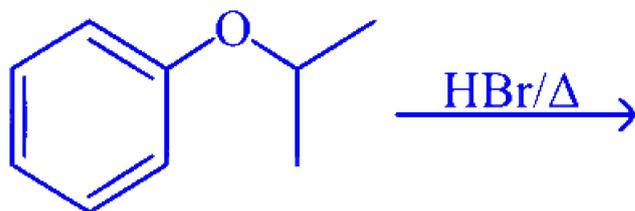


Thus, compound X and Z are



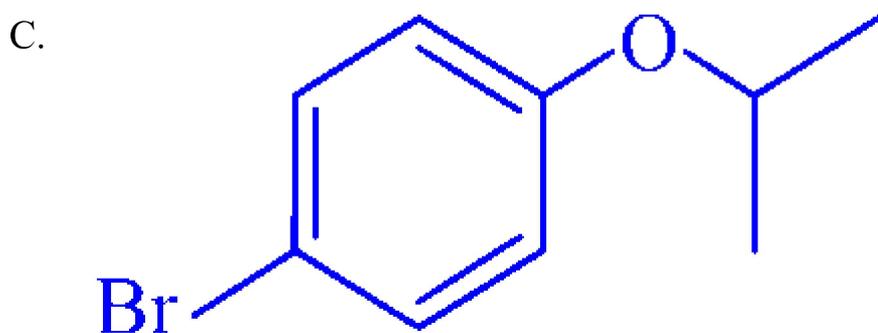
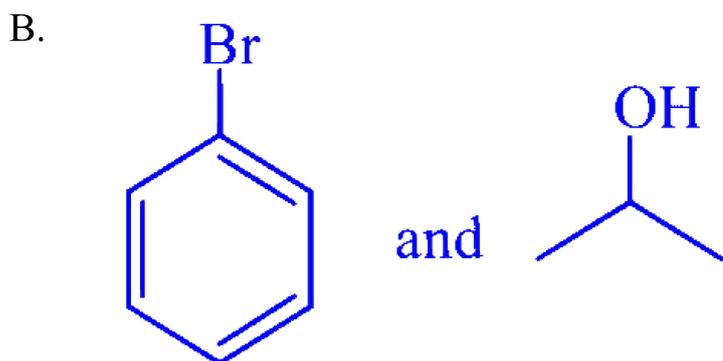
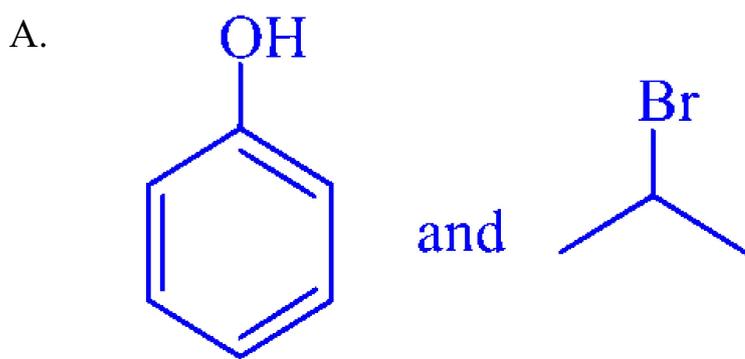
Question15

Identify the product(s) formed in the following reaction.

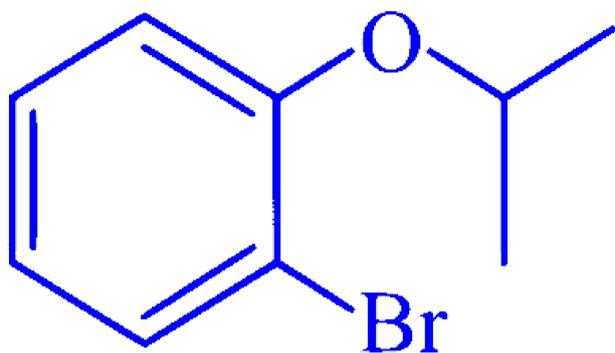


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Options:

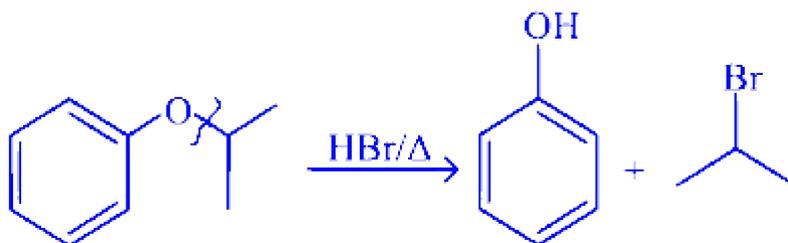


D.



Answer: A

Solution:



Question16

Which compound is formed on catalytic hydrogenation of carbon monoxide at high p and high T in presence of $ZnO - Cr_2O_3$ catalyst?

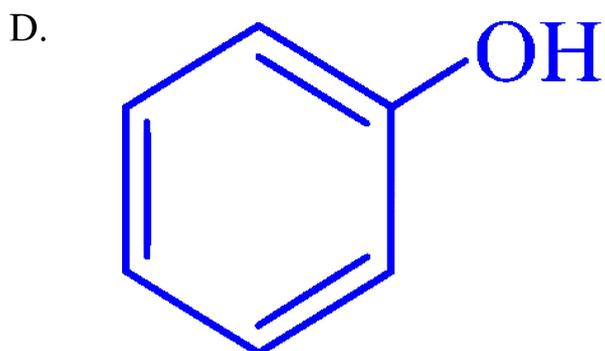
AP EAPCET 2022 - 5th July Morning Shift

Options:

A. CH_3OH

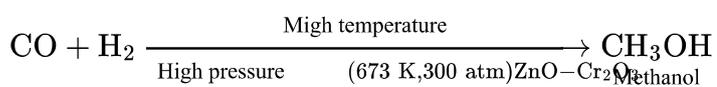
B. CH_3COOH

C. $\text{CH}_3\text{CH}_2\text{OH}$



Answer: A

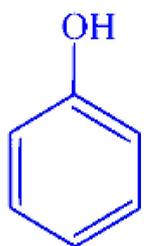
Solution:



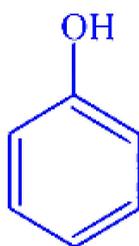
Methanol is industrially prepared when mixture of carbon monoxide and hydrogen is subjected to high temperature and pressure in presence of $\text{ZnO} - \text{Cr}_2\text{O}_3$ as catalyst.

Question17

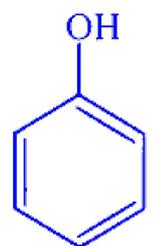
The correct order of acidity of the following compounds is



I



II



III

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Options:

A. III > II > I

B. II > III > I

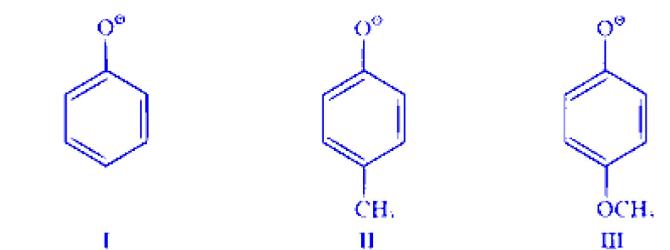
C. I > II > III

D. III > I > II

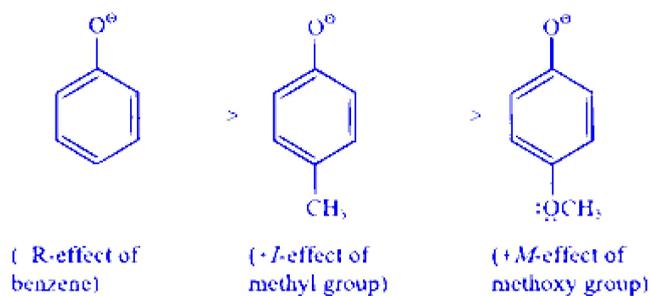
Answer: C

Solution:

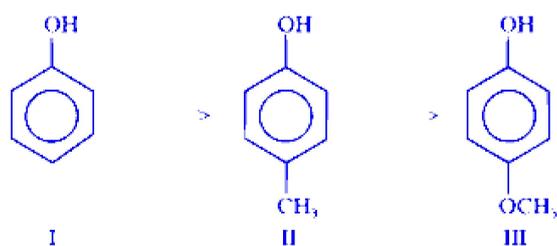
Acidity \propto stability of the anion formed. The anions formed are



Stability order is

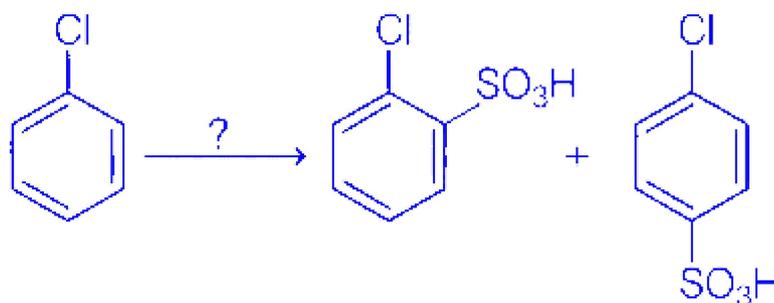


Thus, acidity order is



Question18

Identify the best suitable reagent for the following reaction.



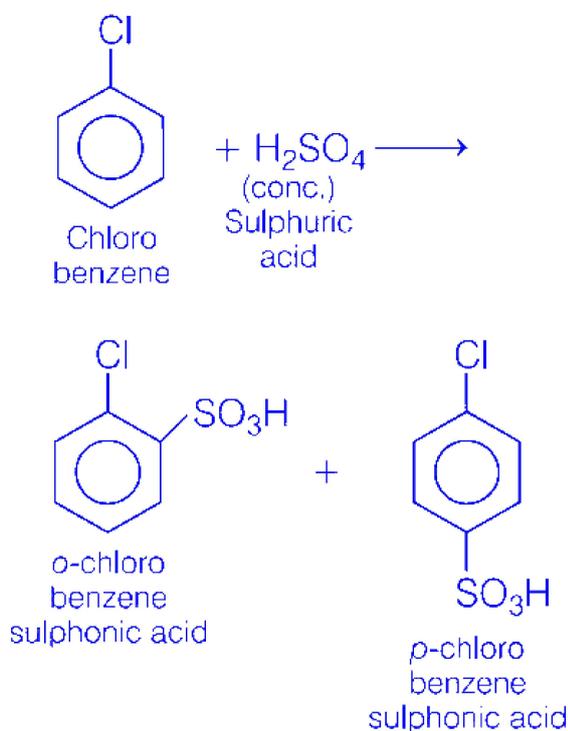
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Options:

- A. Concentrated sulphuric acid
- B. Dilute sulphuric acid (10%)
- C. Concentrated sulphuric acid and concentrated nitric acid
- D. concentrated acetic acid (fuming)

Answer: A

Solution:

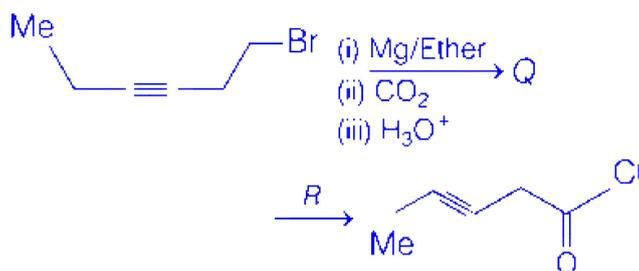


Chlorine is an ortho-para directing group. Chlorine is an electronegative species but it has lone pair of electrons which has a tendency to add resonance structures of the benzene ring which develop a negative charge on the ortho and para positions and a minimum electron density at the meta position.



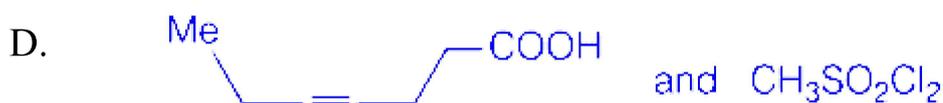
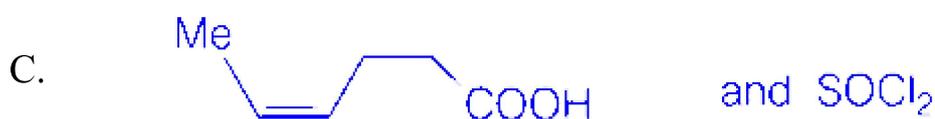
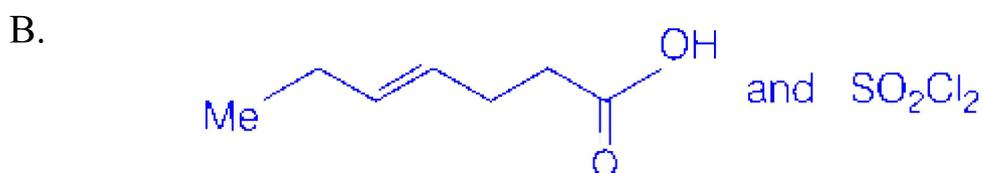
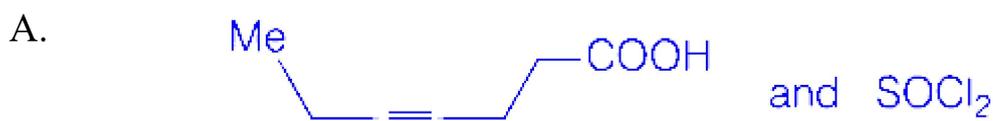
Question 19

In the following reaction sequence, identify product 'Q' and reagent 'R'.



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Options:



Answer: A

Solution:

Alkyl bromide in presence of Mg/ether gives RMg^+Br^- . Here, alkyl group is nucleophilic and attacks CO_2 to form carboxylic acid.

$SOCl_2$ is used to replace $-OH$ group to $-Cl$ group and evolved SO_2 and HCl gas.

