Level - II

Chapter 11

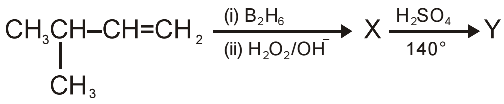
Alcohols, Phenols and Ethers

Solutions

SECTION - A

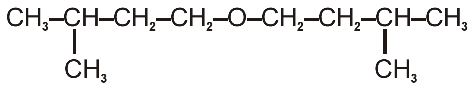
Objective Type Questions

(Preparation of Alcohols and Phenols)

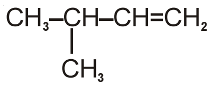
1. 

$CH_3\underset{CH_3}{CH}-CH=CH_2 \xrightarrow[\text{(ii) } H_2O_2/OH^-]{\text{(i) } B_2H_6} X \xrightarrow[140^\circ]{H_2SO_4} Y$

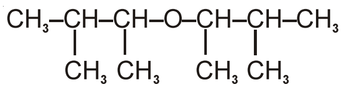
What is Y?

(1) 

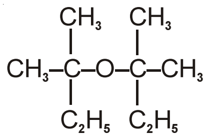
$CH_3-\underset{CH_3}{CH}-CH_2-CH_2-O-CH_2-CH_2-\underset{CH_3}{CH}-CH_3$

(2) 

$CH_3-\underset{CH_3}{CH}-CH=CH_2$

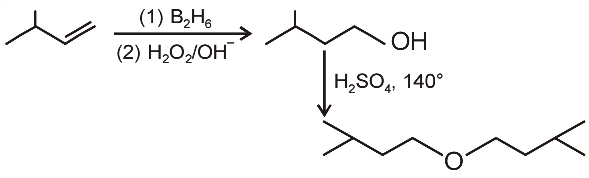
(3) 

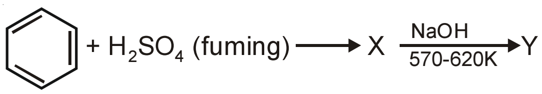
$CH_3-\underset{CH_3}{CH}-\underset{CH_3}{CH}-O-\underset{CH_3}{CH}-\underset{CH_3}{CH}-CH_3$

(4) 

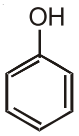
$CH_3-\overset{CH_3}{\underset{C_2H_5}{C}}-O-\overset{CH_3}{\underset{C_2H_5}{C}}-CH_3$

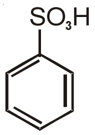
Sol. Answer (1)

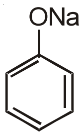


2. 

What is Y?

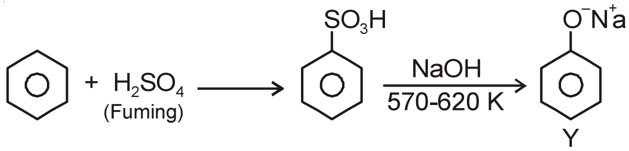
(1) 

(2) 

(3) 

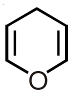
(4) 

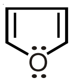
Sol. Answer (3)

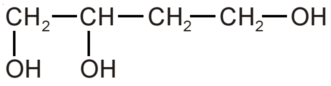


3. $$\begin{tikzcd}CH_2{=}CH{-}CH_2{-}Br \arrow[r, "(1)\ Mg", "{(2)\ HCHO,\ (3)\ H_3O^+}"'] & A \arrow[r, "Br_2", "CCl_4"'] & B \arrow[d, "KOH"] \\ & & C\end{tikzcd}$$

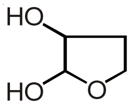
Product (C) is

(1) 

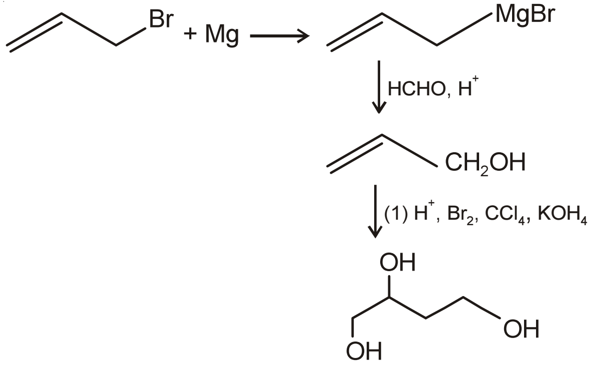
(2) 

(3) 

$$\underset{OH}{CH_2}-\underset{OH}{CH}-CH_2-CH_2-OH$$

(4) 

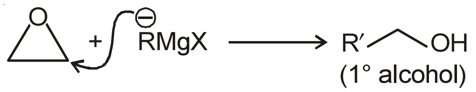
Sol. Answer (3)

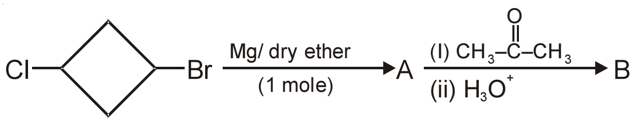


4. Ethylene oxide when treated with Grignard reagent yields

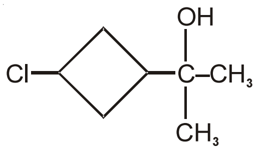
(1) Primary alcohol (2) Secondary alcohol (3) Tertiary alcohol (4) Cyclopropyl alcohol

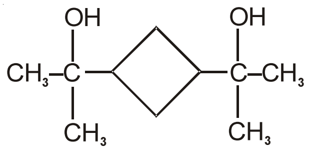
Sol. Answer (1)

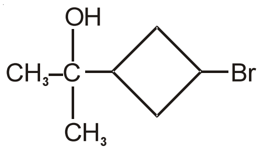


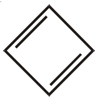
5. 

What is B?

(1) 

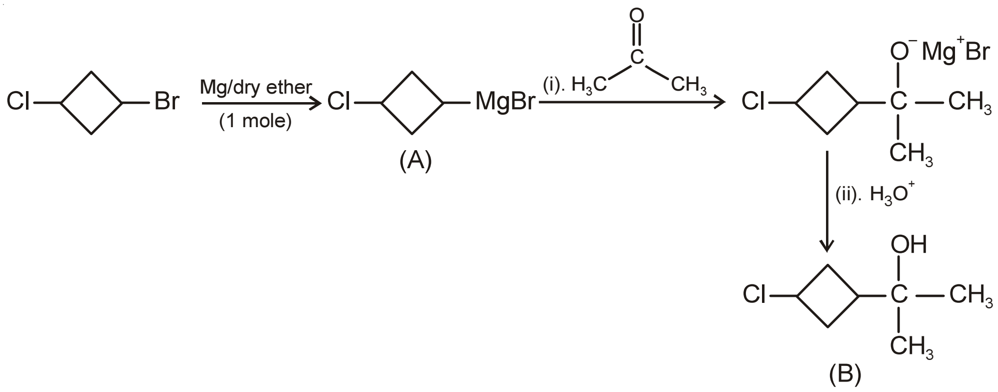
(2) 

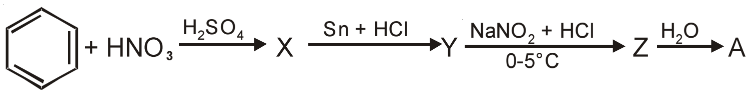
(3) 

(4) 

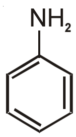
Sol. Answer (1)

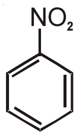
∵ Br has more tendency to form RMgX, than 'Cl' because of more size. So, reaction will take place from 'Br' side. *i.e.*,



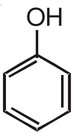
6. 

. What is A?

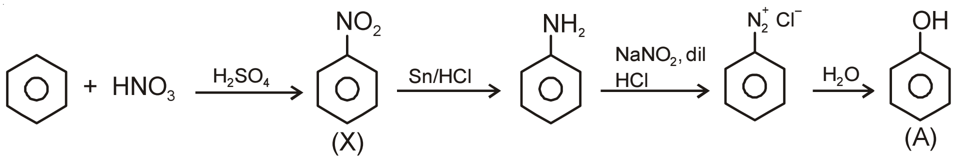
(1) 

(2) 

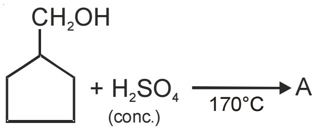
(3) 

(4) 

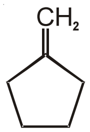
Sol. Answer (4)

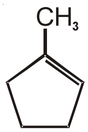


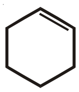
(Physical and Chemical properties of Alcohols and Phenols)

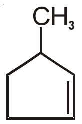
7. 

What is the major product A?

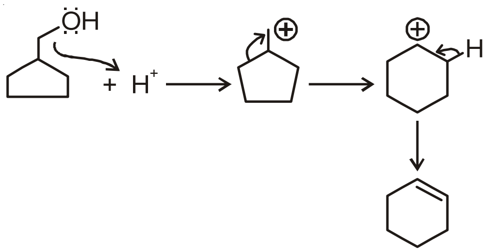
(1) 

(2) 

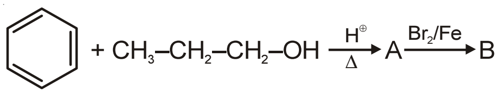
(3) 

(4) 

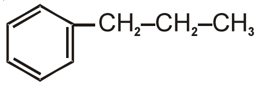
Sol. Answer (3)

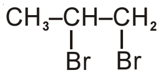


(Cyclohexene)

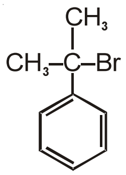
8. 

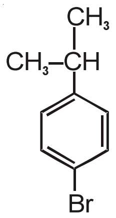
What is the major product B?

(1) 

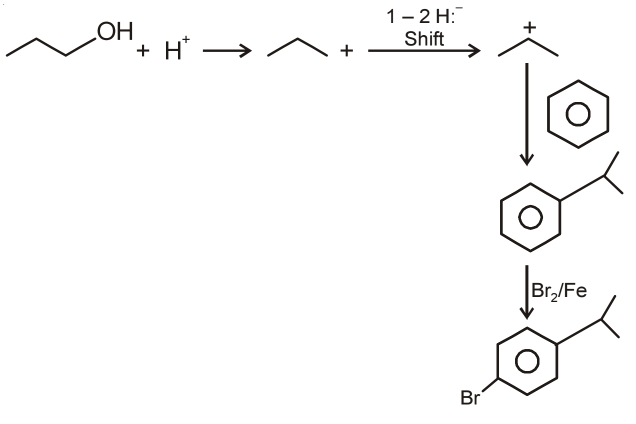
(2) 

$\underset{\text{Br}}{\underset{|}{CH_3–CH}}–\underset{\text{Br}}{\underset{|}{CH_2}}$

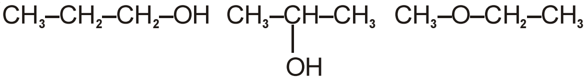
(3) 

(4) 

Sol. Answer (4)



9. Which of the following is the correct increasing order of boiling point of following compounds?



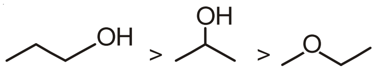
$CH_3-CH_2-CH_2-OH \quad CH_3-\underset{OH}{\underset{|}{C}H}-CH_3 \quad CH_3-O-CH_2-CH_3$

I II III

(1) II < I < III (2) III < II < I (3) I < II < III (4) II < III < I

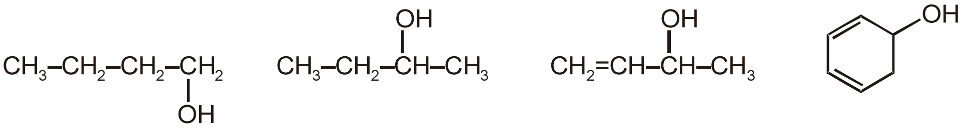
Sol. Answer (2)

The order of boiling point is



(I) (II) (III)

10. Which of the following is the correct ease of dehydration?



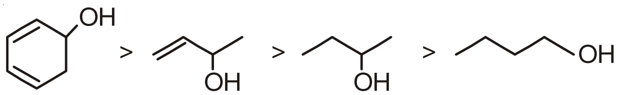
$CH_3-CH_2-CH_2-\underset{OH}{\underset{|}{C}H_2} \quad CH_3-CH_2-\overset{OH}{\overset{|}{C}H}-CH_3 \quad CH_2=CH-\overset{OH}{\overset{|}{C}H}-CH_3$

I II III IV

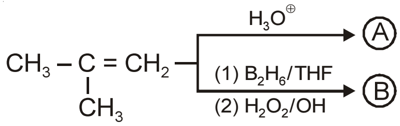
(1) I > III > II > IV (2) IV > III > II > I (3) IV > II > III > I (4) III > IV > II > I

Sol. Answer (2)

The ease of dehydration is,



(IV) (III) (II) (I)

11. 

$CH_3-\underset{CH_3}{\underset{|}{C}}=CH_2 \xrightarrow{H_3O^{\oplus}} Ⓐ$

$CH_3-\underset{CH_3}{\underset{|}{C}}=CH_2 \xrightarrow[(2)\ H_2O_2/OH]{(1)\ B_2H_6/THF} Ⓑ$

Product Ⓐ and Ⓑ can be distinguished by

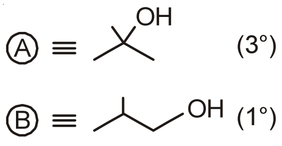
(1) Sodium metal

(2) Neutral $FeCl_3$

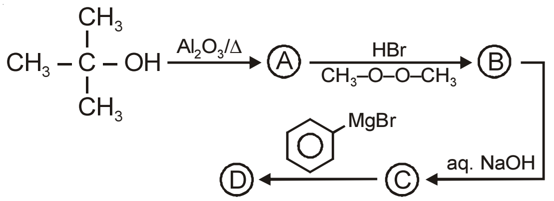
(3) Lucas reagent

(4) Esterification reaction

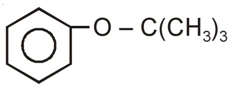
Sol. Answer (3)

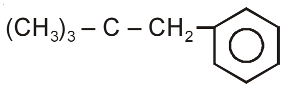


Lucas reagent can distinguish them

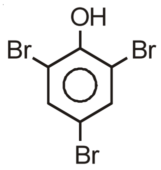
12. 

The end product Ⓓ of the reaction is

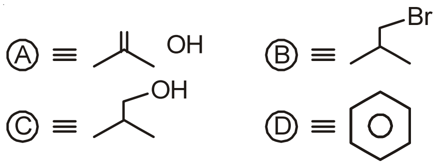
(1) 

(2) 

(3) 

(4) 

Sol. Answer (3)



13. Consider the following reaction :

$$\text{Phenol} \xrightarrow[\text{Zn dust}]{} X \xrightarrow[\text{Anhydrous AlCl}_3]{CH_3Cl} Y \xrightarrow[H_2O/H^+]{\text{Alkaline KMnO}_4} Z$$

The product Z is

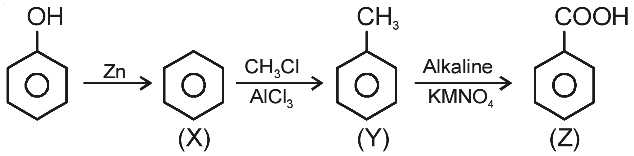
(1) Benzene

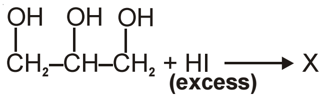
(2) Toluene

(3) Benzaldehyde

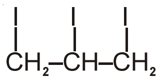
(4) Benzoic acid

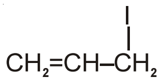
Sol. Answer (4)



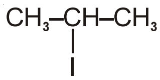
14. 
$$\overset{OH}{CH_2}-\overset{OH}{CH}-\overset{OH}{CH_2} + \underset{\textbf{(excess)}}{HI} \longrightarrow X$$

What is X?

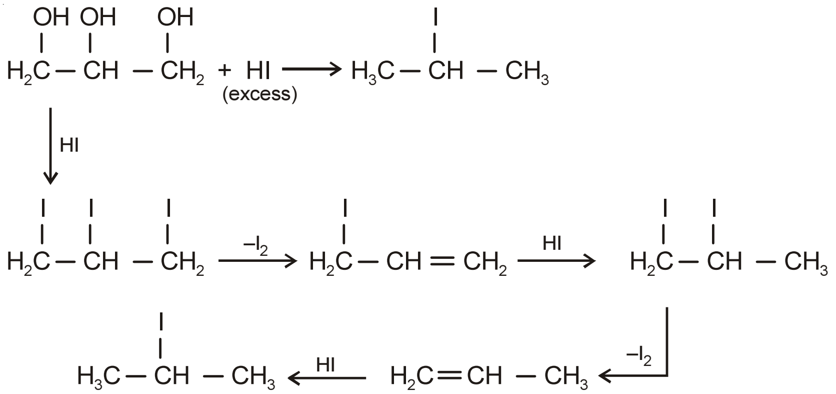
(1) 
$$\overset{I}{CH_2}-\overset{I}{CH}-\overset{I}{CH_2}$$

(2) 
$$CH_2=CH-\overset{I}{CH_2}$$

(3) $CH_3-CH=CH_2$

(4) 
$$CH_3-\underset{I}{CH}-CH_3$$

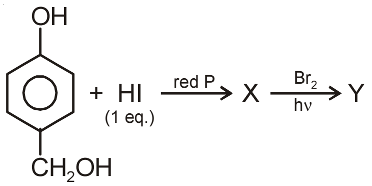
Sol. Answer (4)



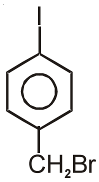
$$H_2\overset{OH}{C}-\overset{OH}{CH}-\overset{OH}{CH_2} + \underset{(excess)}{HI} \longrightarrow H_3C-\overset{I}{CH}-CH_3$$

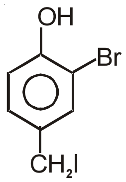
$$H_2\overset{I}{C}-\overset{I}{CH}-\overset{I}{CH_2} \xrightarrow{-I_2} H_2\overset{I}{C}-CH=CH_2 \xrightarrow{HI} H_2\overset{I}{C}-\overset{I}{CH}-CH_3 \xrightarrow{-I_2} H_2C=CH-CH_3 \xrightarrow{HI} H_3C-\overset{I}{CH}-CH_3$$

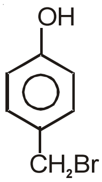
∴ Answer (4)

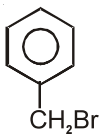
15. 

What is Y?

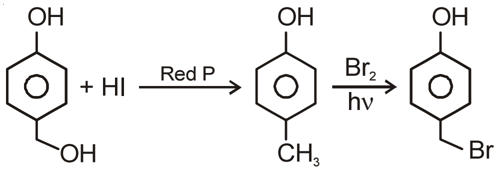
(1) 

(2) 

(3) 

(4) 

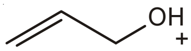
Sol. Answer (3)



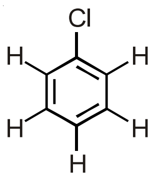
16. Which of the following will not give positive test with neutral $FeCl_3$?

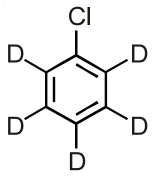
(1) Nitrophenol (2) Phenol (3) Allyl alcohol (4) o-cresol

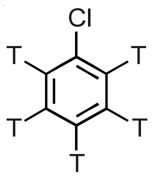
Sol. Answer (3)

 + $FeCl_3 \longrightarrow$ No Reaction

17. In Dow's process haloarene is converted to phenol with fused NaOH. The most reactive compound is

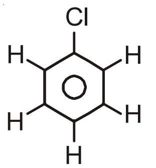
(1) 

(2) 

(3) 

(4) All are equally reactive

Sol. Answer (1)



18. Among the following four compounds

a. Phenol b. Methyl phenol c. Meta nitrophenol d. Para nitrophenol

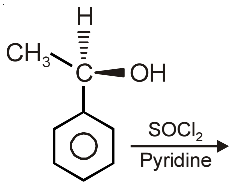
The acidity order is

(1) d > c > a > b (2) c > d > a > b (3) a > d > c > b (4) b > a > c > d

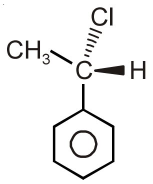
Sol. Answer (1)

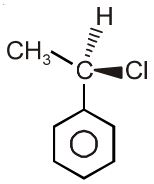
The acidic order is

Paranitrophenol > Meta-nitrophenol > Phenol > Methyl Phenol

19. 
Product (major)

The product is

(1) 

(2) 

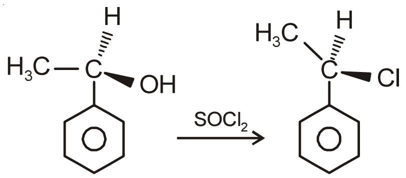
(3) Mixture of (1) & (2)

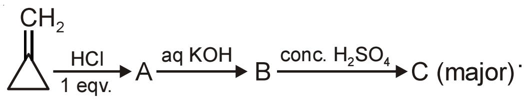
(4) No reaction

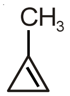
Sol. Answer (1)

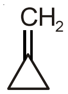
In absence of pyridene, the reaction of $SOCl_2$ with alkyl halide is S_Ni (Intramolecular nucleophilic substitution reaction) and hence S_Ni, the confuguration is retained.

i.e., retention reaction takes place in S_Ni. So,

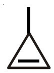


20. 
Product (C) is

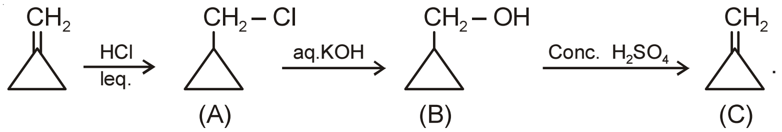
(1) 

(2) 

(3) 

(4) 

Sol. Answer (2)

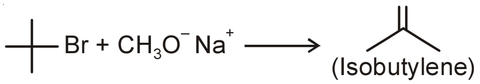


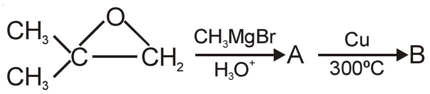
(Ethers-Preparation and properties)

21. Reaction of t-butyl bromide with sodium methoxide produces

(1) Sodium t-butoxide (2) t-butyl methyl ether (3) Isobutane (4) Isobutylene

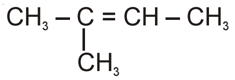
Sol. Answer (4)



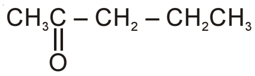
22. 

B is

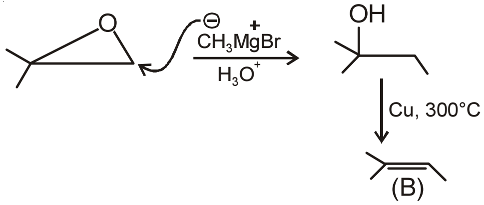
(1) $(CH_3)_3CHO$

(2) 
$CH_3 - \underset{\underset{CH_3}{|}}{C} = CH - CH_3$

(3) $(CH_3)_2CHCOCH_3$

(4) 
$CH_3\underset{\underset{O}{||}}{C} - CH_2 - CH_2CH_3$

Sol. Answer (2)



∴ In basic medium the opening of epoxide is S_N2 type. So, nucleophile CH_3 attack less hindered 'C' of epoxide.

23. Ethyl chloride is converted into diethyl ether by

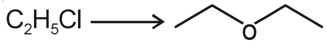
(1) Perkin's reaction

(2) Grignard reaction

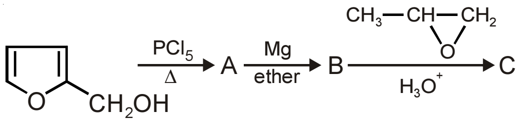
(3) Wurtz synthesis

(4) Williamson's synthesis

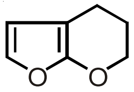
Sol. Answer (4)

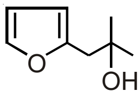


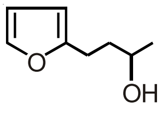
This can be done by Williamson's synthesis.

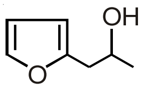
24. 

Product (C) is

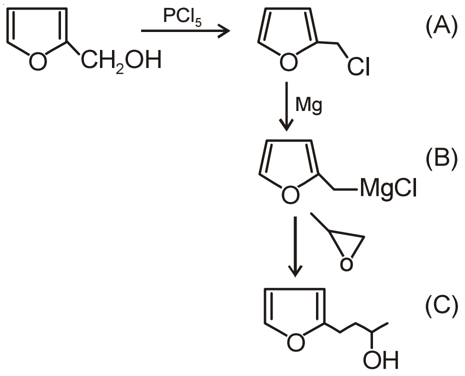
(1) 

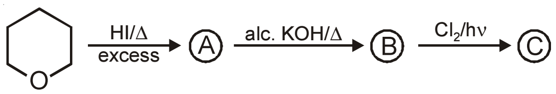
(2) 

(3) 

(4) 

Sol. Answer (3)

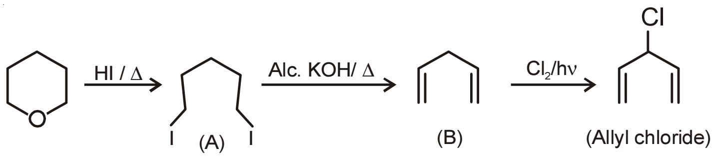


25. 

Product Ⓒ is

(1) Alkyl iodide (2) Vinyl chloride (3) Vinyl iodide (4) Allyl chloride

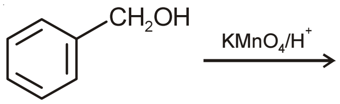
Sol. Answer (4)

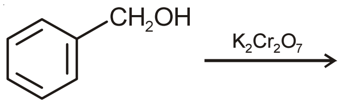


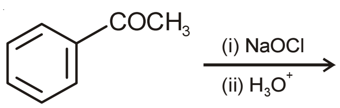
SECTION - B

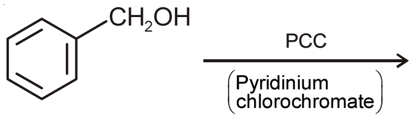
Previous Years Questions

1. The reaction that **does not** give benzoic acid as the major product is **[NEET-2019 (Odisha)]**

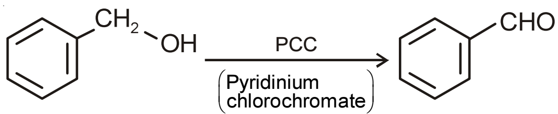
(1) 

(2) 

(3) 

(4) 

Sol. Answer (4)



PCC oxidises primary alcohol to aldehyde.

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

$H_3C-CH_2-CH_2-O-C(CH_3)_3 \xrightarrow[\Delta]{\text{excessHI}} C+D$ **[NEET-2019 (Odisha)]**

(1) $H_3C-CH_2-CH_2-OH$ and $HO-C(CH_3)_3$ (2) $H_3C-CH_2-CH_2-I$ and $I-C(CH_3)_3$

(3) $H_3C-CH_2-CH_2-OH$ and $I-C(CH_3)_3$ (4) $H_3C-CH_2-CH_2-I$ and $HO-C(CH_3)_3$

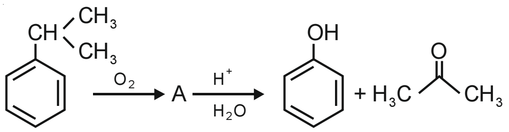
Sol. Answer (2)

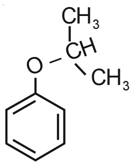
$$H_3C-CH_2-CH_2-O-C(CH_3)_3 \xrightarrow[\Delta]{HI} CH_3-CH_2-CH_2-OH + (CH_3)_3C-I$$

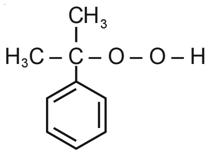
$$\downarrow HI$$

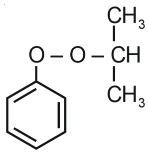
$$CH_3CH_2CH_2-I$$

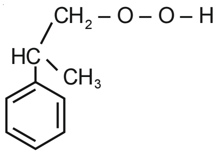
3. The structure of intermediate A in the following reaction, is **[NEET-2019]**



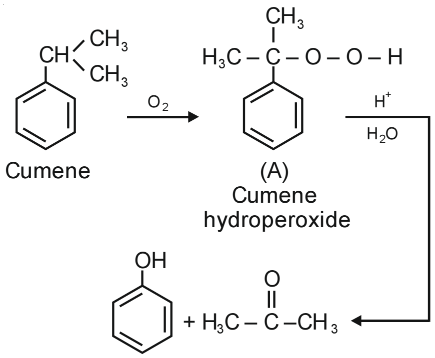
(1) 

(2) 

(3) 

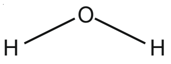
(4) 

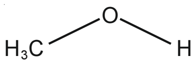
Sol. Answer (2)

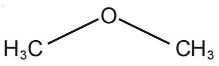


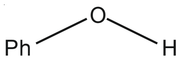
4. The compound that is most difficult to protonate is :

[NEET-2019]

(1) 

(2) 

(3) 

(4) 

Sol. Answer (4)

Due to involvement of lone pair of electrons in resonance in phenol, it will have positive charge (partial), hence incoming proton will not be able to attack easily.

5. The compound A on treatment with Na gives B, and with PCl_5 gives C. B and C react together to give diethyl ether. A, B and C are in the order **[NEET-2018]**

(1) C_2H_5OH, C_2H_6, C_2H_5Cl

(2) C_2H_5OH, C_2H_5Cl, C_2H_5ONa

(3) C_2H_5OH, C_2H_5ONa, C_2H_5Cl

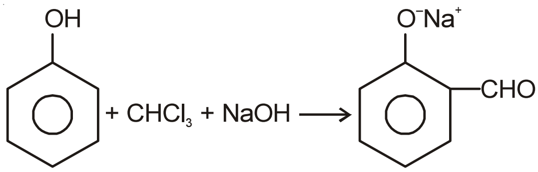
(4) C_2H_5Cl, C_2H_6, C_2H_5OH

Sol. Answer (3)

$$\begin{tikzcd}\underset{(A)}{C_2H_5OH} \arrow[r, "Na"] \arrow[d, "PCl_5"] & \underset{(B)}{C_2H_5O^- Na^+} \\ \underset{(C)}{C_2H_5Cl} & \end{tikzcd}$$

$$\underset{(B)}{C_2H_5O^- Na^+} + \underset{(C)}{C_2H_5Cl} \xrightarrow{S_N2} C_2H_5OC_2H_5$$

6. In the reaction **[NEET-2018]**



The electrophile involved is

(1) Dichloromethyl cation $(\overset{\oplus}{C}HCl_2)$

(2) Formyl cation $(\overset{\oplus}{C}HO)$

(3) Dichlorocarbene $(:CCl_2)$

(4) Dichloromethyl anion $(\overset{\oplus}{C}HCl_2)$

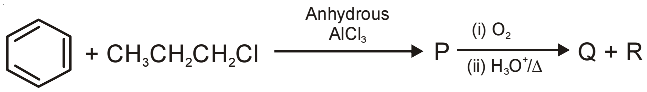
Sol. Answer (3)

It is Reimer-Tiemann reaction. The electrophile formed is $:CCl_2$ (Dichlorocarbene) according to the following reaction

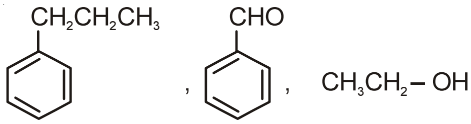
$$CHCl_3 + OH^- \rightleftharpoons \overset{\ominus}{\ddot{C}}Cl_3 + H_2O$$

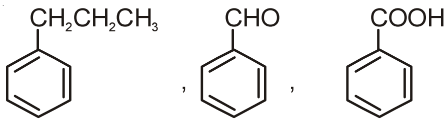
$$\overset{\ominus}{\ddot{C}}Cl_3 \longrightarrow \underset{\text{Electrophile}}{:CCl_2} + Cl^-$$

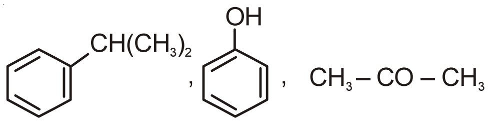
7. Identify the major products P, Q and R in the following sequence of reactions: **[NEET-2018]**

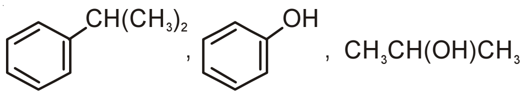


P **Q** **R**

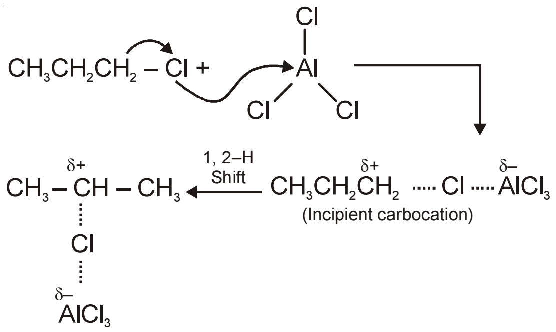
(1) 

(2) 

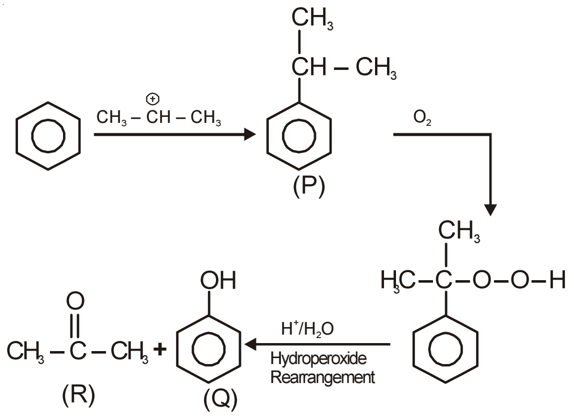
(3) 

(4) 

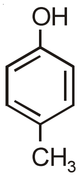
Sol. Answer (3)

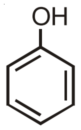


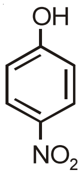
Now,

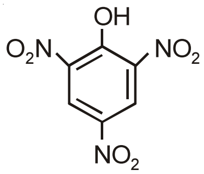


8. Which one is the most acidic compound? **[NEET-2017]**

(1) 

(2) 

(3) 

(4) 

Sol. Answer (4)

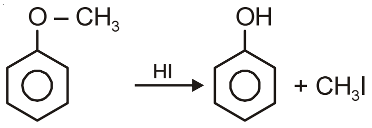
$-NO_2$ group has very strong –I & –R effects.

9. The heating of phenyl-methyl ethers with HI produces. **[NEET-2017]**

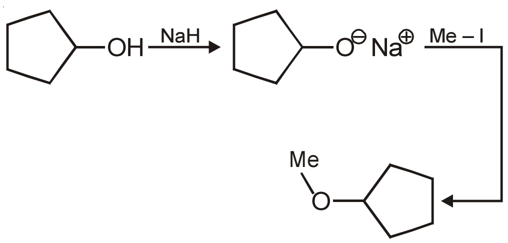
(1) Ethyl chlorides (2) Iodobenzene

(3) Phenol (4) Benzene

Sol. Answer (3)



10. The reaction,



can be classified as **[NEET-2016]**

(1) Williamson alcohol synthesis reaction

(2) Williamson ether synthesis reaction

(3) Alcohol formation reaction

(4) Dehydration reaction

Sol. Answer (2)

Fact

11. Which of the following reagents would distinguish cis-cyclopenta-1, 2-diol from the trans-isomer?

[NEET-2016]

(1) Aluminium isopropoxide

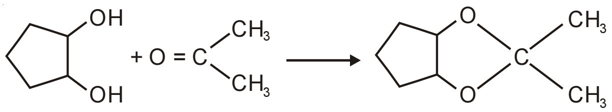
(2) Acetone

(3) Ozone

(4) MnO_2

Sol. Answer (2)

cis-cylopenta-1, 2-diol can form cyclic ketal whereas tran-cyclopenta-1, 2-diol can't form cyclic ketal.



12. Reaction of phenol with chloroform in presence of dilute sodium hydroxide finally introduces which one of the following functional group? **[Re-AIPMT-2015]**

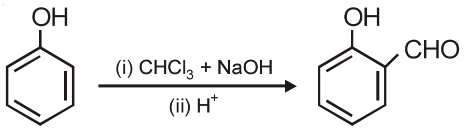
(1) $-CHCl_2$

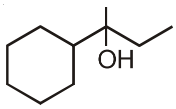
(2) –CHO

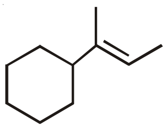
(3) $-CH_2Cl$

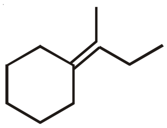
(4) –COOH

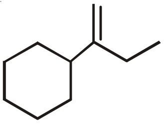
Sol. Answer (2)

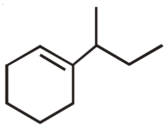


13. Which of the following is not the product of dehydration of  ? **[Re-AIPMT-2015]**

(1) 

(2) 

(3) 

(4) 

Sol. Answer (4)

More stable carbocation can't be rearranged to a less stable carbocation.

14. Which of the following reaction(s) can be used for the preparation of alkyl halides?

(I) $CH_3CH_2OH + HCl \xrightarrow{\text{anh. } ZnCl_2}$

(II) $CH_3CH_2OH + HCl \longrightarrow$

(III) $(CH_3)_3COH + HCl \longrightarrow$

(IV) $(CH_3)_2CHOH + HCl \xrightarrow{\text{anh. } ZnCl_2}$

[Re-AIPMT-2015]

(1) (IV) only

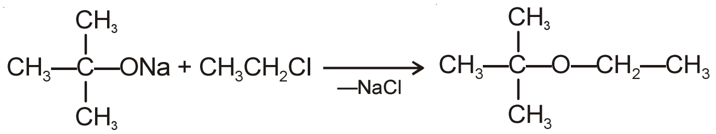
(2) (III) and (IV) only

(3) (I), (III) and (IV) only

(4) (I) and (II) only

Sol. Answer (3)

The reactions of primary and secondary alcohols with HCl require the presence of a catalyst $ZnCl_2$.

15. The reaction 

$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-ONa + CH_3CH_2Cl \xrightarrow[-NaCl]{} CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-O-CH_2-CH_3$ is called **[AIPMT-2015]**

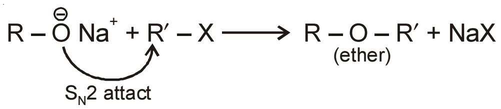
(1) Gatterman - Koch reaction

(2) Williamson synthesis

(3) Williamson continuous etherification process

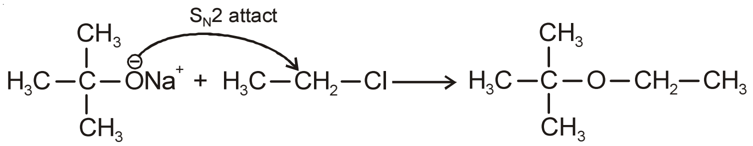
(4) Etard reaction

Sol. Answer (2)

In Williamson synthesis, 

$R-\overset{\ominus}{O}\,\overset{+}{Na} + R'-X \longrightarrow \underset{\text{(ether)}}{R-O-R'} + NaX$

As attack is S_N2 $\therefore$ $R'-X$ should be less sterically hindered i.e, $R'-X$ should be H_3C-X or 1° $R-X$ So,



$H_3C-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-\overset{\ominus}{O}\overset{+}{Na} + H_3C-CH_2-Cl \longrightarrow H_3C-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-O-CH_2-CH_3$

16. Among the following sets of reactants which one produces anisole ? **[AIPMT-2014]**

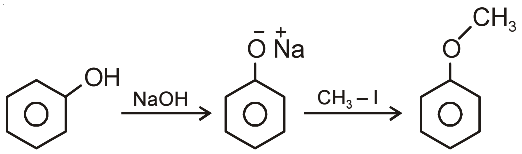
(1) CH_3CHO; RMgX

(2) C_6H_5OH; NaOH; CH_3I

(3) C_6H_5OH; netural $FeCl_3$

(4) $C_6H_5-CH_3$; CH_3COCl; $AlCl_3$

Sol. Answer (2)



(Anisole)

17. Identity Z in the sequence of reactions $CH_3CH_2CH=CH_2 \xrightarrow{HBr/H_2O_2} Y \xrightarrow{C_2H_5ONa} Z$ **[AIPMT-2014]**

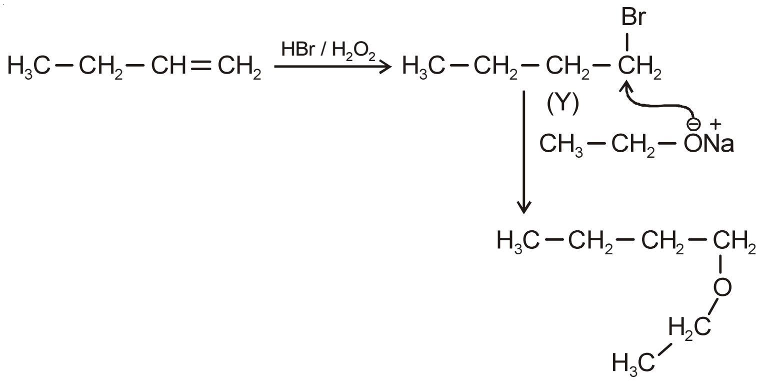
(1) $CH_3-(CH_2)_3-O-CH_2CH_3$

(2) $(CH_3)_2CH_2-O-CH_2CH_3$

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

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

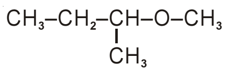
Sol. Answer (1)

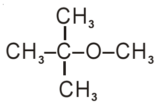


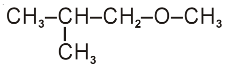
∴ Z is $H_3C-(CH_2)_3-O-CH_2-CH_3$

18. Among the following ethers, which one will produce methyl alcohol on treatment with hot concentrated HI ?

[NEET-2013]

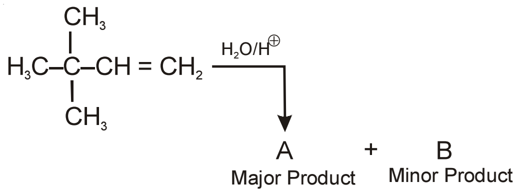
(1) 
$\mathrm{CH_3{-}CH_2{-}\underset{CH_3}{CH}{-}O{-}CH_3}$

(2) 
$\mathrm{CH_3{-}\overset{CH_3}{\underset{CH_3}{C}}{-}O{-}CH_3}$

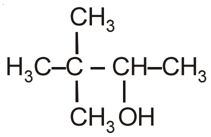
(3) 
$\mathrm{CH_3{-}\underset{CH_3}{CH}{-}CH_2{-}O{-}CH_3}$

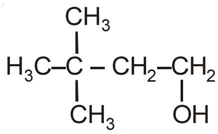
(4) $CH_3-CH_2-CH_2-CH_2-O-CH_3$

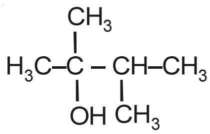
Sol. Answer (2)

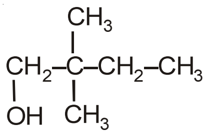
19. In the following reaction : 
$$\mathrm{H_3C{-}\overset{CH_3}{\underset{CH_3}{C}}{-}CH=CH_2 \xrightarrow{H_2O/H^{\oplus}} \underset{\text{Major Product}}{A} + \underset{\text{Minor Product}}{B}}$$

The major product is **[AIPMT (Prelims)-2012]**

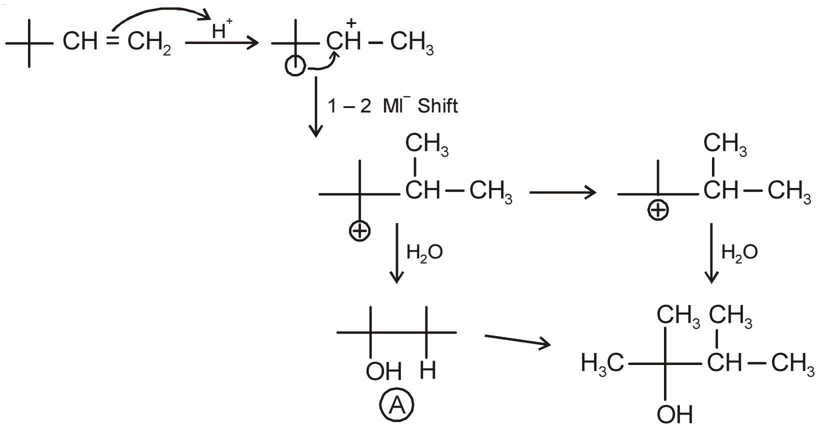
(1) 
$\mathrm{H_3C{-}\overset{CH_3}{\underset{CH_3}{C}}-\underset{OH}{CH}{-}CH_3}$

(2) 
$\mathrm{H_3C{-}\overset{CH_3}{\underset{CH_3}{C}}-CH_2{-}\underset{OH}{CH_2}}$

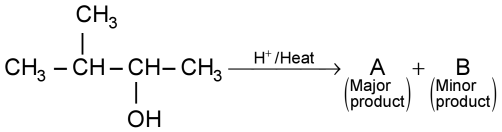
(3) 
$\mathrm{H_3C{-}\overset{CH_3}{\underset{OH}{C}}-\underset{CH_3}{CH}{-}CH_3}$

(4) 
$\mathrm{\underset{OH}{CH_2}{-}\overset{CH_3}{\underset{CH_3}{C}}{-}CH_2{-}CH_3}$

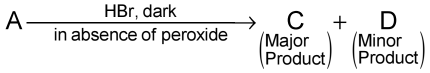
Sol. Answer (3)



20. In the following reactions,

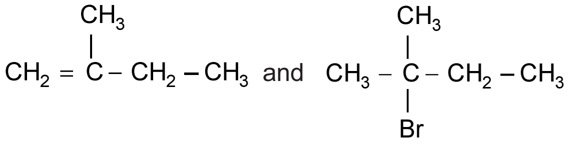
(a) 

$$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{CH}-\underset{\underset{\displaystyle OH}{|}}{CH}-CH_3 \xrightarrow{H^+/\text{Heat}} \underset{\left(\substack{\text{Major}\\ \text{product}}\right)}{A} + \underset{\left(\substack{\text{Minor}\\ \text{product}}\right)}{B}$$

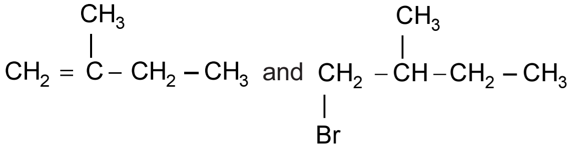
(b) 

$$A \xrightarrow[\text{in absence of peroxide}]{\text{HBr, dark}} \underset{\left(\substack{\text{Major}\\ \text{Product}}\right)}{C} + \underset{\left(\substack{\text{Minor}\\ \text{Product}}\right)}{D}$$

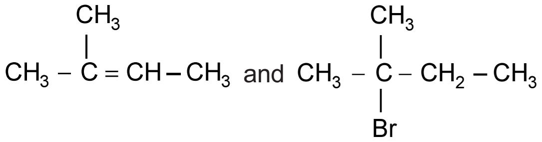
The major products (A) and (C) are respectively **[AIPMT (Prelims)-2011]**

(1) 

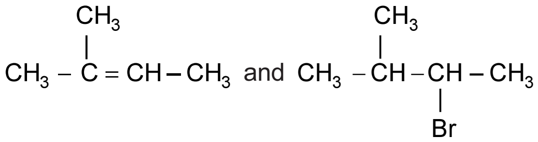
$$CH_2=\overset{\overset{\displaystyle CH_3}{|}}{C}-CH_2-CH_3 \text{ and } CH_3-\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle Br}{|}}{C}}-CH_2-CH_3$$

(2) 

$$CH_2=\overset{\overset{\displaystyle CH_3}{|}}{C}-CH_2-CH_3 \text{ and } \underset{\underset{\displaystyle Br}{|}}{CH_2}-\overset{\overset{\displaystyle CH_3}{|}}{CH}-CH_2-CH_3$$

(3) 

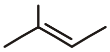
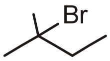
$$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{C}=CH-CH_3 \text{ and } CH_3-\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle Br}{|}}{C}}-CH_2-CH_3$$

(4) 

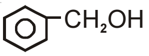
$$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{C}=CH-CH_3 \text{ and } CH_3-\overset{\overset{\displaystyle CH_3}{|}}{CH}-\underset{\underset{\displaystyle Br}{|}}{CH}-CH_3$$

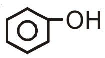
Sol. Answer (3)

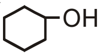
As per the reaction sequence

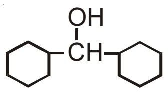
 and  will form

21. Which one of the following compounds has the most acidic nature ? **[AIPMT (Prelims)-2010]**

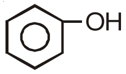
(1) 

(2) 

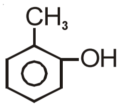
(3) 

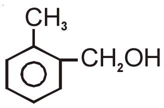
(4) 

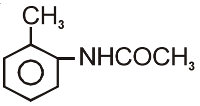
Sol. Answer (2)

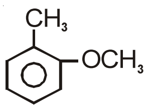
 is the most acidic.

22. Which one is most reactive towards electrophilic reagent? **[AIPMT (Prelims)-2010]**

(1) 

(2) 

(3) 

(4) 

Sol. Answer (1)

Due to greater e^- releasing effect.

23. Among the following four compounds

a. Phenol b. Methyl phenol c. m-Nitrophenol d. P-nitrophenol

The acidity order is **[AIPMT (Mains)-2010]**

(1) d > c > a > b (2) c > d > a > b (3) a > d > c > b (4) b > a > c > d

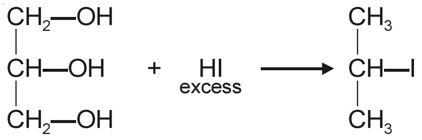
Sol. Answer (1)

Withdrawing group increasing the acidic character and electron donating group decreases the acidic characters.

24. When glycerol is treated with excess of HI, it produces **[AIPMT (Mains)-2010]**

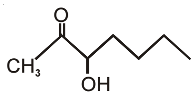
(1) 2-iodopropane (2) Allyl iodide (3) Propene (4) Glycerol triiodide

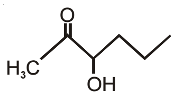
Sol. Answer (1)

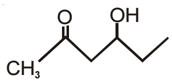


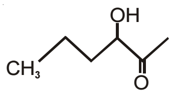
$$\begin{array}{c}CH_2\text{—}OH\\|\\CH\text{—}OH\\|\\CH_2\text{—}OH\end{array} + \underset{\text{excess}}{HI} \longrightarrow \begin{array}{c}CH_3\\|\\CH\text{—}I\\|\\CH_3\end{array}$$

25. Which one of the following compounds will be most readily dehydrated ? **[AIPMT (Mains)-2010]**

(1) 

(2) 

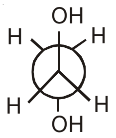
(3) 

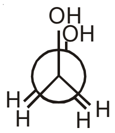
(4) 

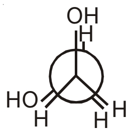
Sol. Answer (3)

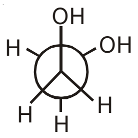
As carbocation intermediate, more the stability of carbocation, faster the rate of dehydration.

26. Which of the following conformers for ethylene glycol is most stable? **[AIPMT (Mains)-2010]**

(1) 

(2) 

(3) 

(4) 

Sol. Answer (4)

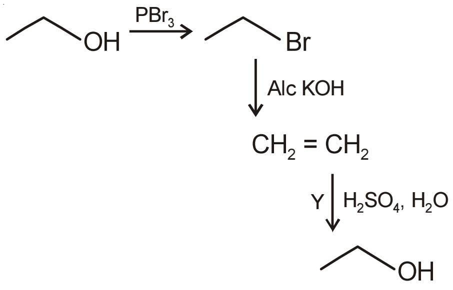
Intramolecular H-bonding.

27. Consider the following reaction,

Ethanol $\xrightarrow{PBr_3}$ X $\xrightarrow{\text{alc. KOH}}$ Y $\xrightarrow[\text{(ii) } H_2O\text{, heat}]{\text{(i) } H_2SO_4 \text{ room temperature}}$ Z ; **[AIPMT (Prelims)-2009]**

(1) $CH_3CH_2–O–CH_2–CH_3$ (2) $CH_3–CH_2–O–SO_3H$ (3) CH_3CH_2OH (4) $CH_2 = CH_2$

Sol. Answer (3)



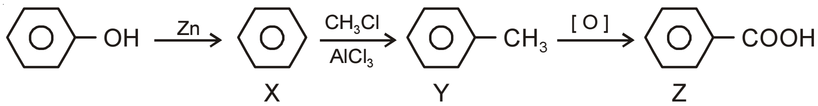
28. Consider the following reaction

$$\text{Phenol} \xrightarrow[\text{Zn dust}]{} X \xrightarrow[\text{Anhydrous AlCl}_3]{CH_3Cl} Y \xrightarrow{\text{Alkaline KMnO}_4} Z$$

The product Z is **[AIPMT (Prelims)-2009]**

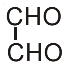
(1) Benzaldehyde (2) Benzoic acid (3) Benzene (4) Toluene

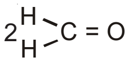
Sol. Answer (2)



29. $H_2COH.CH_2OH$ on heating with periodic acid gives **[AIPMT (Prelims)-2009]**

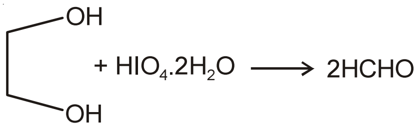
(1) 2HCOOH

(2) 
$\begin{array}{c}CHO\\|\\CHO\end{array}$

(3) 
$2\,H_2C=O$

(4) $2\,CO_2$

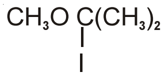
Sol. Answer (3)



30. The major organic product in the reaction, $CH_3 - O - CH(CH_3)_2 + HI \rightarrow$ Product is **[AIPMT (Prelims)-2006]**

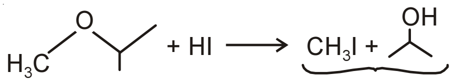
(1) $CH_3OH + (CH_3)_2CHI$

(2) $ICH_2OCH(CH_3)_2$

(3) 
$CH_3O\underset{\displaystyle I}{\underset{|}{C}}(CH_3)_2$

(4) $CH_3I + (CH_3)_2CHOH$

Sol. Answer (4)



31. Ethylene oxide when treated with Grignard reagent yields **[AIPMT (Prelims)-2006]**

(1) Secondary alcohol

(2) Tertiary alcohol

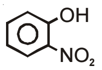
(3) Cyclopropyl alcohol

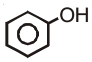
(4) Primary alcohol

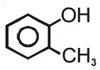
Sol. Answer (4)

32. Which one of the following compounds is most acidic? **[AIPMT (Prelims)-2005]**

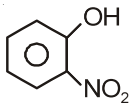
(1) $Cl–CH_2–CH_2–OH$

(2) 

(3) 

(4) 

Sol. Answer (2)



is the most acidic because of (–M & –I) effect of $–NO_2$.

33. When 3, 3-dimethyl 2-butanol is heated with H_2SO_4, the major product obtained is

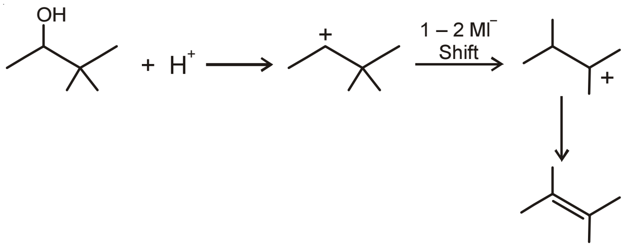
(1) 2, 3-dimethyl 2-butene

(2) cis and trans isomers of 2, 3-dimethyl 2-butene

(3) 2, 3-dimethyl 1-butene

(4) 3, 3-dimethyl 1-butene

Sol. Answer (1)



34. Decreasing order of reactivity of hydrogen halide acids in the conversion of ROH $\rightarrow$ RX is

(1) HCl > HBr > HI > HF | (2) HI > HBr > HCl > HF
(3) HF > HCl > HBr > HI | (4) HF > HBr > HI > HCl

Sol. Answer (2)

R–OH + HX $\rightarrow$ R – X

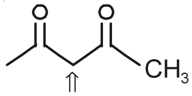
The HX reactivity order is HI > HBr > HCl > HF

35. More acidic than ethanol is

(1) $CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_3$ (2) $CH_3CO_2CH_2CH_3$

(3) $CH_3COCH_2COCH_3$ (4) CH_3COCH_3

Sol. Answer (3)



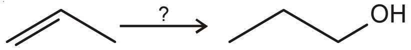
Active methyl more acidic than ethanol.

36. Which reagent converts propene to 1-propanol?

(1) H_2O, H_2SO_4 (2) B_2H_6, H_2O_2, OH^-

(3) $Hg(OAc)_2$, $NaBH_4/H_2O$ (4) Aq. KOH

Sol. Answer (2)



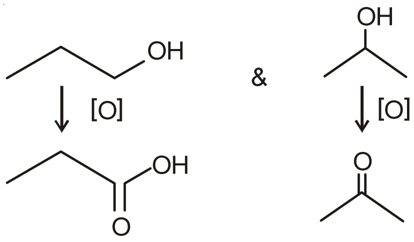
The reagent must be B_2H_6, H_2O_2/OH^-

37. *n*-propyl alcohol and isopropyl alcohol can be chemically distinguished by which reagent?

(1) PCl_5 (2) Reduction

(3) Oxidation with potassium dichromate (4) Ozonolysis

Sol. Answer (3)



38. Which one of the following will not form a yellow precipitate on heating with an alkaline solution of iodine?

(1) $CH_3CH(OH)CH_3$ (2) $CH_3CH_2CH(OH)CH_3$ (3) CH_3OH (4) CH_3CH_2OH

Sol. Answer (3)

$CH_3OH + I_2 / OH^- \rightarrow$ No reaction.

39. The general molecular formula, which represents the homologous series of alkanols is

(1) $C_nH_{2n+2}O$ (2) $C_nH_{2n}O_2$ (3) $C_nH_{2n}O$ (4) $C_nH_{2n+1}O$

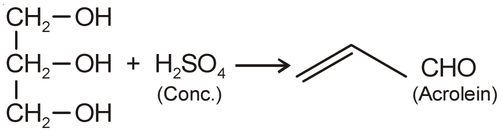
Sol. Answer (1)

$C_nH_{2n+2}O$ is alkanols.

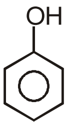
40. On heating glycerol with conc. H_2SO_4, a compound is obtained which has bad odour. The compound is

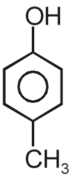
(1) Acrolein (2) Formic acid (3) Allyl alcohol (4) Glycerol sulphate

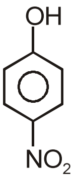
Sol. Answer (1)



41. The correct acidic order of the following is

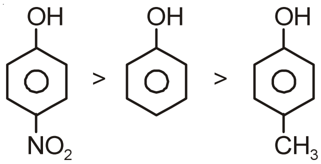
I. 

II. 

III. 

(1) I > II > III (2) III > I > II (3) II > III > I (4) I > III > II

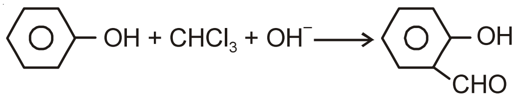
Sol. Answer (2)



42. When phenol is treated with $CHCl_3$ and NaOH, the product formed is

(1) Benzaldehyde (2) Salicylaldehyde (3) Salicylic acid (4) Benzoic acid

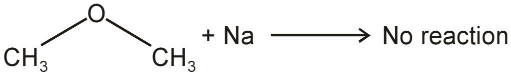
Sol. Answer (2)

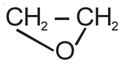


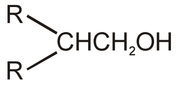
43. The compound which does not react with sodium, is

(1) CH_3COOH (2) $CH_3 - CHOH - CH_3$ (3) C_2H_5OH (4) $CH_3 - O - CH_3$

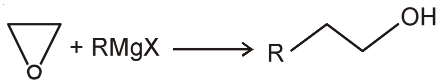
Sol. Answer (4)



44. Reaction of  CH_2-CH_2 (O) with RMgX leads to formation of

(1) RCH_2CH_2OH (2) $RCHOHCH_3$ (3) RCHOHR (4)  R_2CHCH_2OH

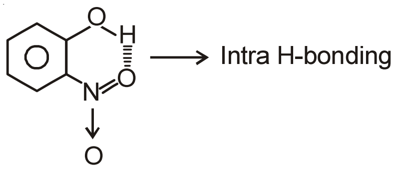
Sol. Answer (1)



45. Which of the following will not be soluble in sodium hydrogen carbonate?

(1) 2,4,6-trinitrophenol (2) Benzoic acid (3) o-Nitrophenol (4) Benzenesulphonic acid

Sol. Answer (3)



Due to presence of intra H-bond, the 'H' is engaged, it becomes weak acid. Moreover $NaHCO_3$ is a weaker base. So, o–nitrophenol does not react with $NaHCO_3$ and hence it is not soluble in $NaHCO_3$.

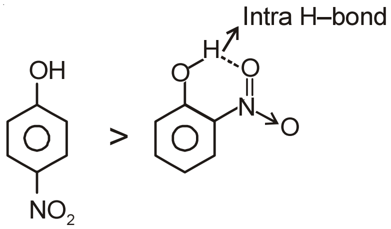
SECTION - C

Assertion-Reason Type Questions

1. A : p-nitrophenol has high pK_a in comparison to o-nitrophenol.

R : In o-nitrophenol, intermolecular H-bonding is present.

Sol. Answer (4)



Due to intra H bond in o-nitrophenol it is less acidic than p-nitrophenol.

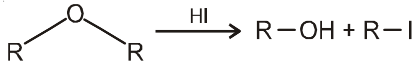
So, K_a (p-nitrophenol) > K_a (o-nitrophenol)

So, pK_a order p-nitrophenol < o-nitrophenol

2. A : When $C_2H_5-O-CH_3$ is reacted with one mole of HI then C_2H_5OH & CH_3I is formed.

R : It is S_N1 reaction.

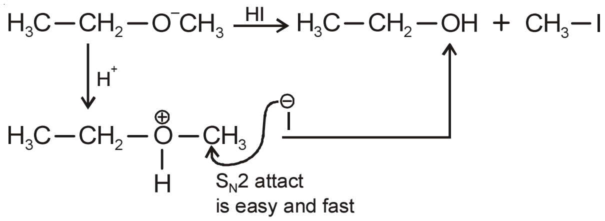
Sol. Answer (3)



The -R gp 3° then only S_N1 attack of I^- takes place otherwise S_N2 attack takes place.

So, in absence of 3°R, that –'R' is being attack by I^- (or X^-) which is less sterically crowded, because the attack is S_N2. Since S_N2 reactivity order follows as $H_3C – I > 1°R – I > 2°R – I > 3°R – I$

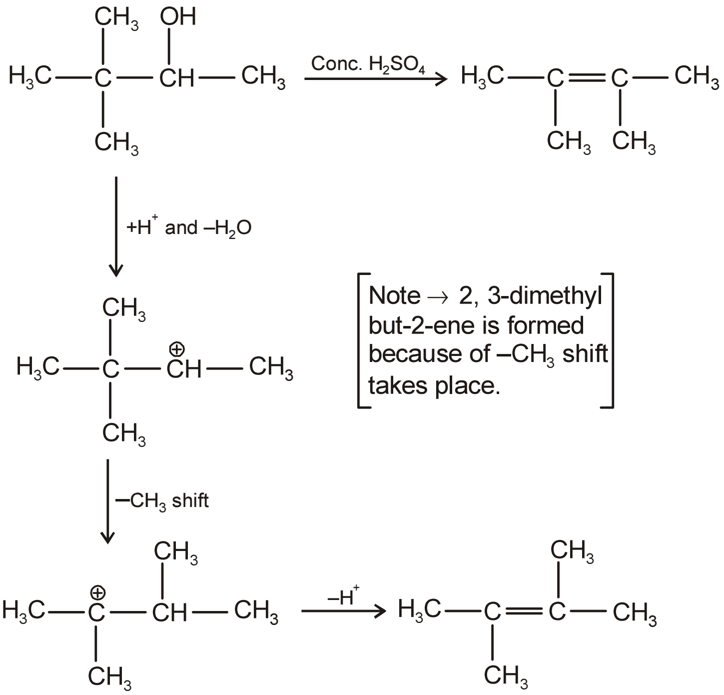
Therefore,



3. A : When 3, 3-dimethyl butan-2-ol is heated in presence of concentrated H_2SO_4 then 2, 3-dimethyl but-2-ene is formed as major product.

   R : In this reaction, carbocation is formed as an intermediate.

Sol. Answer (2)



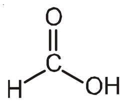
Note → 2, 3-dimethyl but-2-ene is formed because of $–CH_3$ shift takes place.

4. A : In esterification reaction, HCOOH is the most reactive acid among carboxylic acid.

   R : Alcohol acts as nucleophile.

Sol. Answer (2)

As in esterification, steric crowding is dominant factor, so smaller is the 'R' group of carboxylic acid more is (RCO_2H) the reactivity.

∴  is most acidic since 'H' is smallest.

5. A : Ethers can't be distilled upto dryness due to fear of explosion.

   R : Due to the formation of superoxide, it is explosive.

Sol. Answer (3)

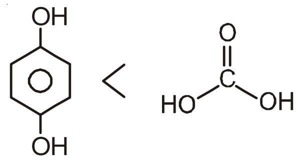
Ethers absorb and react with oxygen from air, in presence of light, forming unstable peroxide that can detonate with extreme violence when they become concentrated through evaporation or distillation and disturbed by heat, shock or friction.

6. A : Phenol does not react with $NaHCO_3$.

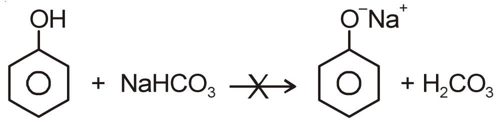
R : Phenol is less acidic than H_2CO_3.

Sol. Answer (1)

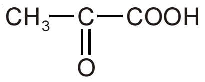
Acidic strength order



So,

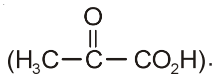


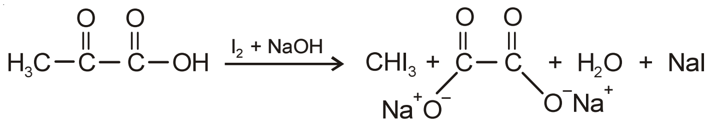
Reaction is not possible.

7. A :  $CH_3-\underset{\underset{O}{\|}}{C}-COOH$ gives haloform reaction.

R : It is more acidic than acetic acid.

Sol. Answer (2)

With I_2 + NaOH and I_2 + Na_2CO_3, the iodoform (or haloform) test is given by pyruvic acid  $(H_3C-\overset{\overset{O}{\|}}{C}-CO_2H)$.



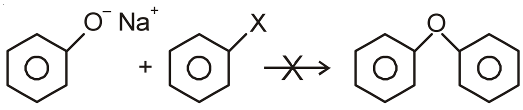
But this reaction is not because that it is more acidic than acetic acid.

8. A : Diphenyl ether is prepared by Williamson synthesis.

R : This reaction generally proceed by S_N1 mechanism.

Sol. Answer (4)

Diphenyl ether cannot be prepared by Williamsons's synthesis, because S_N2 attack on 'C' of benzene is not possible.



Not possible

Wiiliamson's synthesis always follows S_N2 attack.

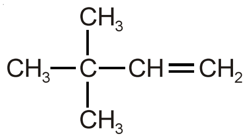
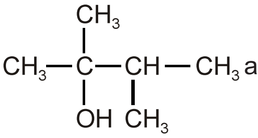
9. A : Grignard's reagent is prepared in the presence of ether.

R : Grignard's reagent is soluble and stable in ether.

Sol. Answer (1)

Grignard reagent is prepared in presence of ether solvent because Grignard reagent (RMgX) is more soluble in ether solvent and stable as ether doesn't provid 'H$^+$'.

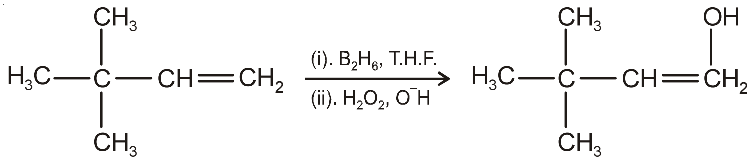
$$R-X+Mg\xrightarrow{\text{ether}}R-MgX$$

10. A : 
$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH=CH_2$ on hydroboration oxidation gives 
$CH_3-\underset{OH}{\overset{CH_3}{C}}-\underset{CH_3}{CH}-CH_3$ as major product.

R : It involves the formation of carbocation so undergoes rearrangement.

Sol. Answer (4)

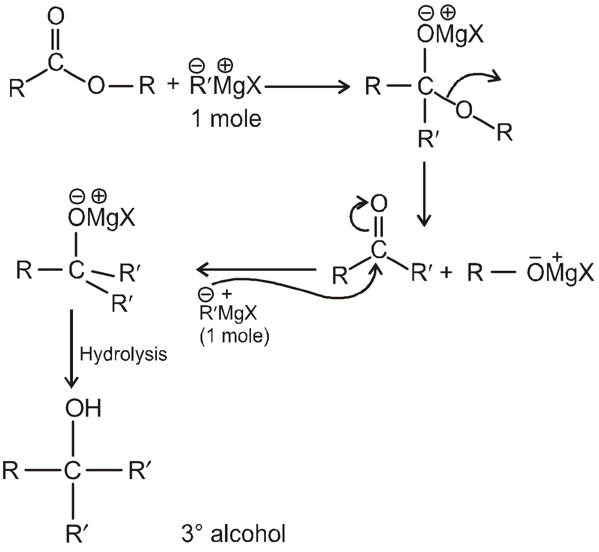
Hydroboration oxidation follows through formation of 4-membered cyclic Ts only and not via carbocation and hence it gives anti markovnikov addition of H_2O on alkene.

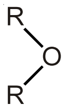
i.e., 
$$H_3C-\underset{CH_3}{\overset{CH_3}{C}}-CH=CH_2\xrightarrow[\text{(ii). }H_2O_2,\ \bar{O}H]{\text{(i). }B_2H_6,\ \text{T.H.F.}}H_3C-\underset{CH_3}{\overset{CH_3}{C}}-CH=\overset{OH}{CH_2}$$

11. A : Two moles of Grignard reagent is consumed in the formation of tertiary alcohol from ester followed by hydrolysis.

R : One mole of Grignard reagent converts ester into Ketone and second mole of Grignard reagent adds to Ketone.

Sol. Answer (1)

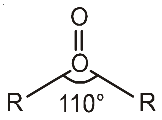


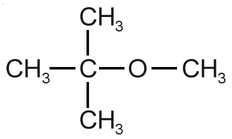
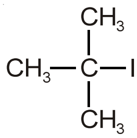
12. A :  bond angle in ether is slightly greater than normal tetrahedral angle (109.5°).

R : The hybridisation of oxygen atom in ether is *sp*^{3}.

Sol. Answer (2)

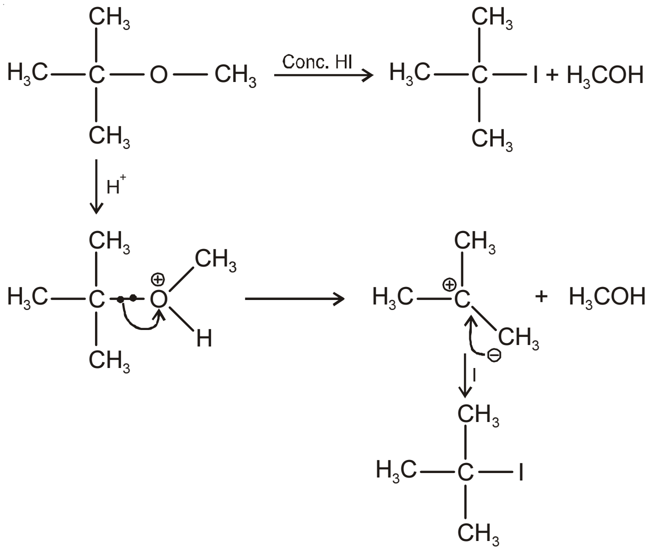
The B.A. in ether is slightly greater than normal tetrahedral angle 109.5°, this is because of repulsion between two alkyl group.



13. A :  $CH_3-C(CH_3)_2-O-CH_3$ on reaction with conc. HI gives  $CH_3-C(CH_3)_2-I$ and CH_3OH as major product.

R : This reaction proceed by S_N1 mechanism.

Sol. Answer (1)

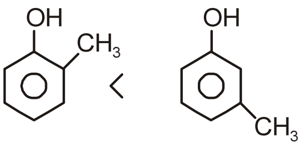


In case of 3°R the attack of HI is S_N1 and takes place at first.

14. A : Ortho-cresol is weaker acidic than meta-cresol.

R : It is due to ortho effect.

Sol. Answer (3)

Acidic order 

(o-cresol) (m-cresol)

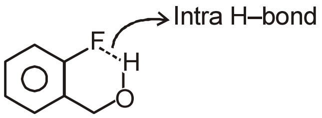
This is because of +I effect.

→ Ortho effect is found in benzoic acid only.

15. A : Among all ortho halophenol, fluorophenol is least acidic.

R : Ortho-fluorophenol forms intramolecular H-bond.

Sol. Answer (1)



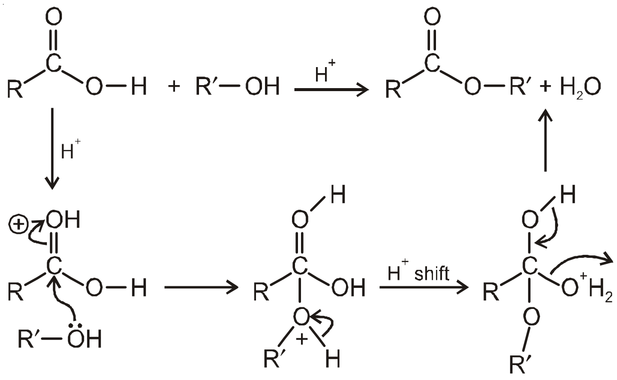
Since only - ‘F’ can form H-bond among all halogen, therefore it is least acidic.

16. A : In esterification reaction alcohol act as nucleophile.

R : In this reaction O–H bond of alcohol is broken.

Sol. Answer (1)

In esterification reaction alcohol acts as nucleophile because there is lp present on $-\ddot{\underset{\cdot\cdot}{\text{O}}}\text{H}$ of R – OH and since O – H bond can be cleaved easily. So, it favours its nucleophility.



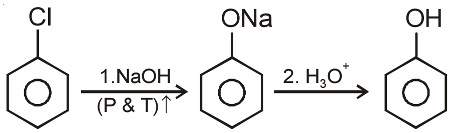
Act as Nu

17. A : Phenol is manufactured by Dow's process.

R : It involves the formation of benzyne intermediate.

Sol. Answer (2)

Dow’s process, involves the formation of benzyne intermediate but is not the correct reason.

Dow's process 

18. A : Primary alcohol is prepared by the reaction of primary amine with HNO_2.

R : Dimethyl amine is a primary amine but does not form methyl alcohol with HNO_2.

Sol. Answer (3)

Primary alcohol is prepared by the reaction of primary amine with HNO_2.

$$R-NH_2+HNO_2 \longrightarrow R-OH+N_2\uparrow+H_2O$$

19. A : The reactivity order of alcohols is 1° > 2° > 3° for the reaction in which O–H bond is broken.

R : The reactivity order of alcohol is 3° > 2° > 1° for the reaction in which C–O bond is broken.

Sol. Answer (2)

Reactivity order of alcohols for the reaction in which O – H bond is broken is in the order of

$H_3C - OH > 1°R - OH > 2°R - OH > 3°R - OH$

As the stablity order of their conjugate base.

$H_3C - O^- > 1°R - O^- > 2°R - O^- > 3°R - O^-$ (because of +I effect of 'R' group)

→ Reactivity order of alcohol for the reaction in which C – O bond is broken is as

$3°R - OH > 2°R - OH > 1°R - OH > H_3C - OH$

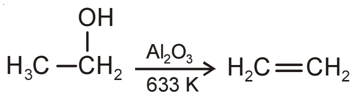
Since stablity order of carbocation.

$3°R^+ > 2°R^+ > 1°R^+ > H_3C^+$

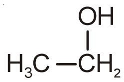
20. A : The dehydration of ethyl alcohol in presence of Al_2O_3 at 633 K gives ethene.

R : The reaction proceed through the formation of carbocation intermediate.

Sol. Answer (3)



$$H_3C-\overset{\overset{\large OH}{|}}{C}H_2 \xrightarrow[633\ K]{Al_2O_3} H_2C{=}CH_2$$



$H_3C-\overset{\overset{\large OH}{|}}{C}H_2$ (I°R – OH) prefer to go E_2 elimination reaction, so carbocation does not form in this reaction.

❑ ❑ ❑