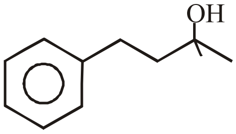
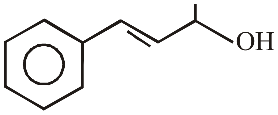
SOLVED EXAMPLES

Ex. 1 Give the IUPAC names for the following compounds. Chiral descriptions are not required.

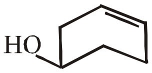
(a)



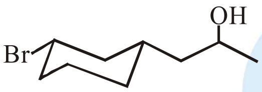
(b)



(c)



(d)



Sol. **(a)** 2-Methyl-4-phenylbutan-2-ol ; **(b)** **trans**-4-phenylbut-3-en-2-ol ; **(c)** Cyclohex - 3-enol ;
(d) 1-(**cis**-3-Bromocyclohexyl)propan-2-ol

Ex. 2 How will you carry out the following conversions ? You may use other organic compounds if necessary.

(a) CH_3OH to CH_3CH_2OH

(b) CH_3CH_2OH to CH_3OH

(c) CH_3CH_2OH to $HOCH_2CH_2OH$

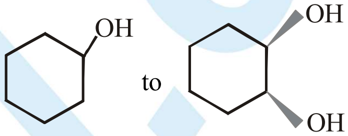
(d) $CH_3CH_2CH_2CH_2OH$ to $CH_3CH_2CHOHCH_3$

(e) CH_3CH_2OH to $CH_3CH_2CHOHCH_3$

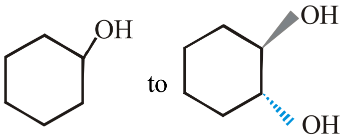
(f) $C_6H_5COCH_3$ to $C_6H_5CH_2\ CH_2OH$

(g) CH_3CH_2OH to $(C_2H_5)_2CHOHCH_3$

(h)



(i)



(j) $CH_2=CHCH_2OH$ to $CH_2OHCHOHCHO$

Sol. **(a)**

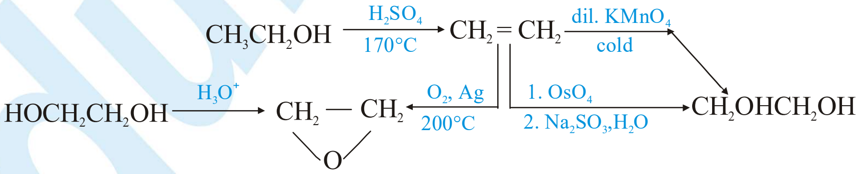
$$\begin{tikzcd}
CH_3OH \arrow[r, "I_2\text{, red P}", "\text{heat}"'] & {} \arrow[r, "Mg", "Et_2O"'] \arrow[d, "KCN"] & CH_3MgI \arrow[d, "\text{1. }CO_2\text{ 2. }H_3O"] & \\
CH_3CH_2OH & CH_3CN \arrow[l, "\text{1. }LiAlH_4"', "\text{2. }HNO_2"] \arrow[r, "H_3O^+", "\text{heat}"'] & CH_3COOH \arrow[r, "\text{1. }LiAlH_4", "\text{2. }H_3O^+"'] & CH_3CH_2OH
\end{tikzcd}$$

Alternatively, $CH_3OH \xrightarrow{PCC} HCHO \xrightarrow[\text{2. }H_3O^+]{\text{1. }CH_3MgI} CH_3CH_2OH$

(b) $CH_3CH_2OH \xrightarrow[H_2SO_4\text{, heat}]{K_2Cr_2O_7} CH_3COOH \xrightarrow{AgOH} CH_3COOAg \xrightarrow[CCl_4\text{, heat}]{Br_2} CH_3Br \xrightarrow{AgOH} CH_3OH$

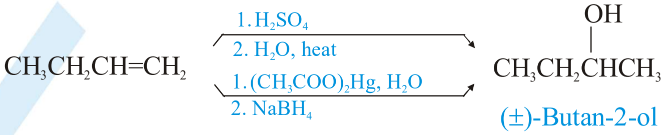
Alternatively, $CH_3CH_2OH \xrightarrow[170°C]{H_2SO_4} CH_2=CH_2 \xrightarrow[\text{2. }Zn/H_2O]{\text{1. }O_3} HCHO \xrightarrow[\text{2. }H_3O^+]{\text{1. }LiAlH_4} CH_3OH$

(c)



$$\begin{tikzcd}
 & CH_3CH_2OH \arrow[r, "H_2SO_4", "170°C"'] & CH_2=CH_2 \arrow[dl, "O_2\text{, Ag}"', "200°C"] \arrow[dr, "\text{1. }OsO_4", "\text{2. }Na_2SO_3\text{,}H_2O"'] \arrow[dr, bend left, "\text{dil. }KMnO_4", "\text{cold}"'] & \\
HOCH_2CH_2OH \arrow[r, "H_3O^+"] & \underset{\diagdown O \diagup}{CH_2 — CH_2} & & CH_2OHCH_2OH
\end{tikzcd}$$

(d) $CH_3CH_2CH_2CH_2OH \xrightarrow{PBr_3} CH_3CH_2CH_2CH_2Br \xrightarrow[\text{heat}]{\text{alc. KOH}} CH_3CH_2CH=CH_2$



$$\begin{tikzcd}
CH_3CH_2CH=CH_2 \arrow[r, shift left=2, "\text{1. }H_2SO_4\text{ 2. }H_2O\text{, heat}"] \arrow[r, shift right=2, "\text{1. }(CH_3COO)_2Hg\text{, }H_2O\text{ 2. }NaBH_4"'] & CH_3CH_2\overset{OH}{\overset{|}{C}}HCH_3
\end{tikzcd}$$

(±)-Butan-2-ol

(e)

$$CH_3CH_2OH \xrightarrow{PBr_3} CH_3CH_2Br \xrightarrow[Et_2O,\ heat]{Mg} CH_3CH_2MgBr$$

$$CH_3CH_2OH \xrightarrow{PPC} CH_3CHO \xrightarrow[2.\ H_3O^+]{1.\ CH_3CH_2MgBr} CH_3CHOHCH_2CH_3$$

(±)-Butan-2-ol

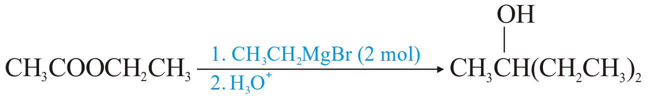
(f)

$$C_6H_5COCH_3 \xrightarrow[H_2O]{NaBH_4} C_6H_5CHOHCH_3 \xrightarrow[heat]{H_2SO_4} C_6H_5CH{=}CH_2 \xrightarrow[2.\ H_2O_2, NaOH]{1.\ BH_3} C_6H_5CH_2CH_2OH$$

(g)

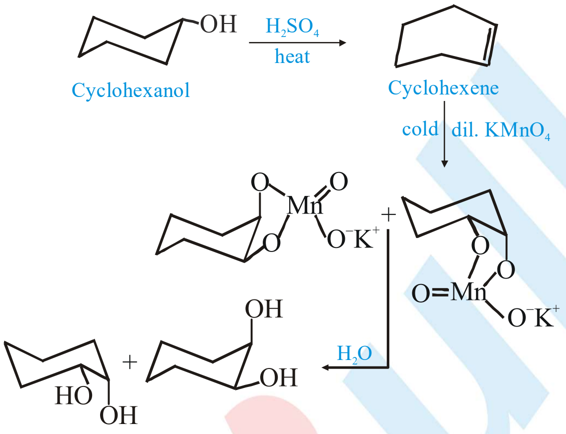
$$CH_3CH_2OH \xrightarrow[H_2SO_4,\ heat]{K_2Cr_2O_7} CH_3COOH \xrightarrow[H_2SO_4,\ heat]{CH_3CH_2OH} CH_3COOCH_2CH_3$$

$$CH_3CH_2OH \xrightarrow{PBr_3} CH_3CH_2Br \xrightarrow[Et_2O,\ heat]{Mg} CH_3CH_2MgBr$$



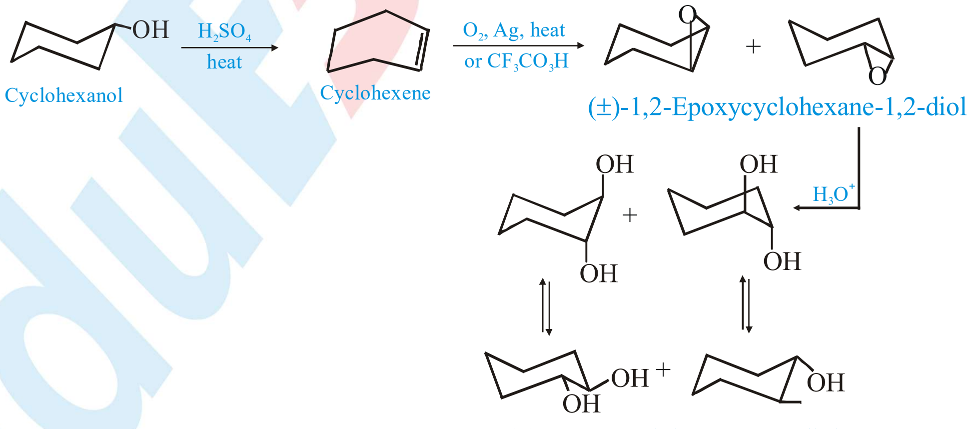
$$CH_3COOCH_2CH_3 \xrightarrow[2.\ H_3O^+]{1.\ CH_3CH_2MgBr\ (2\ mol)} CH_3\overset{OH}{\overset{|}{C}}H(CH_2CH_3)_2$$

(h)



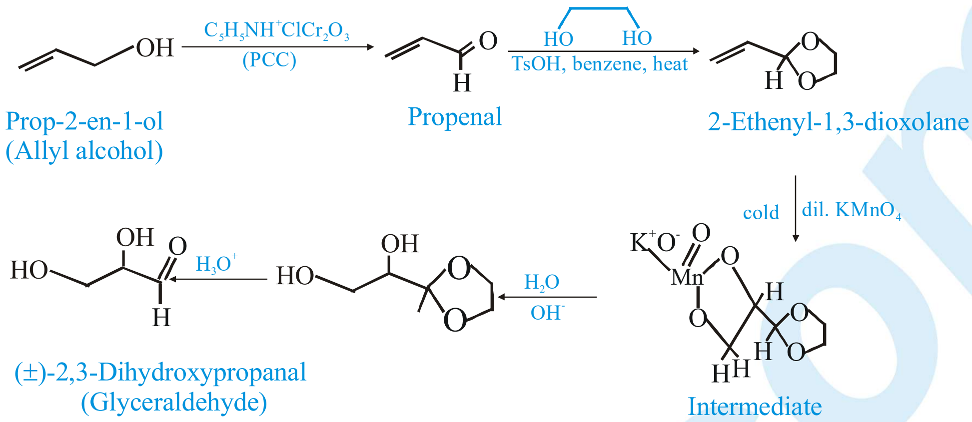
(±)-cis-Cyclohexane-1,2-diol

(i)



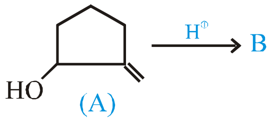
(±)-trans-Cyclohexane-1,2-diol

(j)

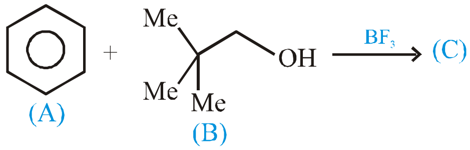


Ex.3 Complete the following reactions :

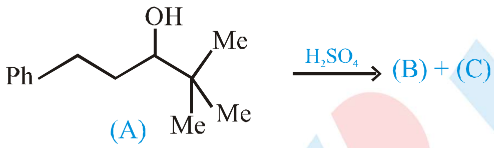
a.



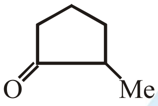
b.



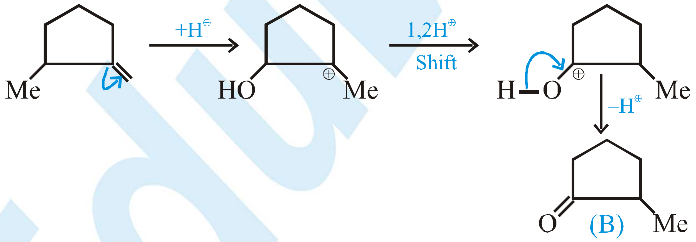
c.



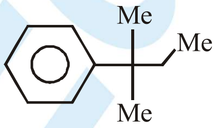
Sol. B ⇒



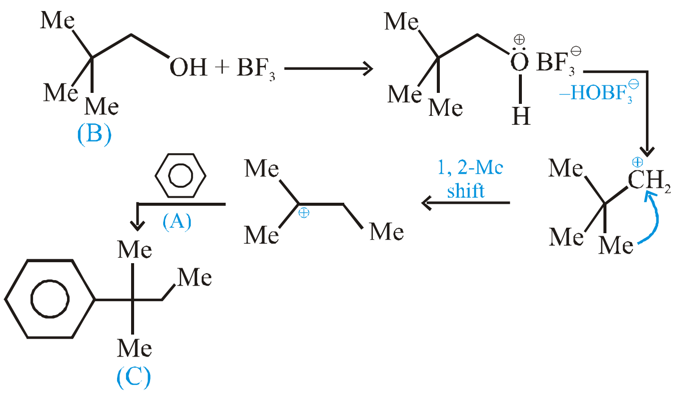
Mechanism :



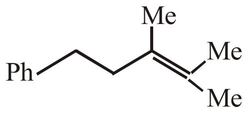
b. C ⇒



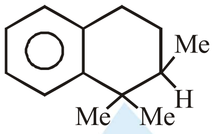
Mechanism :



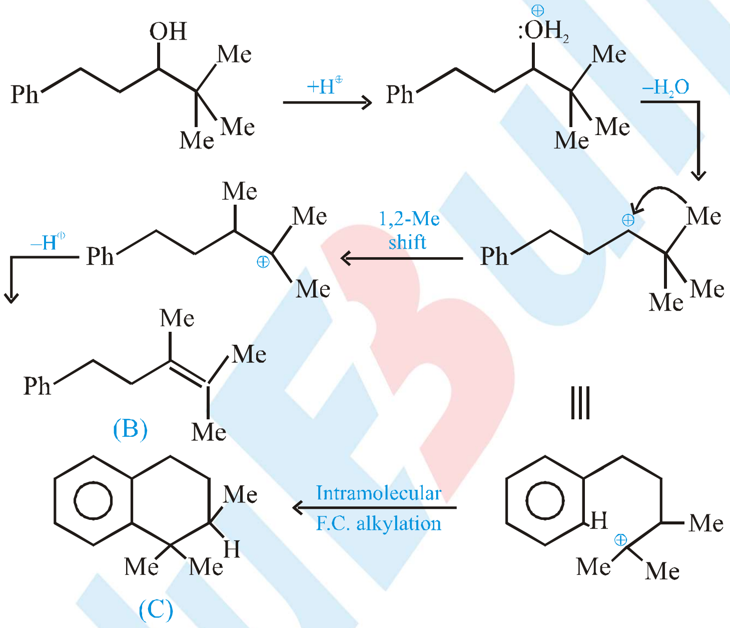
c. B ⇒



C ⇒

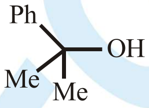


Mechanism :



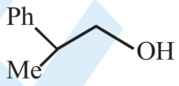
Ex. 4 Synthesise the following alcohols by using Grignard reagent (G.R.)

(I)

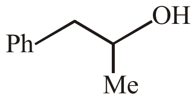


(II)

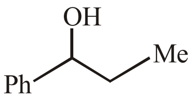
(III)



(IV)

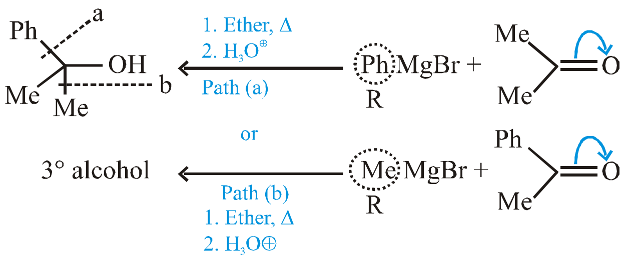


(V)

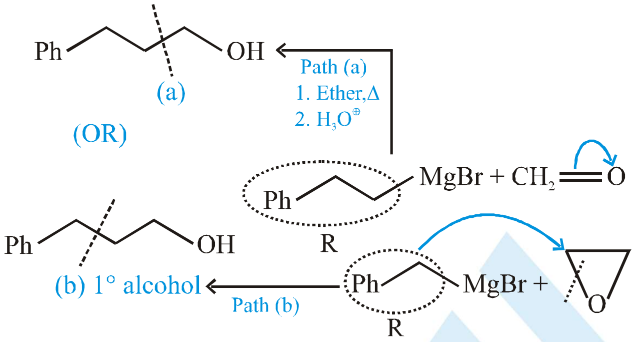


Sol. **a.** Synthesis by using G.R.

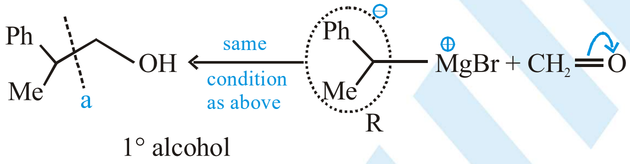
(I)



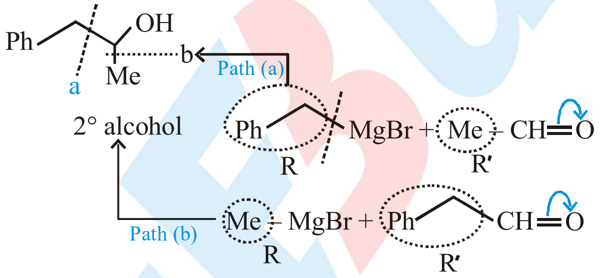
(II)



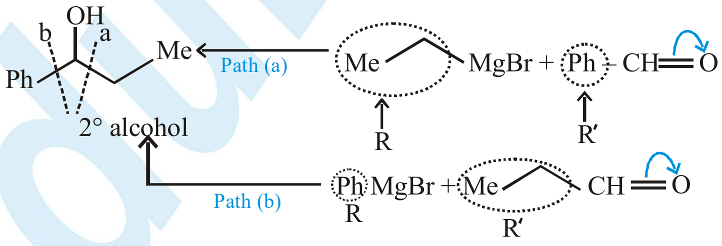
(III)



(IV)



(V)



Ex. 5 Complete the following reactions of dimethyl ether with the following reagents :

(a) Cl_2 / light (1eq.)

(b) Cl_2 (excess) / hν

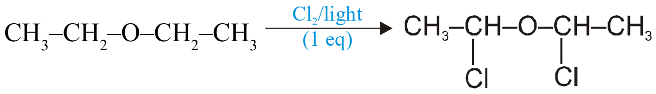
(c) Dil. H_2SO_4 then H_2O

(d) Conc. H_2SO_4 then heat

(e) (1) CH_3COCl
(2) $AlCl_3$

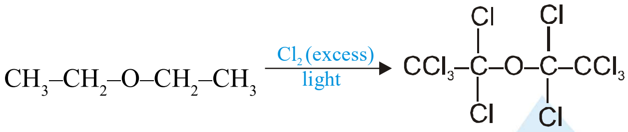
(f) (1) $(CH_3CO)_2O$
(2) $AlCl_3$

Sol. **(a)**



$$CH_3-CH_2-O-CH_2-CH_3 \xrightarrow[\text{(1 eq)}]{Cl_2/\text{light}} CH_3-\underset{\underset{Cl}{|}}{CH}-O-\underset{\underset{Cl}{|}}{CH}-CH_3$$

(b)



$$CH_3-CH_2-O-CH_2-CH_3 \xrightarrow[\text{light}]{Cl_2\,\text{(excess)}} CCl_3-\overset{\overset{Cl}{|}}{\underset{\underset{Cl}{|}}{C}}-O-\overset{\overset{Cl}{|}}{\underset{\underset{Cl}{|}}{C}}-CCl_3$$

(c) $CH_3-CH_2-O-CH_2-CH_3 \xrightarrow{\text{dil. } H_2SO_4} CH_3-CH_2-OH + CH_3-CH_2-HSO_4 \xrightarrow{H_2O} CH_3-CH_2-OH$

(d) $CH_3-CH_2-O-CH_2-CH_3 \xrightarrow{\text{conc. } H_2SO_4} CH_3-CH_2-OH + CH_3-CH_2-HSO_4 \xrightarrow{\Delta} CH_2 = CH_2$

(e) $CH_3-CH_2-O-CH_2-CH_3 \xrightarrow[(2)\,AlCl_3]{(1)\,CH_3COCl} CH_3-CH_2-Cl + CH_3-COOCH_2-CH_3$

(f) $CH_3-CH_2-O-CH_2-CH_3 \xrightarrow[(2)\,AlCl_3]{(1)\,CH_3(CO)_2O} 2CH_3-COOCH_2-CH_3$

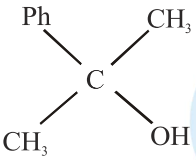
Exercise # 1 [Single Correct Choice Type Questions]

1. In the following reaction sequence

$$Ph-C\equiv CH \xrightarrow[Hg^{2+}]{aq.H_2SO_4} A \xrightarrow[2.H_2O]{1.CH_3MgI} B$$

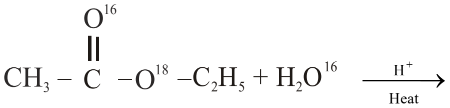
the product **(B)** is :

(A) $PhCOCH_3$ **(B)** $PhCH_2CHOHCH_3$ **(C)**



(D) $PhCH_2COCH_3$

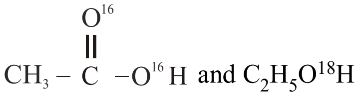
2. Consider the following reaction.



$$CH_3-\overset{\overset{O^{16}}{||}}{C}-O^{18}-C_2H_5 + H_2O^{16} \xrightarrow[Heat]{H^+}$$

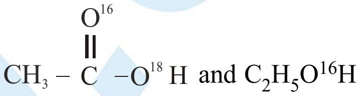
The products formed in the reaction are

(A)



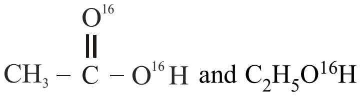
$CH_3-\overset{\overset{O^{16}}{||}}{C}-O^{16}H$ and $C_2H_5O^{18}H$

(B)



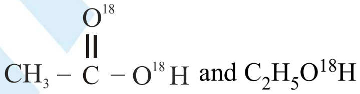
$CH_3-\overset{\overset{O^{16}}{||}}{C}-O^{18}H$ and $C_2H_5O^{16}H$

(C)



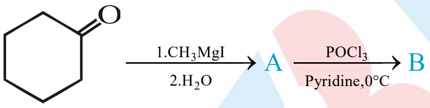
$CH_3-\overset{\overset{O^{16}}{||}}{C}-O^{16}H$ and $C_2H_5O^{16}H$

(D)



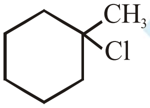
$CH_3-\overset{\overset{O^{18}}{||}}{C}-O^{18}H$ and $C_2H_5O^{18}H$

3. Consider the following reaction sequence,

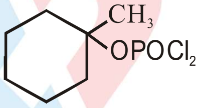


The product **(B)** is-

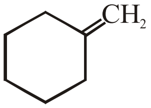
(A)



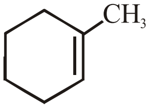
(B)



(C)



(D)



4. Consider the following reaction sequence

$$CH_2=CH_2 \xrightarrow[cold]{dil.KMnO_4} A \xrightarrow[excess]{PCl_5} B$$

The products **(A)** and **(B)** are, respectively :

(A) CH_3CH_2OH and CH_3CH_2Cl
(B) CH_3CHO and CH_3CHCl_2
(C) $CH_2OH\ CH_2OH$ and CH_2ClCH_2Cl
(D) CH_2OHCH_2OH and CH_2OHCH_2Cl

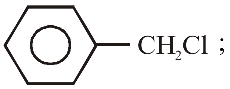
5. Consider the following reaction sequence,

$$CH_3C\equiv CH \xrightarrow[2\ mole]{HCl} A \xrightarrow[Heat]{aq.KOH} B$$

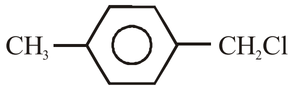
The products **(A)** and **(B)** are, respectively,

(A) $CH_3CH_2CHCl_2$ and CH_3CH_2CHO
(B) $CH_3CCl_2CH_3$ and CH_3COCH_3
(C) $CH_3CCl_2CH_3$ and $CH_3C\equiv CH$
(D) $CH_3CHClCH_2Cl$ and $CH_3CHOHCH_2OH$

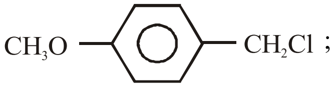
6. Consider the following chlorides :



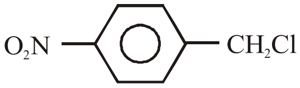
(A)



(B)



(C)



(D)

The order of reactivity of A, B, C and D towards hydrolysis by S_N1 mechanism is :

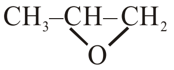
(A) $A < B < C < D$ **(B)** $D < C < B < A$ **(C)** $D < A < B < C$ **(D)** $C < B < A < D$

7. Propene is allowed to react with m-chloroperoxobenzoic acid. The product **(A)** is then reduced with $LiAlH_4$ in dry ether to give **(B)**.

$$CH_3CH = CH_2 \xrightarrow{MCPBA} A \xrightarrow[2.\ H_3O^+]{1.\ LiAlH_4} B$$

The structure of the product **(B)** is:

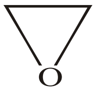
(A) $CH_3CHOHCH_2OH$ **(B)** $CH_3CH_2CH_2OH$ **(C)** $CH_3CHOHCH_3$ **(D)**



$CH_3-CH-CH_2$ (with O bridging CH and CH_2)

8. 2-Phenylethanol may be prepared by the reaction of phenylmagnesium bromide with :

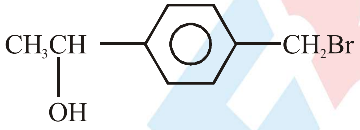
(A) HCHO **(B)** CH_3CHO **(C)** CH_3COCH_3 **(D)**



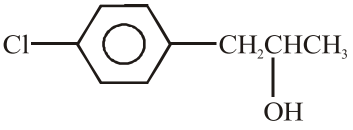
9. In the reaction

the product **(B)** is :

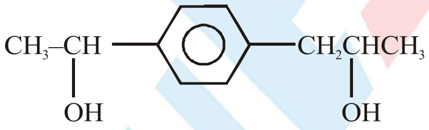
(A)



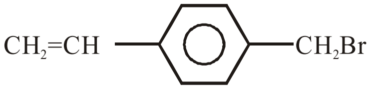
(B)



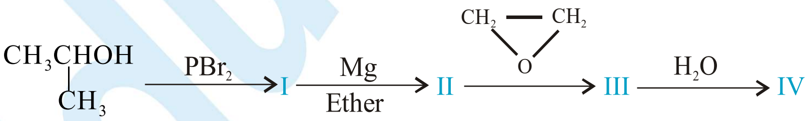
(C)



(D)



10. The final product (IV) in the sequence of reactions is :

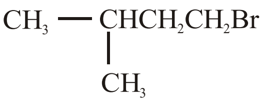


$$\underset{\substack{|\\ CH_3}}{CH_3CHOH} \xrightarrow{PBr_2} I \xrightarrow[Ether]{Mg} II \xrightarrow{CH_2-CH_2 \ (O)} III \xrightarrow{H_2O} IV$$

(A)

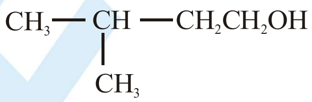
$CH_3-\underset{\substack{|\\ CH_3}}{CH}OCH_2CH_2OH$

(B)



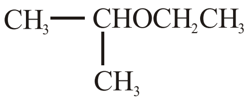
$CH_3-\underset{\substack{|\\ CH_3}}{CH}CH_2CH_2Br$

(C)



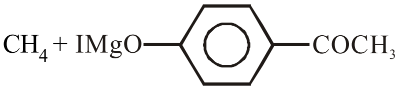
$CH_3-\underset{\substack{|\\ CH_3}}{CH}-CH_2CH_2OH$

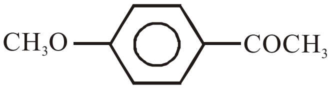
(D)

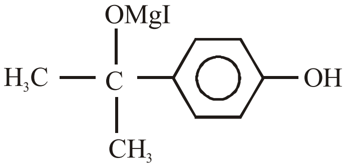


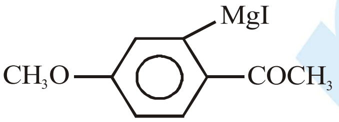
$CH_3-\underset{\substack{|\\ CH_3}}{CH}OCH_2CH_3$

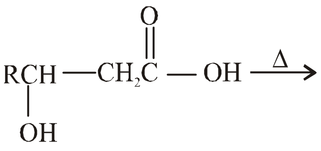
11. The reaction of 1 mol each of p-hydroxyacetophenone and methyl magnesium iodide will give :

(A) 

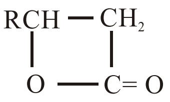
(B) 

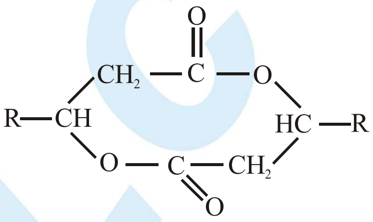
(C) 

(D) 

12. The product obtained in the reaction  ? is :

$RCH(OH)-CH_2\overset{O}{\overset{\|}{C}}-OH \xrightarrow{\Delta}$?

(A) 

(B) 

(C) RCH=CHCOOH

(D) None of these

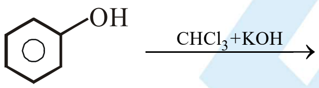
13. The final product in the reaction is :

Ph—OH + CCl_4 $\xrightarrow{KOH}$ product

(A) Salicyl aldehyde **(B)** Salicylic acid **(C)** Methyl salicylate **(D)** Benzyl chloride

14. In the reaction of phenol with $CHCl_3$ and aqueous NaOH at 70°C, the electrophile attacking the ring is :

(A) $CHCl_3$ **(B)** $\dot{C}HCl_2$ **(C)** $\overset{\&}{C}Cl_2$ **(D)** $COCl_2$

15.  Product :

about above reaction the incorrect statement is

(A) The name of reaction is Reimer tiemann's reaction

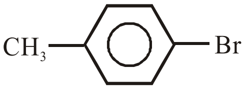
(B) The intermediate in the reaction is dichloro carbene

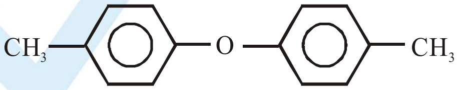
(C) The final product is o-hydroxy benzaldehyde

(D) the final product is benzyl chloride

16. The final product obtained in the reaction is :

(A) 

(B) 

(C) 

(D) None of these

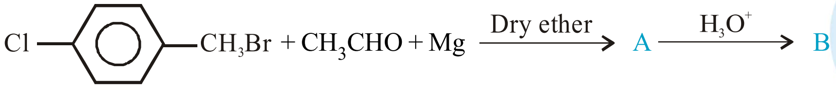
17. The acidity of the compounds RCOOH, H_2CO_3, C_6H_5OH, ROH decreases in the order :

(A) RCOOH > H_2CO_3 > C_6H_5OH > ROH
(B) C_6H_5OH > RCOOH > H_2CO_3 > ROH
(C) ROH > C_6H_5OH > RCOOH > H_2CO_3
(D) H_2CO_3 > RCOOH > C_6H_5OH > ROH

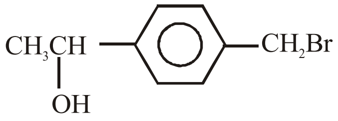
18. Arrange the following in order of decreasing acidic strength. p- nitrophenol (I), p-cresol (II), m-cresol (III), phenol (IV) :

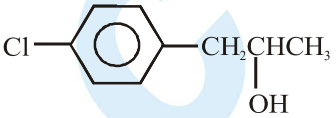
(A) I > II > III > IV
(B) IV > III > II > I
(C) I > III > II > IV
(D) III > II > I > IV

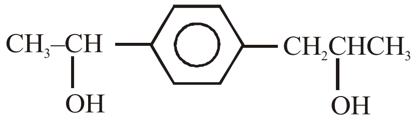
19. In the reaction

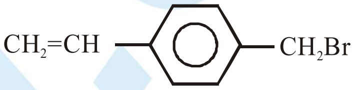


the product **(B)** is :

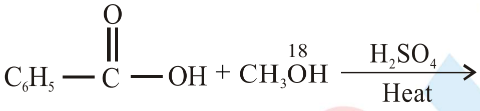
(A) 

(B) 

(C) 

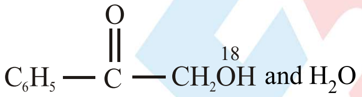
(D) 

20. The products formed in the reaction are :


$$C_6H_5-\overset{\overset{\displaystyle O}{\|}}{C}-OH + CH_3\overset{18}{O}H \xrightarrow[\text{Heat}]{H_2SO_4}$$

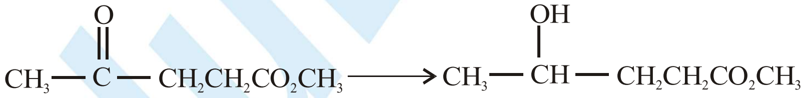
(A) 
$C_6H_5-\overset{\overset{O}{\|}}{C}-\overset{18}{O}CH_3$ and H_2O

(B) 
$C_6H_5-\overset{\overset{O}{\|}}{C}-OCH_3$ and $H_2\overset{18}{O}$

(C) 
$C_6H_5-\overset{\overset{O}{\|}}{C}-CH_2\overset{18}{O}H$ and H_2O

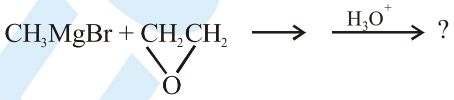
(D) $C_6H_5\overset{18}{O}CH_3$, CO and H_2O

21. The conversion


$$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_2CH_2CO_2CH_3 \longrightarrow CH_3-\overset{\overset{\displaystyle OH}{|}}{CH}-CH_2CH_2CO_2CH_3$$

(A) $LiAlH_4$ and then H^+
(B) $NaBH_4$ and then H^+
(C) H_2/ Carbon
(D) None of these

22. Identify the final product of the reaction :

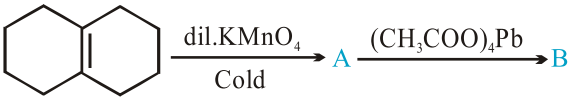


(A) CH_3OH
(B) CH_3CH_2OH
(C) 
(D) $CH_3CH_2CH_2OH$

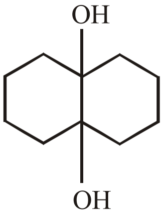
23. For the cleavage of ethers by halogen acids, the order of reactivity of halogen acids is :

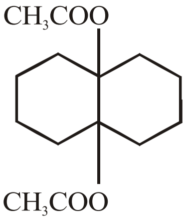
(A) HI > HBr > HCl **(B)** HBr > HI > HCl
(C) HCl > HBr > HI **(D)** Ethers do not undergo cleavage

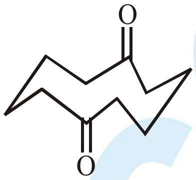
24. Consider the following reactions :

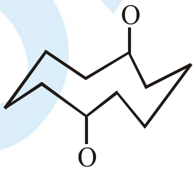


The product **(B)** is

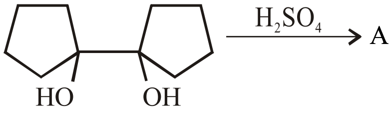
(A)


(B)


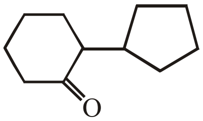
(C)


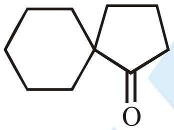
(D)


25. The major product **(A)** formed in the reaction

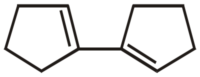


is :

(A)


(B)


(C)


(D)


26. Decreasing order of relative nucleophilicity of the following nucleophiles in protic solvent is -

$\overset{\ominus}{S}H$, $Ac\overset{\ominus}{O}$, $Ph\overset{\ominus}{O}$, $\overset{\ominus}{O}H$, H_2O

(A) $\overset{\ominus}{S}H > \overset{\ominus}{O}H > H_2O > Ac\overset{\ominus}{O} > Ph\overset{\ominus}{O}$
(B) $\overset{\ominus}{S}H > \overset{\ominus}{O}H > Ph\overset{\ominus}{O} > Ac\overset{\ominus}{O} > H_2O$
(C) $\overset{\ominus}{S}H > Ph\overset{\ominus}{O} > \overset{\ominus}{O}H > H_2O > Ac\overset{\ominus}{O}$
(D) $\overset{\ominus}{O}H > \overset{\ominus}{S}H > Ph\overset{\ominus}{O} > Ac\overset{\ominus}{O} > H_2O$

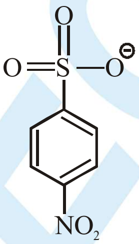
27. Electrophiles are

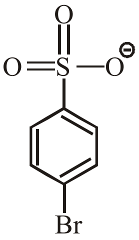
(A) Electron deficient species **(B)** having atleast one pair of electron
(C) Electron rich species **(D)** having vacant p or d-orbital

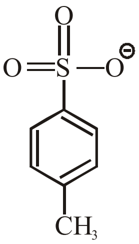
28. Which of the following is an electrophilic reagent ?

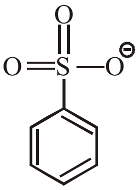
(A) H_2O **(B)** OH^- **(C)** NO_2^+ **(D)** None

29. The best leaving group is :

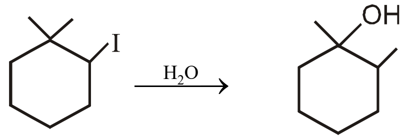
(A)


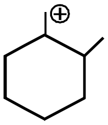
(B)


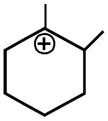
(C)


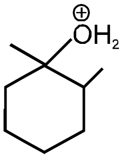
(D)


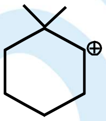
30. Which of the following is not expected to be intermediate of the following reaction ?



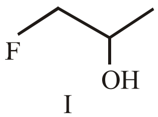
(A)


(B)


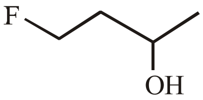
(C)


(D)


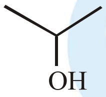
31. The correct order of reactivity of following alcohols towards conc.HCl/ZnCl$_2$ is :



I



II

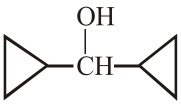


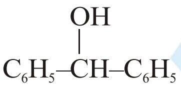
III

IV

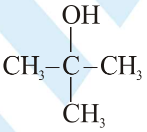
(A) I > II > III > IV **(B)** I > III > II > IV **(C)** IV > III > II > I **(D)** IV > III > I > II

32. Which one of the following will be most reactive for S$_N$1 reaction ?

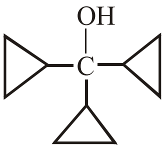
(A)


(B)


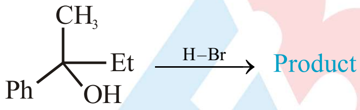
$C_6H_5-\underset{}{\overset{OH}{\overset{|}{C}H}}-C_6H_5$

(C)


$CH_3-\overset{OH}{\overset{|}{\underset{CH_3}{\underset{|}{C}}}}-CH_3$

(D)


33. Which describes the best stereochemical aspects of the following reaction ?

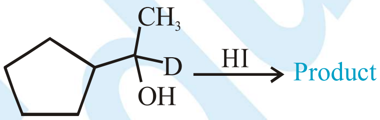


(A) Inversion of configuration occurs at the carbon undergoing substitution.

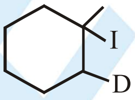
(B) Retention of configuration occurs at the carbon undergoing substitution.

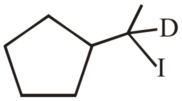
(C) Racemization occurs at the carbon undergoing substitution.

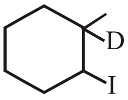
(D) The carbon undergoing substitution is not stereogenic.

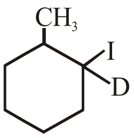
34.


Identify the major product :

(A)


(B)


(C)


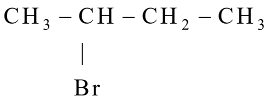
(D)


35. $\underset{1-\text{butanol}}{CH_3(CH_2)_2-CH_2OH} \xrightarrow{NaBr,\ H_2SO_4} X,$

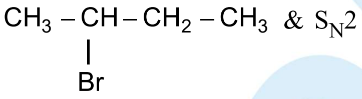
Identify X and the mechanism of the reaction

(A) $CH_3-CH_2-CH_2-CH_2-Br$ & S_N1

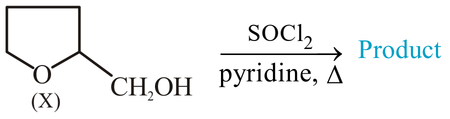
(B) $CH_3-CH_2-CH_2-CH_2-Br$ & S_N2

(C) 

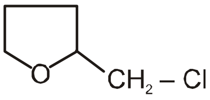
$CH_3-\underset{\underset{Br}{|}}{CH}-CH_2-CH_3$ & S_N1

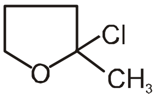
(D) 

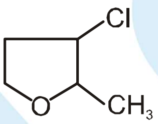
$CH_3-\underset{\underset{Br}{|}}{CH}-CH_2-CH_3$ & S_N2

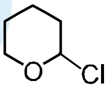
36. 

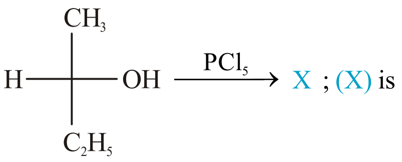
Product of the above reaction is :

(A) 

(B) 

(C) 

(D) 

37. 

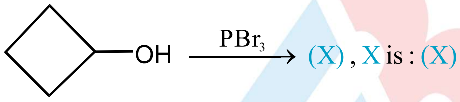
(D-2-Butanol)

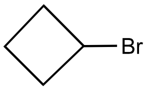
(A) S-2-Chlorobutane

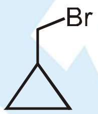
(B) R - 2-Chlorobutane

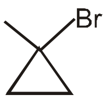
(C) Mixture of R and S 2-Chlorobutane

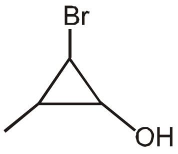
(D) 1-Chlorobutane

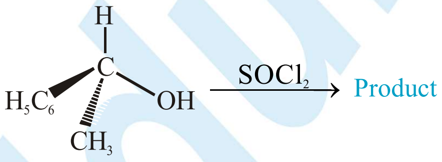
38. 

(A) 

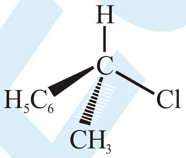
(B) 

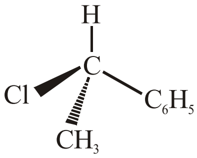
(C) 

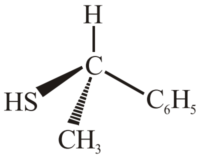
(D) 

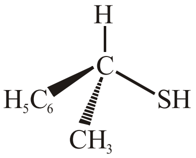
39. 

Identify the product

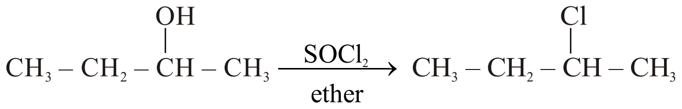
(A) 

(B) 

(C) 

(D) 

40. Consider the following reaction.



$$CH_3-CH_2-\overset{OH}{\overset{|}{CH}}-CH_3 \xrightarrow[\text{ether}]{SOCl_2} CH_3-CH_2-\overset{Cl}{\overset{|}{CH}}-CH_3$$

In the above reaction which phenomenon will take place :

(A) Inversion **(B)** Retention **(C)** Racemisation **(D)** Isomerisation

41. In the given reaction :

$$CH_3-CH_2-CH_2-O-CH_2-CH_3 \xrightarrow{HCl/\Delta} [X]+[Y]$$

[X] and [Y] will respectively be :

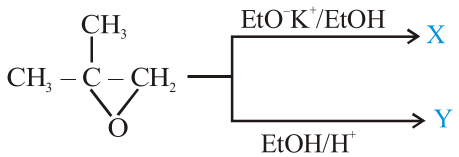
(A) $CH_3–CH_2–CH_2OH$ & $CH_3–CH_2–Cl$

(B) $CH_3–CH_2–CH_2–Cl$ & $CH_3–CH_2–OH$

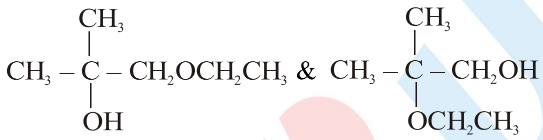
(C) $CH_3–CH_2–CH_2–Cl$ & $CH_2=CH_2$

(D) $CH_3–CH=CH_2$ & $CH_2=CH_2$

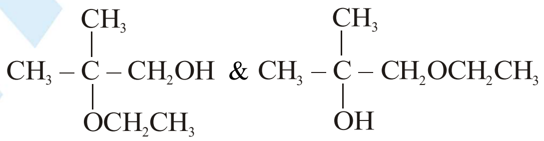
42.



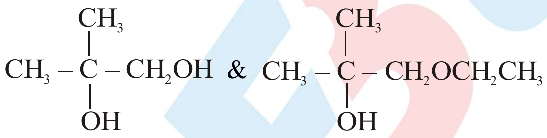
The product X and Y are respectively :

(A) 

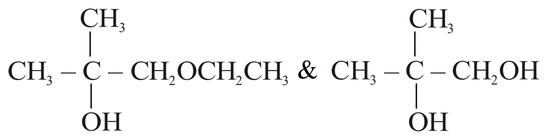
$CH_3-\overset{CH_3}{\underset{OH}{C}}-CH_2OCH_2CH_3$ & $CH_3-\overset{CH_3}{\underset{OCH_2CH_3}{C}}-CH_2OH$

(B) 

$CH_3-\overset{CH_3}{\underset{OCH_2CH_3}{C}}-CH_2OH$ & $CH_3-\overset{CH_3}{\underset{OH}{C}}-CH_2OCH_2CH_3$

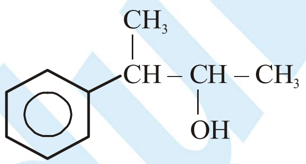
(C) 

$CH_3-\overset{CH_3}{\underset{OH}{C}}-CH_2OH$ & $CH_3-\overset{CH_3}{\underset{OH}{C}}-CH_2OCH_2CH_3$

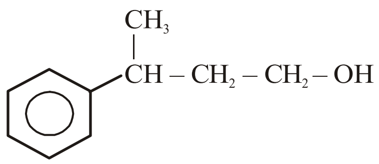
(D) 

$CH_3-\overset{CH_3}{\underset{OH}{C}}-CH_2OCH_2CH_3$ & $CH_3-\overset{CH_3}{\underset{OH}{C}}-CH_2OH$

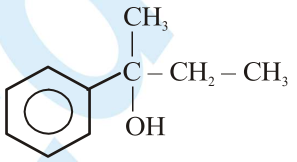
43. The relative rate of acid catalysed dehydration of following alcohols would be,



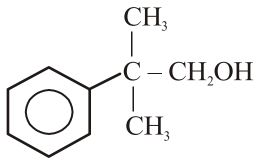
I



II

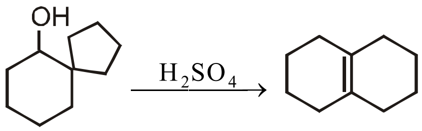


III

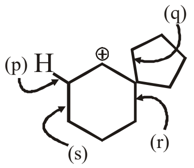


IV

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

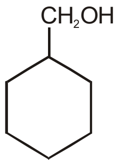
44. 

In the above reaction the major product is shown, which is formed through the intermediate (carbocation) given below :

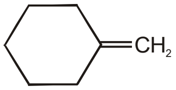


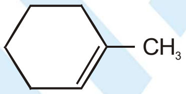
Which bond will migrate to form the above product ?

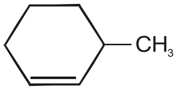
(A) p **(B)** q **(C)** r **(D)** s

45. In the given reaction :  $\xrightarrow{Conc.H_2SO_4}$ [X] as major product

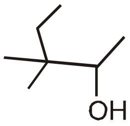
[X] will be :

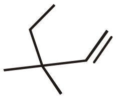
(A) 

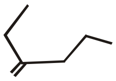
(B) 

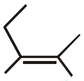
(C) 

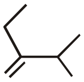
(D) 

46.  $\xrightarrow{Conc.\ H_2SO_4}$ Major product is :

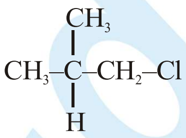
(A) 

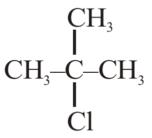
(B) 

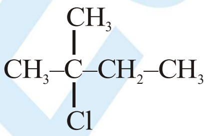
(C) 

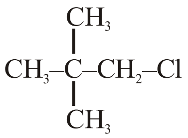
(D) 

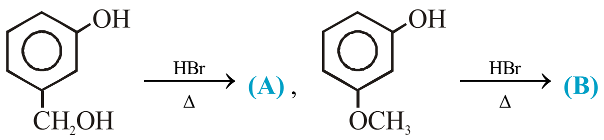
47. In which of the following reaction, regioselectivity can be observed.

(A) 
$CH_3-\underset{H}{\overset{CH_3}{C}}-CH_2-Cl \xrightarrow{alc.\ KOH/\Delta}$

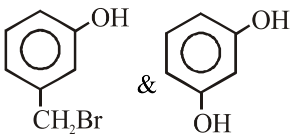
(B) 
$CH_3-\underset{Cl}{\overset{CH_3}{C}}-CH_3 \xrightarrow{alc.\ KOH/\Delta}$

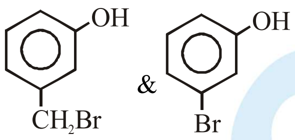
(C) 
$CH_3-\underset{Cl}{\overset{CH_3}{C}}-CH_2-CH_3 \xrightarrow{alc.\ KOH/\Delta}$

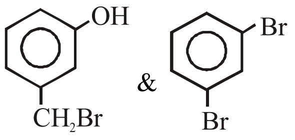
(D) 
$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-CH_2-Cl \xrightarrow{alc.\ KOH/\Delta}$

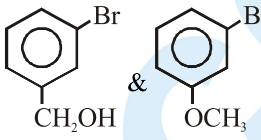
48. 

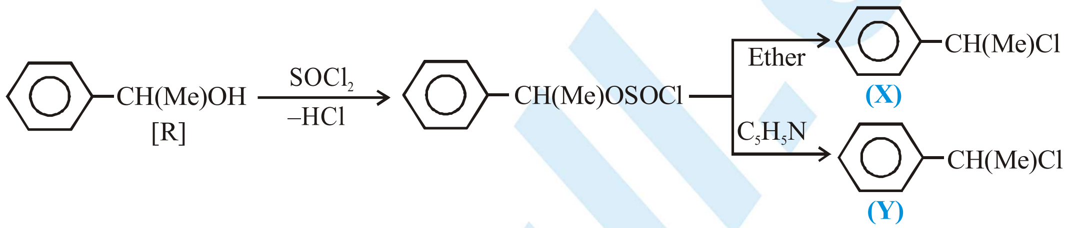
The product **(A)** and **(B)** are respectively :

(A) 

(B) 

(C) 

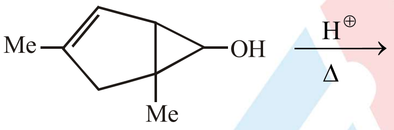
(D) 

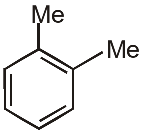
49. 

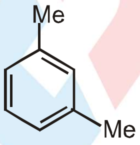
Which configuration will be adopted by X and Y respectively :

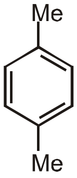
(A) R, R **(B)** R, S **(C)** S, S **(D)** S, R

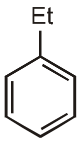
50. Write the product of the following reaction



(A) 

(B) 

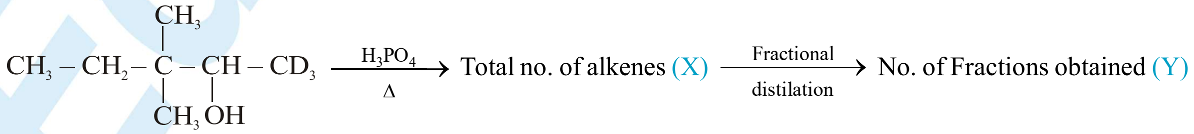
(C) 

(D) 

51. When (1R, 2R)-1, 2-Dibromo-1, 2-diphenyl ethane is treated with alcoholic solution of KOH, the most probable product would be :

(A) trans-1, 2-diphenyl ethene **(B)** A mixture of cis, trans alkenyl bromide

(C) cis-alkenyl bromide **(D)** trans-alkenyl bromide

52. 

$$CH_3-CH_2-\underset{CH_2OH}{\overset{CH_3}{C}}-\underset{CH_3}{CH}-CD_3 \xrightarrow[\Delta]{H_3PO_4} \text{Total no. of alkenes (X)} \xrightarrow[\text{distilation}]{\text{Fractional}} \text{No. of Fractions obtained (Y)}$$

X and Y are :

(A) 6 ,6 **(B)** 9, 5 **(C)** 9, 6 **(D)** 6, 4

53. Number of fractions on fractional distillation of solvolysis in ethanol of 1-chlorobut-2-ene is :
(A) 1 **(B)** 2 **(C)** 3 **(D)** 4

54. $CH_3CH_2OH + HCl \xrightarrow{ZnCl_2} CH_3CH_2Cl + H_2O$

In the above reaction, the leaving group is :

(A) $HO^{\ominus}$ **(B)** H_2O **(C)** $HO\overset{\ominus}{Zn}Cl_2$ **(D)** $H_3O^{\oplus}$

55. Which of the following statement is not true ?

(A) Nucleophiles possess unshared pairs of electron which are utilized in forming bonds with electrophilic substrate.

(B) The cyanide ion is an ambident nucleophile and causes nucleophilic substitution of alkyl halide by either of its carbon atom or nitrogen atom.

(C) The nitrite ion is an ambident nucleophile and causes nucleophilic substitution of alkyl halide by either of its oxygen atoms or nitrogen atom.

(D) Strength of Nucleophile generally decreases on going down a group in the periodic table.

56. $Cl–CH_2CH_2CH_2CH_2OH \xrightarrow{NaOH(aq.)}$ A, the product A is :

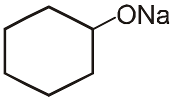
(A) $HO–CH_2CH_2CH_2CH_2OH$

(B) 

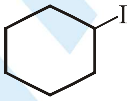
(C) 
$Cl–CH_2–\underset{OH}{\underset{|}{CH}}–CH_2–CH_2OH$

(D) $ClCH_2CH_2CH_2CH_2ONa$

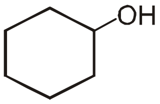
57. Which of the following reactions is the best choice for preparing methyl cyclohexyl ether ?

(A) 

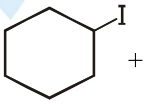
$+ CH_3I \longrightarrow$

(B) 

$+ CH_3ONa \longrightarrow$

(C) 

$+ CH_3I \longrightarrow$

(D) 

$+ CH_3OH \longrightarrow$

58. Which of the following statements are correct for the given alcohol ?

$$R – OH \xrightarrow{X^{\ominus}} R – X + \overset{\ominus}{OH}$$

(A) Reaction will not take place because $\overset{\ominus}{OH}$ is poor leaving group ; $\overset{\ominus}{X}$ is weak base and $\overset{\ominus}{OH}$ is strong base

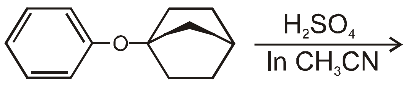
(B) Reaction will not take place because $\overset{\ominus}{OH}$ is poor leaving group ; $\overset{\ominus}{X}$ is strong base and $\overset{\ominus}{OH}$ is weak base.

(C) Reaction will not take place because $\overset{\ominus}{OH}$ is strong leaving group ; $\overset{\ominus}{X}$ is strong base and $\overset{\ominus}{OH}$ is weak base.

(D) Reaction will not take place because $\overset{\ominus}{OH}$ is good leaving group ; $\overset{\ominus}{X}$ is weak base and $\overset{\ominus}{OH}$ is strong base.

59. Consider the following reactions carried out at the same temperature.

(I) 

(II) 

Which of the following statement is correct about these reaction.

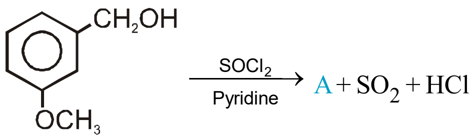
(A) Both the reactions take place at the same rate

(B) The first reactions take place faster than second reaction.

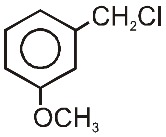
(C) The second reactions take place faster than first reaction.

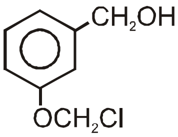
(D) Both the reactions take place by S_N1 mechanism

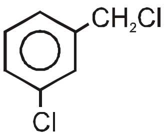
60.

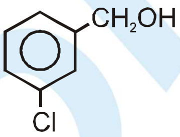


The product A in the above reaction is

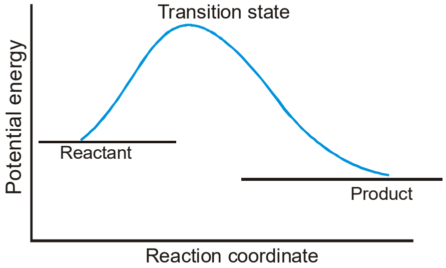
(A)


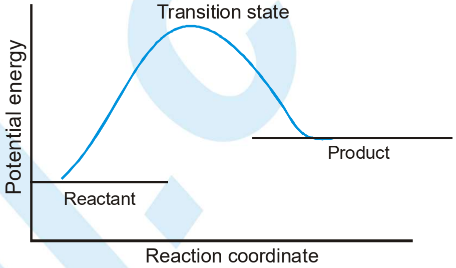
(B)


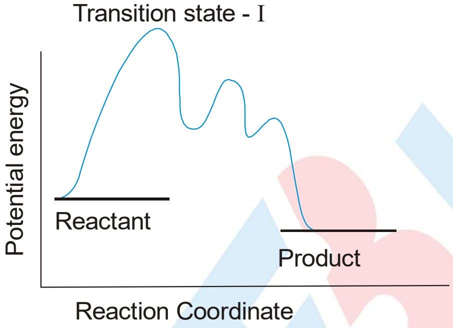
(C)


(D)


61. Following are the curves for nucleophilic substitution reaction.

(I)


(II)


(III)


The correct statement (s) is (are)

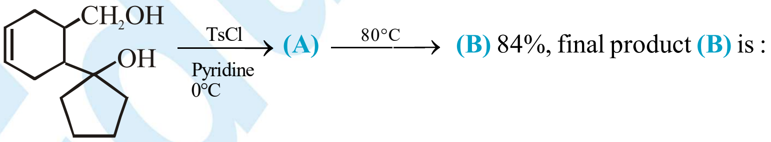
(A) 'I' is potential energy diagram for S_N2 reaction that takes place with a negative potential energy change.

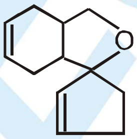
(B) 'II' is potential energy diagram for S_N2 reaction with a positive potential energy change

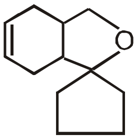
(C) 'III' shows potential energy diagram for S_N1 reaction with large potential energy of activation for first (slowest) step

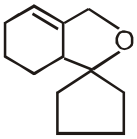
(D) All of the above

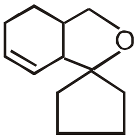
62.



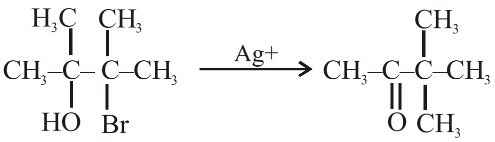
(A)


(B)


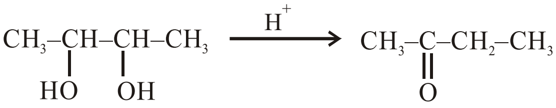
(C)


(D)


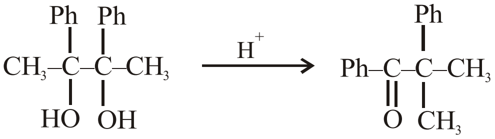
63. Which of the following does not representing the correct product

(A) 

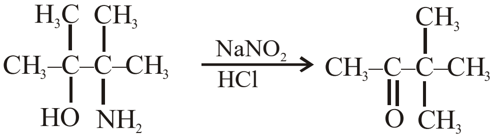
$CH_3-\underset{HO}{\overset{H_3C}{C}}-\underset{Br}{\overset{CH_3}{C}}-CH_3 \xrightarrow{Ag+} CH_3-\underset{\underset{O}{\|}}{C}-\underset{CH_3}{\overset{CH_3}{C}}-CH_3$

(B) 

$CH_3-\underset{HO}{CH}-\underset{OH}{CH}-CH_3 \xrightarrow{H^+} CH_3-\underset{\underset{O}{\|}}{C}-CH_2-CH_3$

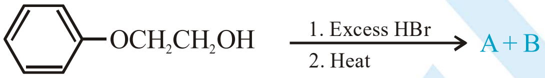
(C) 

$CH_3-\underset{HO}{\overset{Ph}{C}}-\underset{OH}{\overset{Ph}{C}}-CH_3 \xrightarrow{H^+} Ph-\underset{\underset{O}{\|}}{C}-\underset{CH_3}{\overset{Ph}{C}}-CH_3$

(D) 

$CH_3-\underset{HO}{\overset{H_3C}{C}}-\underset{NH_2}{\overset{CH_3}{C}}-CH_3 \xrightarrow[HCl]{NaNO_2} CH_3-\underset{\underset{O}{\|}}{C}-\underset{CH_3}{\overset{CH_3}{C}}-CH_3$

64. What are the products of the following reaction ?



(A) p $Br-C_6H_4-OCH_2CH_2-Br$ **(B)** $Ph-Br+Br-CH_2CH_2-OH$

(C) $Ph-Br+Br-CH_2CH_2-Br$ **(D)** $Ph-OH+CH_3-CHBr_2$

Exercise # 2 Part # I [Multiple Correct Choice Type Questions]

1. Which of these statements are correct about nucleophiles :

(A) Nucleophiles have an unshared electron pair and can make use of this to react with an electron deficient species.

(B) The nucleophilicity of an element (as electron donor) generally increases on going down a group in the periodic table.

(C) A nucleophile is electron-deficient species

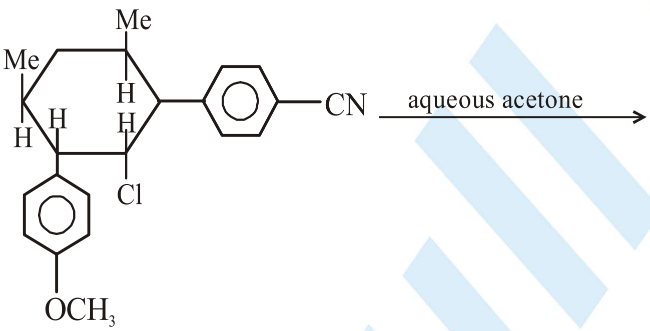
(D) All good nucleophiles are good bases when we deal across the period.

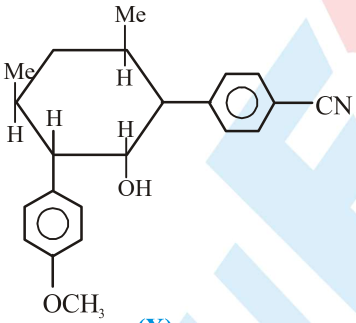
2. The correct nucleophilicity order is/are :

(A) $(CH_3)_3O^{\ominus} > CH_3^{\ominus}$ **(B)** $CH_3S^{\ominus} > CH_3SH$

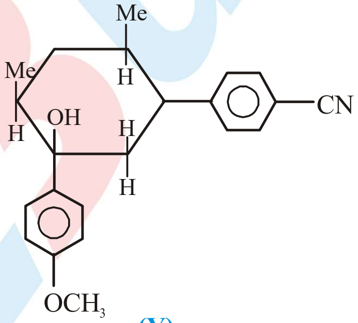
(C) $CH_3CH_2CH_2O^{\ominus} > (CH_3)_3CO^{\ominus}$ **(D)** $(CH_3CH_2)_3N > (CH_3CH_2)_3P$

3. Which of the following are correct regarding the products of the given reaction

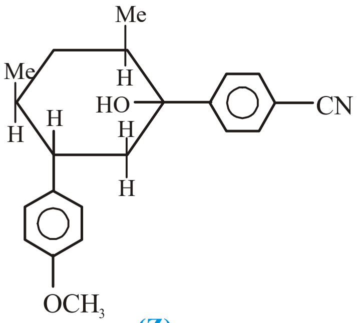




(X)



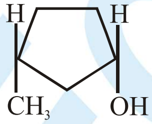
(Y)



(Z)

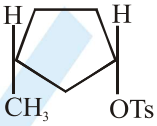
(A) only X and Z are formed **(B)** Y > Z (amount) **(C)** X > Y (amount) **(D)** Y > X (amount)

4.

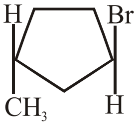


$\xrightarrow[\text{Pyridine}]{\text{TsCl}}$ X $\xrightarrow{\text{NaBr}}$ Y. X and Y are :

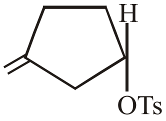
(A) X =



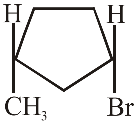
(B) Y =

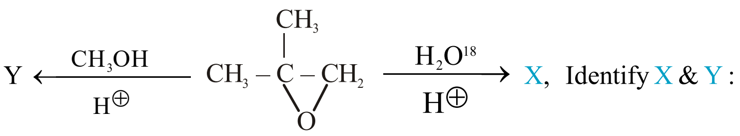


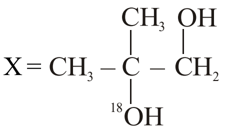
(C) X =

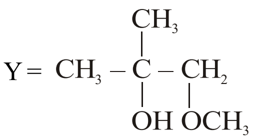


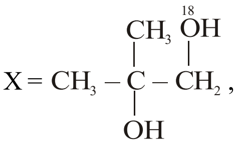
(D) Y =

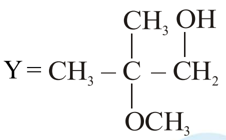


5. 
$$Y \xleftarrow[H^{\oplus}]{CH_3OH} \underset{\diagdown O \diagup}{CH_3-\overset{CH_3}{\overset{|}{C}}-CH_2} \xrightarrow[H^{\oplus}]{H_2O^{18}} X$$
Identify X & Y :

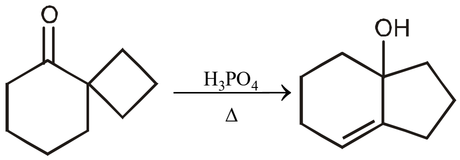
(A) 
$X = CH_3-\underset{^{18}OH}{\overset{CH_3}{C}}-\overset{OH}{CH_2}$

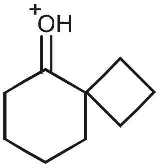
(B) 
$Y = CH_3-\underset{OH}{\overset{CH_3}{C}}-\underset{OCH_3}{CH_2}$

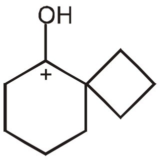
(C) 
$X = CH_3-\underset{OH}{\overset{CH_3}{C}}-\overset{^{18}OH}{CH_2}$,

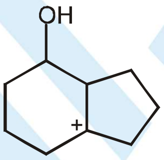
(D) 
$Y = CH_3-\underset{OCH_3}{\overset{CH_3}{C}}-\overset{OH}{CH_2}$

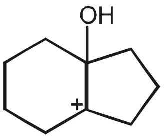
6. What are the possible intermediates of the following reaction which form during this reaction path way ?



(A) 

(B) 

(C) 

(D) 

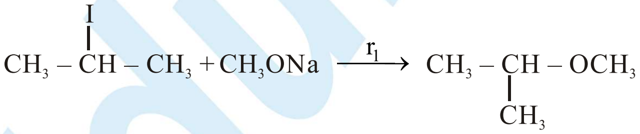
7. Which of the following order is/are correct for the rate of E2 reaction.

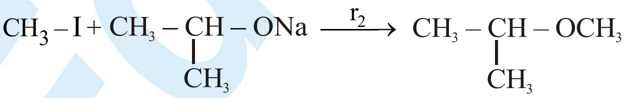
(A) 5-Bromocycloheptene > 4-Bromocycloheptene
(B) 2-Bromo-1-phenylbutane > 3-Bromo-1-phenylbutane
(C) 3-Bromocyclohexene > Bromocyclohexane
(D) 3-Bromo-2-methylpentane > 2-Bromo-4-methylpentane

8. Which of the following statement (s) is/are correct

(A) E2 is a concerted reaction in which bonds break and new bonds form at the same time in a single step.
(B) Order of reactivity of alkyl halides towards E2 dehydrohalogenation is found to be 3° > 2° > 1°
(C) In E2 reaction both β hydrogen and leaving group should be antiperiplanar.
(D) In E2 elimination different stereoisomer (diastereomer) converts into different stereo product.

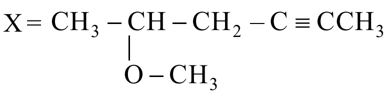
9. Observe the following reaction and tick correct option (s)

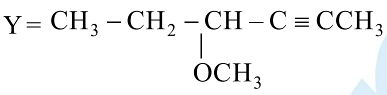

$CH_3-\overset{I}{CH}-CH_3+CH_3ONa \xrightarrow{r_1} CH_3-\underset{CH_3}{CH}-OCH_3$ .... **(I)**

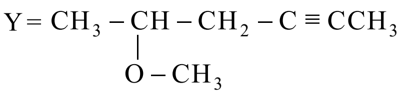

$CH_3-I+CH_3-\underset{CH_3}{CH}-ONa \xrightarrow{r_2} CH_3-\underset{CH_3}{CH}-OCH_3$ .... **(II)**

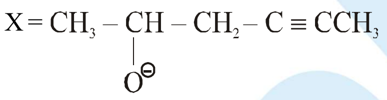
(A) $r_1 < r_2$
(B) Transition state in reaction (I) is less stable then transition state in reaction (II)
(C) Substrate of both the reactions are equally reactive to a particular nucleophile
(D) r_1 and r_2 both are directly proportional to the concentration of nucleophile CH_3ONa

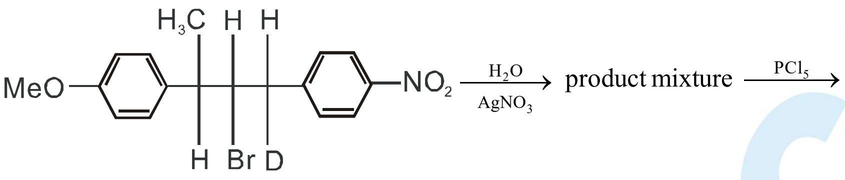
10. 
$CH_3-CH-CH_2$ O $\xrightarrow{CH_3C\equiv C^{\ominus}}$ (X) $\xrightarrow{CH_3I}$ (Y). Identify X & Y :

(A) 
$X = CH_3-\underset{\underset{O-CH_3}{|}}{CH}-CH_2-C\equiv CCH_3$

(B) 
$Y = CH_3-CH_2-\underset{\underset{OCH_3}{|}}{CH}-C\equiv CCH_3$

(C) 
$Y = CH_3-\underset{\underset{O-CH_3}{|}}{CH}-CH_2-C\equiv CCH_3$

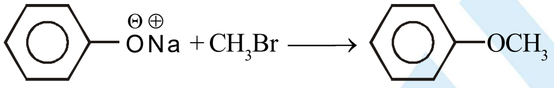
(D) 
$X = CH_3-\underset{\underset{O^{\ominus}}{|}}{CH}-CH_2-C\equiv CCH_3$

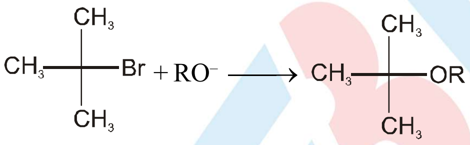
11. 

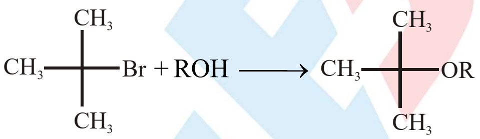
No of product **'m'** (Total isomers) $\xrightarrow[\text{distillation}]{\text{Fractional}}$ No. of Fractions **'n'** .

(A) Value of m & n are 4,2 respectively.
(B) Product mixture, and all fractions are optically active.
(C) Value of m & n are 4,4 respectively.
(D) Reaction of product mixture with PCl_5 is S_N2 mechanism.

12. Which of the following reaction are not feasible ?

(A) 

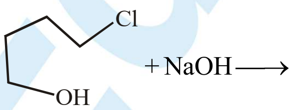
(B) 

(C) 

(D) 

13. Which of the following reaction takes place by S_N2 mechanism :

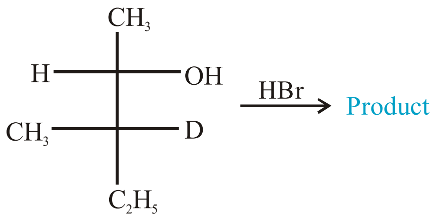
(A) $CH_3-CH_2-ONa + CH_3-CH_2-Cl \longrightarrow$

(B) 

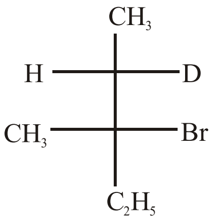
(C) $(CH_3)_3-C-CH_2-CH_2-Br + \text{excess } NH_3 \longrightarrow$

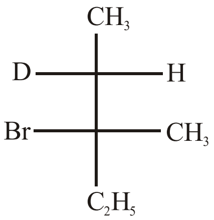
(D) $CH_3-CH_2-OH + HBr \longrightarrow$

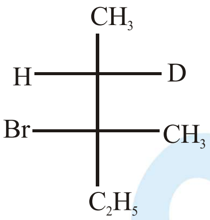
14.

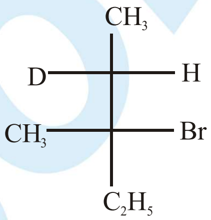


Which of the following structures are possible products.

(A)


(B)


(C)


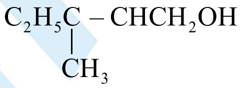
(D)


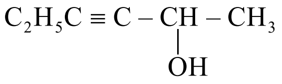
15. Consider the following sequence of reactions.

$$C_2H_5C\equiv CH \xrightarrow{CH_3MgBr} A \xrightarrow[2.H_3O^+]{1.HCHO} B$$

The product **(B)** is

(A) CH_3CH_2OH

(B)

$C_2H_5\underset{\underset{CH_3}{|}}{C}-CHCH_2OH$

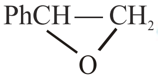
(C)

$C_2H_5C\equiv C-\underset{\underset{OH}{|}}{CH}-CH_3$

(D) $C_2H_5C\equiv C-CH_2OH$

16. In the transformations

$$PhCH=CH_2 \xrightarrow[CH_2Cl_2]{ArCO_3H} A \xrightarrow[2.H_2O]{1.LiAlH_4,Et_2O} B$$

the end product **(B)** is

(A)


(B) $PhCHOH\,CH_3$

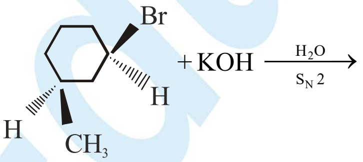
(C) $PhCH_2CH_2COAr$

(D) $PhCH_2CH_2OH$

17. The reactivities of methanol (I), 1- propanol (II), 2- butanol (III) and 2- methyl-2- propanol (IV) towards sodium metal follow the order

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

18. Consider the following reaction.



(1R, 3S)-cis-1 -Bromo -3-methylcyclohexane

The product formed in the reaction is

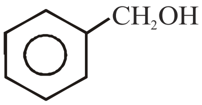
(A) (1R, 3S)-cis-3- methylcyclohexanol

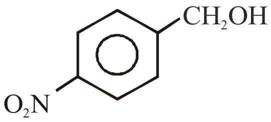
(B) (1S,3R)-cis-3-methylcyclohexanol

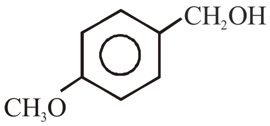
(C) (1S, 3S)-trans-3-methylcyclohexanol

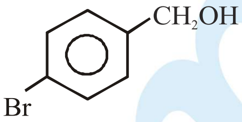
(D) (1R,3R)-trans-3-methylcyclohexanol

19. Consider the following alcohols


(I)


(II)

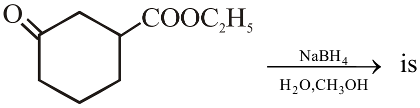

(III)

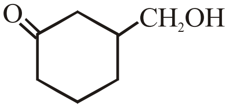

(IV)

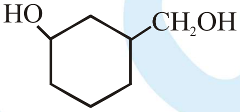
The order of decreasing reactivities of these alcohols towards nucleophilic substitution with HBr is

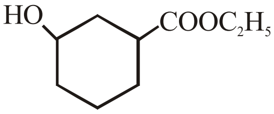
(A) III > I > IV > II **(B)** III > I > II > IV **(C)** I > III > IV > II **(D)** I > III > II > IV

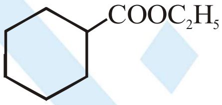
20. The product formed in the following reaction


is

(A)


(B)


(C)


(D)


21. In the reaction

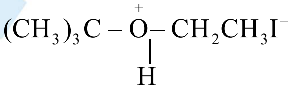
$$(CH_3)_3C{-}O{-}CH_2CH_3 + \underset{(1\ mole)}{HI} \xrightarrow{heat}$$

the product(s) formed is (are)

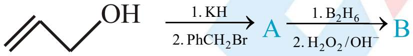
(A) $(CH_3)_3C{-}OH$ and CH_3CH_2I

(B) $(CH_3)_3C{-}I$ and CH_3CH_2OH

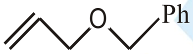
(C) $(CH_3)_3C{-}I$ and CH_3CH_2I

(D)

$(CH_3)_3C - \overset{+}{\underset{H}{O}} - CH_2CH_3 I^-$

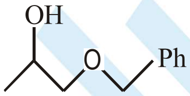
22. Consider the following sequence of reactions.



The end product **(B)** is

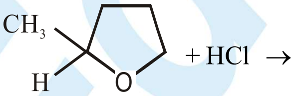
(A)


(B)


(C)


(D)


23. In the reaction



the major product formed is

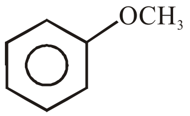
(A)

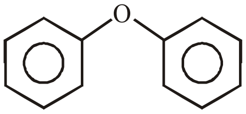

(B)

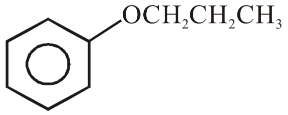

(C)

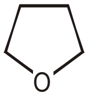

(D)

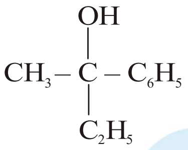

24. Which of the following ethers is not cleaved by concentrated HI even at 525 K ?

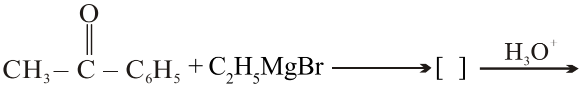
(A) 

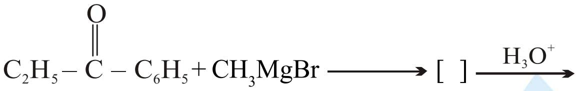
(B) 

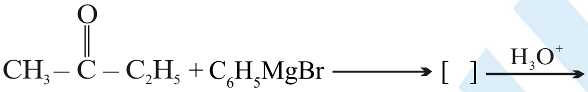
(C) 

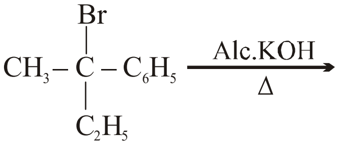
(D) 

25. Which of the following reactions can be used to prepare 
$CH_3-\overset{\overset{OH}{|}}{\underset{\underset{C_2H_5}{|}}{C}}-C_6H_5$

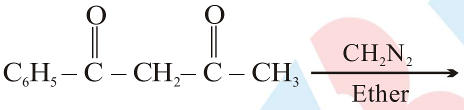
(A) 
$CH_3-\overset{\overset{O}{\|}}{C}-C_6H_5+C_2H_5MgBr\longrightarrow[\ ]\xrightarrow{H_3O^+}$

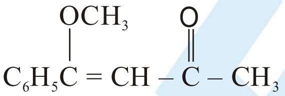
(B) 
$C_2H_5-\overset{\overset{O}{\|}}{C}-C_6H_5+CH_3MgBr\longrightarrow[\ ]\xrightarrow{H_3O^+}$

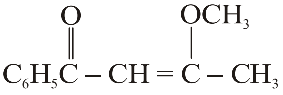
(C) 
$CH_3-\overset{\overset{O}{\|}}{C}-C_2H_5+C_6H_5MgBr\longrightarrow[\ ]\xrightarrow{H_3O^+}$

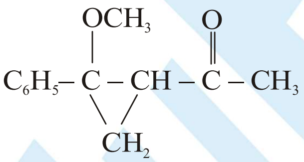
(D) 
$CH_3-\overset{\overset{Br}{|}}{\underset{\underset{C_2H_5}{|}}{C}}-C_6H_5\xrightarrow[\Delta]{Alc.KOH}$

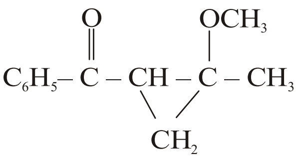
26. What are the products expected in the following reactions ?


$C_6H_5-\overset{\overset{O}{\|}}{C}-CH_2-\overset{\overset{O}{\|}}{C}-CH_3\xrightarrow[Ether]{CH_2N_2}$

(A) 
$C_6H_5\overset{\overset{OCH_3}{|}}{C}=CH-\overset{\overset{O}{\|}}{C}-CH_3$

(B) 
$C_6H_5\overset{\overset{O}{\|}}{C}-CH=\overset{\overset{OCH_3}{|}}{C}-CH_3$

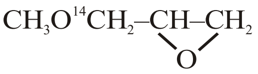
(C) 

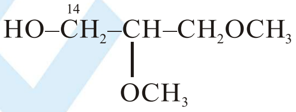
(D) 

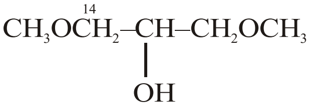
27. Consider the following reaction.

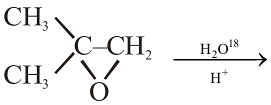
The product **(A)** is

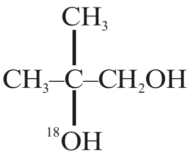
(A) 

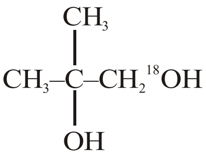
(B) 

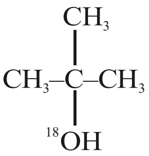
(C) 
$HO-\overset{14}{C}H_2-\underset{\underset{OCH_3}{|}}{CH}-CH_2OCH_3$

(D) 
$CH_3O\overset{14}{C}H_2-\underset{\underset{OH}{|}}{CH}-CH_2OCH_3$

28. In the reaction  A, the product **(A)** has the structure :

(A) 
$CH_3-\overset{CH_3}{\underset{^{18}OH}{C}}-CH_2OH$

(B) 
$CH_3-\overset{CH_3}{\underset{OH}{C}}-CH_2{}^{18}OH$

(C) 
$CH_3-\overset{CH_3}{\underset{^{18}OH}{C}}-CH_3$

(D) 
$CH_3-\overset{CH_3}{CH}-CH_2{}^{18}OH$

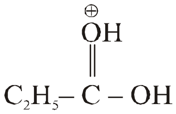
29. The compound which does not react with Sodium is

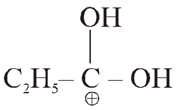
(A) $CH_3CHOHCH_3$ **(B)** CH_3OCH_3 **(C)** CH_3COOH **(D)** CH_3CH_2OH

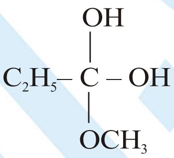
30. Which of the following groups will increase the acidity of Phenol?

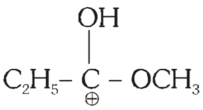
(A) $-NO_2$ **(B)** –CN **(C)** –X (halogen) **(D)** None of these

31. In the esterification of propanoic acid with methanol in the presence of a mineral acid, which of the following are intermediate species?

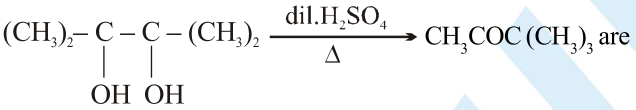
(A) 
$C_2H_5-\overset{\overset{\oplus}{O}H}{\overset{\|}{C}}-OH$

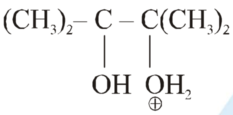
(B) 
$C_2H_5-\overset{OH}{\underset{\oplus}{C}}-OH$

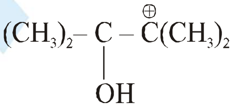
(C) 
$C_2H_5-\overset{OH}{\underset{OCH_3}{C}}-OH$

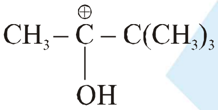
(D) 
$C_2H_5-\overset{OH}{\underset{\oplus}{C}}-OCH_3$

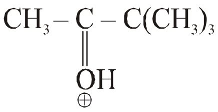
32. The intermediate stages in the conversion


$(CH_3)_2-\underset{OH}{C}-\underset{OH}{C}-(CH_3)_2 \xrightarrow[\Delta]{dil.H_2SO_4} CH_3COC(CH_3)_3$ are

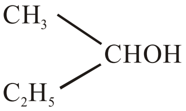
(A) 
$(CH_3)_2-\underset{OH}{C}-\underset{\underset{\oplus}{OH_2}}{C}(CH_3)_2$

(B) 
$(CH_3)_2-\underset{OH}{C}-\overset{\oplus}{C}(CH_3)_2$

(C) 
$CH_3-\underset{OH}{\overset{\oplus}{C}}-C(CH_3)_3$

(D) 
$CH_3-\underset{\substack{\| \\ OH \\ \oplus}}{C}-C(CH_3)_3$

33. An alcohol, on treatment with $P + I_2$ followed by the reaction of the formed product first with $AgNO_2$ and then with HNO_2 and final basicification, gives a blue colour. Which of the following alcohols can it be?

(A) CH_3CH_2OH **(B)** $(CH_3)_2CHOH$ **(C)** $(CH_3)_3C-OH$ **(D)** 
$\begin{matrix}CH_3\\C_2H_5\end{matrix}\!>CHOH$

34. Which of the following will result in the formation of an ether?

(A) $(CH_3)_3C\overset{-}{O}\overset{+}{N}a + CH_3CH_2Br \longrightarrow$

(B) $(CH_3)_3CBr + C_2H_5\overset{-}{O}\overset{+}{N}a \longrightarrow$

(C) $C_6H_5ONa + CH_3Br \longrightarrow$

(D) $C_6H_5Br + CH_3\overset{-}{O}\overset{+}{N}a \longrightarrow$

Part # II [Assertion & Reason Type Questions]

These questions contains, Statement-I (assertion) and Statement-II (reason).

(A) Statement-I is True, Statement-II is True ; Statement-II is a correct explanation for Statement-I
(B) Statement-I is True, Statement-II is True ; Statement-II is NOT a correct explanation for Statement-I
(C) Statement-I is True, Statement-II is False.
(D) Statement-I is False, Statement-II is True.

1. **Statement-I :** Tert-Butoxide is a stronger base than OH^- or $C_2H_5O^-$ ion but is a much poorer nucleophile.
Statement-II : A negatively charged ions is always more powerful nucleophile than its conjugate acid.

2. **Statement-I** With Br_2–H_2O, phenol gives 2,4,6- tribromophenol but with Br-CS_2, it gives 4-bromophenol as the major product.
Statement-II : In water ionization of phenol is enhanced but in CS_2, it is greatly suppressed.

3. **Statement-I :** Solubility on n-alcohols in water decreases with increase in molecular weight.
Statement-II : The relative proportion of the hydrocarbon part in alcohols increases with increasing molecular weight which permits enhanced hydrogen bond with water.

4. **Statement-I :** p- Nitrophenol is a stronger acid than o-nitrophenol.
Statement-II : Intramolecular H-bond makes o-isomer weaker than p-isomer.

5. **Statement-I :** Phenol is more reactive than benzene towards
Statement-II : In the case of phenol, the intermediate carbocation is more resonance stabilized.

6. **Statement-1 :** Alcohol gives substitution reaction with HI but elimination reaction with H_2SO_4 . Although both are strong acid
Statement-2 : $I^{\ominus}$ is a good nucleophile so it gives substitution reaction while $HSO_4^{\ominus}$ is weak nucleophile so it gives elimination reaction.

7. **Statement-1 :** The anti-periplanar transition state is the most commonly seen in E^2 reactions.
Statement-2 : The transition state for the anti-periplanar arrangement is a staggered conformation, with the base far away from the leaving group. In most cases, this transition state is higher in energy than that for the syn-periplanar elimination.

8. **Statement-1 :** Tertiary-butyl methyl ether is not prepared by the reaction of tertiary-butyl bromide with sodium methoxide.
Statement-2 : Tertiary alkyl halide gives elimination with strong base.

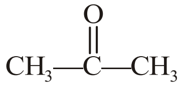
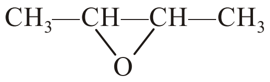
9. **Statement-1 :** Alcohols cannot be converted into alkyl bromides by reaction with NaBr.
Statement-2 : Br^- being very weak base cannot displace strong base OH^-.

10. **Statement-1 :** S_N2 reaction is carried out in the presence of polar aprotic solvents.
Statement-2 : Polar aprotic solvents do not contain acidic hydrogen.

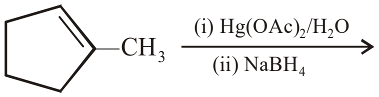
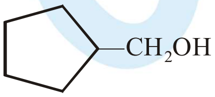
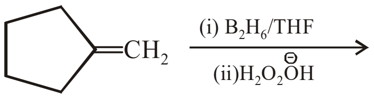
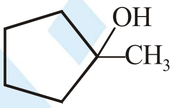
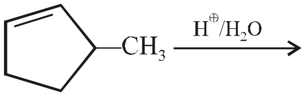
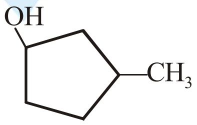
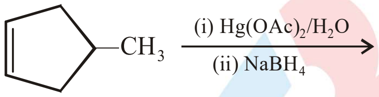
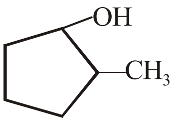
11. **Statement-1 :** Iodide (I^-) is the strongest nucleophile (in protic solvent) among the halide anions
Statement-2 : Iodide is the largest halide anion and is the most weakly solvated in a protic solvent

Exercise # 3 Part # I [Matrix Match Type Questions]

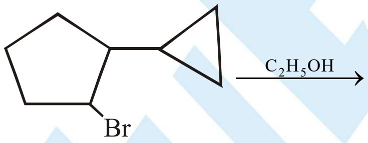
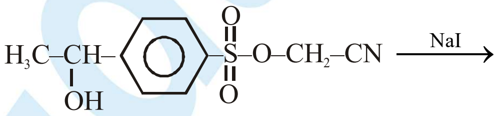
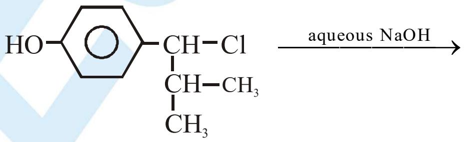
1. Match the column I with column II.

Column-I (substrate + RMgX)	**Column-II (Product)**
(A) HCHO	**(p)** Tertiary alcohol
(B)  $CH_3-\overset{O}{\overset{\Vert}{C}}-CH_3$	**(q)** First ketone then 3° alcohol
(C) 	**(r)** Secondary alcohol
(D) Ester	**(s)** Primary alcohol

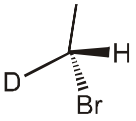
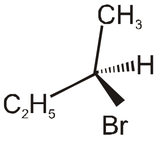
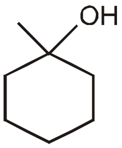
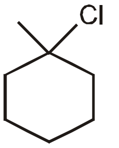
2. Match the column I with column II.

Column-I (Reaction)	**Column-II (Possible products)**
(A) 	**(p)** 
(B) 	**(q)** 
(C) 	**(r)** 
(D) 	**(s)** 

3. Match the characteristics mentioned in Column –II with the reactions given in Column –I

Column–I	**Column–II**
(A) 	**(p)** S_N2
(B) 	**(q)** Rearrangement
(C) 	**(r)** S_N1
(D) 	**(s)** Walden Inversion

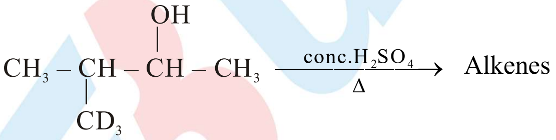
4. Match the column I and II.

Column I		**Column II**
Reaction		Type of reaction
(A) 	$\xrightarrow{KSH}$	**(p)** S_N1
(B) 	$\xrightarrow[\Delta]{Alc. KOH}$	**(q)** S_N2
(C) 	$\xrightarrow[\Delta]{H_2SO_4}$	**(r)** E^1
(D) 	$\xrightarrow{H_2O}$	**(s)** E^2

Part # II [Comprehension Type Questions]

Comprehension # 1

Alcohols undergo acid catalysed elimination reactions to produce alkenes. Because water is lost in the elimination, this reaction is called dehydration reaction. Secondary and tertiary alcohols always give E^1 reaction in dehydration. Primary alcohols whose β-carbon is branched also give E^1 reaction. The reactivity of alcohol for elimination reaction is tertiary alcohol > Secondary alcohol > Primary alcohol.

1. In the given reaction : 

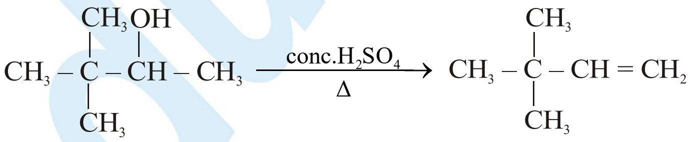
$CH_3-\underset{\underset{CD_3}{|}}{CH}-\overset{\overset{OH}{|}}{CH}-CH_3 \xrightarrow[\Delta]{conc.H_2SO_4}$ Alkenes

Total number of alkenes (Including stereo isomers) formed will be

(A) Two **(B)** Six **(C)** Four **(D)** Five

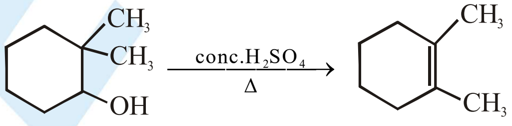
2. Which of the following dehydration product (major) is incorrect ?

(A) 

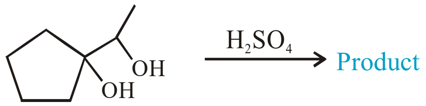
(B) 

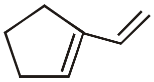
$CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-\overset{\overset{OH}{|}}{CH}-CH_3 \xrightarrow[\Delta]{conc.H_2SO_4} CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH=CH_2$

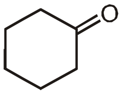
(C) $CH_3CH_2CH_2CH_2OH \xrightarrow[\Delta]{conc.H_2SO_4} CH_3\text{–}CH\text{=}CH\text{–}CH_3$

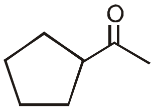
(D) 

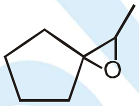
3. Identify the product in the given reaction :



(A) 

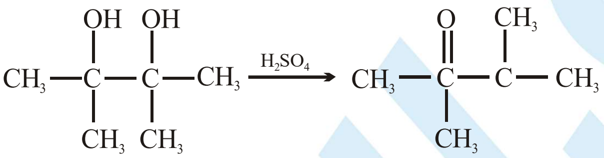
(B) 

(C) 

(D) 

Comprehension # 2

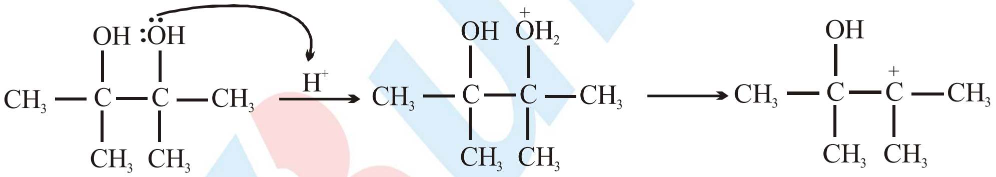
When pinacol is treated with dilute H_2SO_4, a re-arrangement reaction takes place which leads to the formation of a ketone.



$$CH_3-C(OH)(CH_3)-C(OH)(CH_3)-CH_3 \xrightarrow{H_2SO_4} CH_3-C(=O)-C(CH_3)_2-CH_3$$

This reaction involves re-arrangement of carbocation.

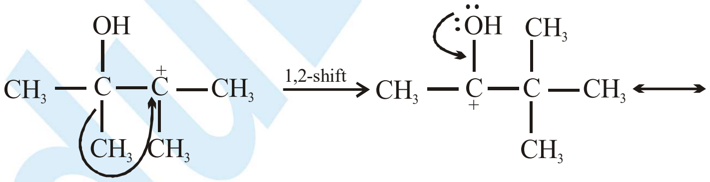
Step 1:



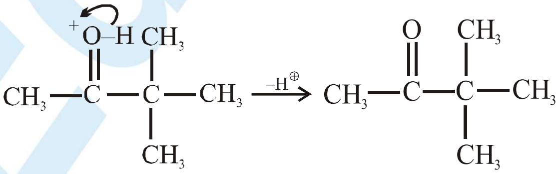
$$CH_3-C(OH)(CH_3)-C(\ddot{O}H)(CH_3)-CH_3 \xrightarrow{H^+} CH_3-C(OH)(CH_3)-C(\overset{+}{O}H_2)(CH_3)-CH_3 \longrightarrow CH_3-C(OH)(CH_3)-\overset{+}{C}(CH_3)-CH_3$$

Step 2 :

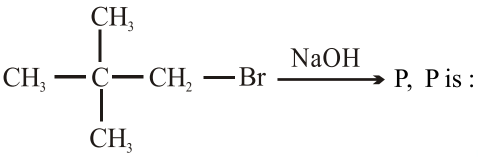
Carbocation rearrange by hydride, alkyl or aryl shift to get as stable as they can. Stability is the driving force for re-arrangement migration of bond may also occur. Where by ring expansion and ring contraction takes place. The relief of strain can provide a powerful driving force for re-arrangement.



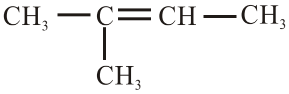
$$CH_3-C(OH)(CH_3)-\overset{+}{C}(CH_3)-CH_3 \xrightarrow{\text{1,2-shift}} CH_3-\overset{+}{C}(\ddot{O}H)-C(CH_3)_2-CH_3 \longleftrightarrow$$



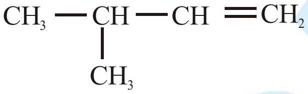
$$CH_3-C(=\overset{+}{O}-H)-C(CH_3)_2-CH_3 \xrightarrow{-H^{\oplus}} CH_3-C(=O)-C(CH_3)_2-CH_3$$

1. What will be the product of following reaction 

$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-CH_2-Br \xrightarrow{NaOH} P$, P is :

(A) 

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

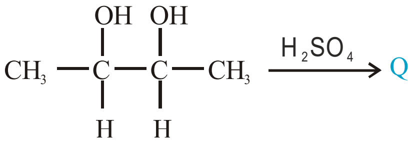
(B) 

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

(C) Both of these

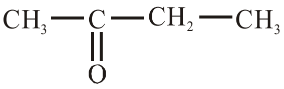
(D) None of these

2. What will be the product of following reaction

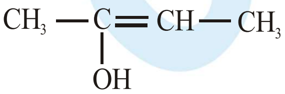


$CH_3-\overset{OH}{\underset{H}{C}}-\overset{OH}{\underset{H}{C}}-CH_3 \xrightarrow{H_2SO_4} Q$

Q is :

(A) 

$CH_3-\underset{O}{\underset{\|}{C}}-CH_2-CH_3$

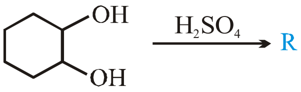
(B) 

$CH_3-\underset{OH}{C}=CH-CH_3$

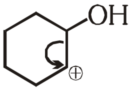
(C) Both

(D) None

3. What will be the product of following reaction



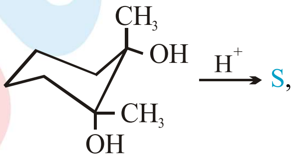
R is :

(A) 

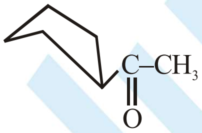
(B) 

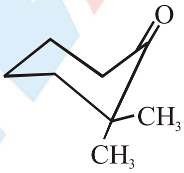
(C) Both

(D) None

4. What will be the product of following reaction 

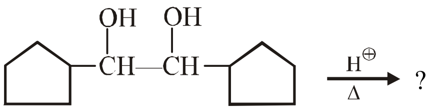
S is :

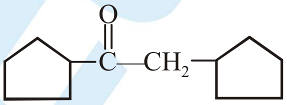
(A) 

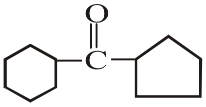
(B) 

(C) Both

(D) None

5. What will be the product of following reaction 

(A) 

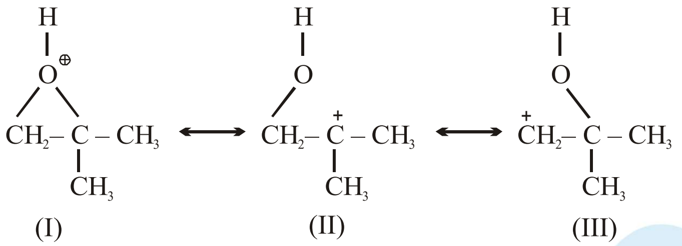
(B) 

(C) both

(D) None

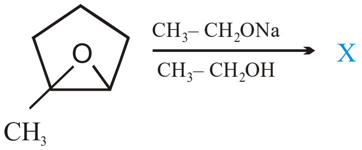
Comprehension # 3

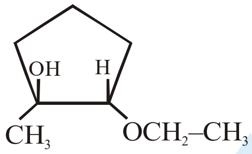
Symmetrically substituted epoxides give the same products in both the acid catalysed and base catalyzed ring opening. An unsymmetrical epoxide gives different products under acid catalysed and base catalysed conditions. Under basic conditions, the alkoxide ion simply attacks the less hindered carbon atom in an S_N2 displacement. Under acidic conditions, the alcohol, attacks the protonated epoxide.

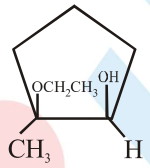


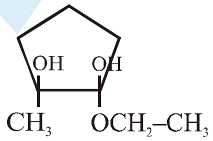
Structure II and III show that the oxirane carbon share part of positive charge. The tertiary carbon bear a larger part of positive charge and it is more strongly electrophilic. The bond between tertiary carbon and oxygen is weaker implying a lower transition state energy for attack at the tertiary carbon. Attack by the weak nucleophilic is sensitive to the strength of electrophilic is sensitive to the strength of electrophile. Centre attack takes place at more electrophilic carbon which is usually the more substituted carbon because it can better support the positive charge.

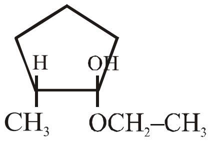
1. What will be the products in following reactions



(A)


(B)


(C)


(D)


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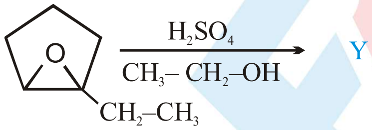
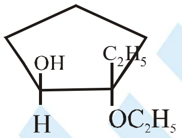


(A)


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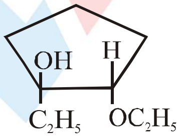

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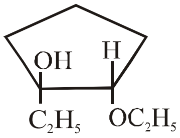
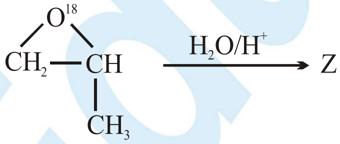
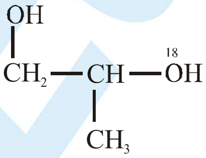


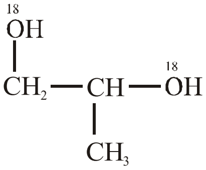
(D) None

3.


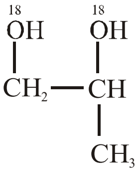
$$\underset{CH_3}{\overset{O^{18}}{CH_2-CH}} \xrightarrow{H_2O/H^+} Z$$

(A)


$$\overset{OH}{CH_2}-\underset{CH_3}{CH}-{}^{18}OH$$

(B)


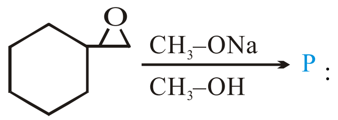
$$\overset{^{18}OH}{CH_2}-\underset{CH_3}{CH}-{}^{18}OH$$

(C)


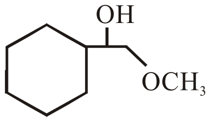
$$\overset{^{18}OH}{CH_2}-\underset{CH_3}{\overset{^{18}OH}{CH}}$$

(D) None

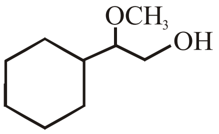
4.



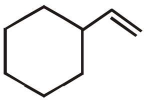
(A)



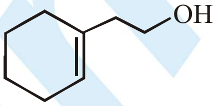
(B)



(C)

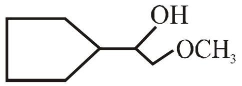


(D)

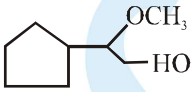


5.

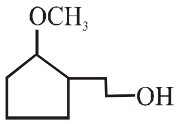
(A)



(B)



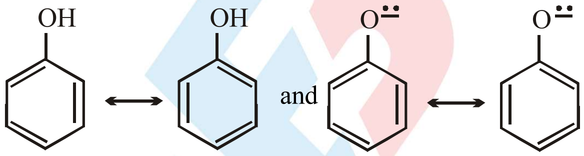
(C)



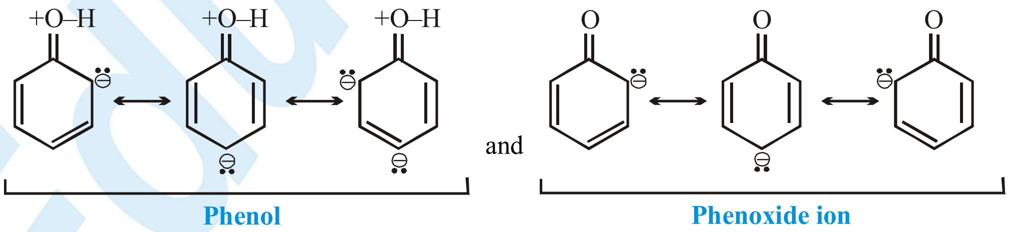
(D) None

Comprehension # 4

Phenols are converted into their salts by aqueous NaOH but not by aqueous bicarbonates. The salts are converted into the free phenols by aqueous mineral acids, carboxylic acid or carbonic acids. Most phenols have K_a value of about 10^{-10}, and are tremendously more acidic than alcohols. The difference in acidity are due to difference in stabilities of reactants and products. Phenol and phenoxide ions contain benzene ring and therefore must be hybrid of Kekuley structures



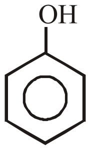
Being basic, oxygen can share more than a pair of electron with the ring.



Since energy must be supplied to separate opposite charge, the structure of phenols should contain more energy. The net effect of resonance is therefore to stabilise the phenoxide ion to a greater extent than the phenol and thus to shift the equilibrium towards ionization and make K_a larger than for an alcohol.

1. Which of the following is strongest acid ?

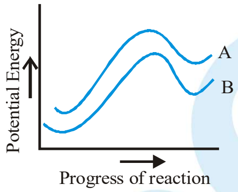
(A) H_2CO_3

(B) 

(C) $CH_3–OH$

(D) $CH_3–CH_2–OH$

2. Consider the following curves :



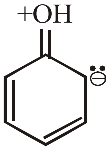
(A) Curve A represents the ionisation of alcohol

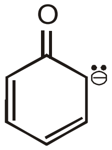
(B) Curve B represent the ionisation of Phenols

(C) Curve A represents the ionisation of phenol

(D) None

3. Which of the following is more stable:

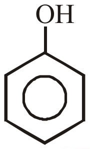
(A) 

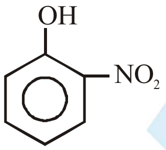
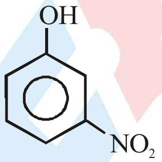
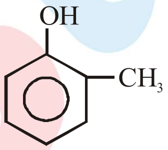
(B) 

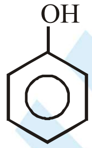
(C) Both

(D) Unpredictable

4. Correct order of acidity is

(A) $H_2CO_3 > CH_3–OH >$ 

(B)  >  > 

(C) $H_2CO_3 >$  $> CH_3 – OH$

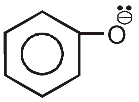
(D) Both B and C

5 Choose the correct statement:

(A) Phenol gives effervescence with $NaHCO_3$

(B) Picric acid is weaker acid than carbonic acid

(C) Picric acid gives effervescence with $NaHCO_3$

(D) $R–\ddot{O}^{\ominus}$ is more stable than 

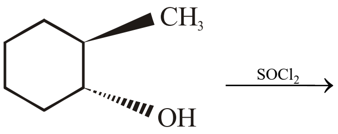
Exercise # 4

[Subjective Type Questions]

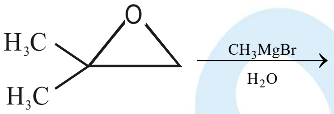
1. Explain why ArOR ethers are cleaved to give RI and ArOH rather than ArI and ROH.

2. Complete tthe following reactions :

(a)

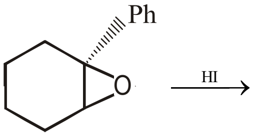


(b)

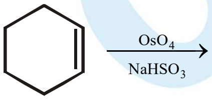


3. Complete tthe follofing reactions :

(a)



(b)



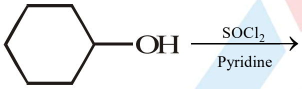
4. $C_2H_5OH \xrightarrow{PCl_5} (A) \xrightarrow{KCN} (B) \xrightarrow{H_3O^+} (C) \xrightarrow{NH_3} (D) \xrightarrow{heat} (E)$

5. $CH_3CH_2CH_2OH \xrightarrow{PBr_5} (A) \xrightarrow{KOH(Alc.)} (B) \xrightarrow{HBr} (C) \xrightarrow{NH_3} (D)$

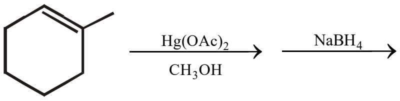
6. t-butyl alcohol reacts less rapidly with metallic sodium than the primary alcohol. Explain why

7. Provide products in the following reactions :

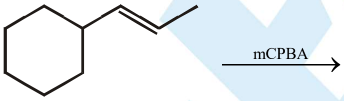
(a)



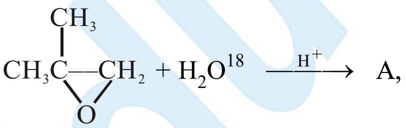
(b)



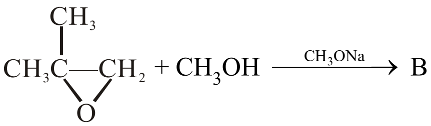
(c)



8. Identify the products A and B giving proper explanation :



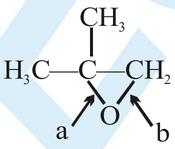
$$CH_3\overset{CH_3}{C}\text{—}CH_2 \ (\text{epoxide, O}) + H_2O^{18} \xrightarrow{H^+} A,$$



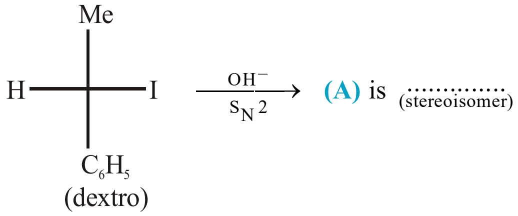
$$CH_3\overset{CH_3}{C}\text{—}CH_2 \ (\text{epoxide, O}) + CH_3OH \xrightarrow{CH_3ONa} B$$

9. Indicate bonds which are cleaved

I : in basic conditions   II : in acidic conditions

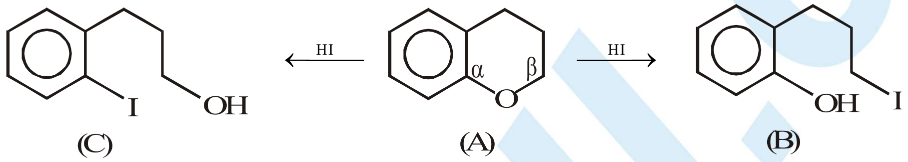


10. In the following S_N2 reaction

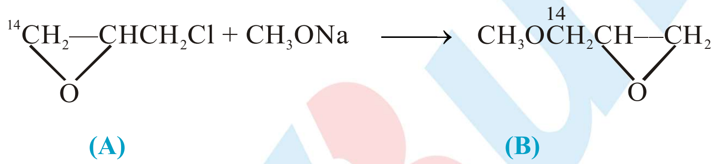


11. Hydration of 3-phenyl-1-butene in dilute H_2SO_4 is not a satisfactory method for preparing 3-phenyl-2-butanol, because 2-phenyl-2-butanol is obtained instead. Explain.

12. When A (given below) reacts with HI products is B and not C. Explain.



13. Isotopic carbon-14 in **(A)** appears at new position (as in B) when **(A)** reacts with CH_3ONa. Explain.



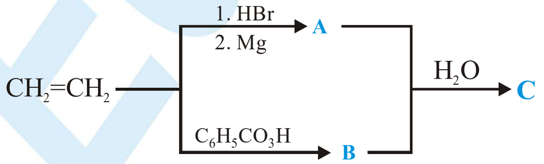
$$\overset{14}{C}H_2\text{—}CHCH_2Cl + CH_3ONa \longrightarrow CH_3OCH_2\overset{14}{C}H\text{—}CH_2$$

14. A compound **(X)** reacts with thionyl chloride to give a compound **(Y)**. **(Y)** reacts with Mg to form a Grignard reagent, which is treated with acetone and the product is hydrolysed to give 2-methyl-2- butanol. What are structural formulae of **(X)** and **(Y)** ?

15. Compound **(A)** $C_4H_{10}O$ reacts rapidly with metallic sodium, but undergoes almost no reaction with Lucas reagent. When **(A)** is treated with hot concentrated sulphuric acid, a new compound **(B)** C_4H_8 is formed. If C_4H_8 is hydrated with sulphuric acid a new compound **(C)** C_4H_9OH is formed, which is almost inert to metallic sodium but reacts rapidly with Lucas reagent. What are **(A)**, **(B)** and **(C)** ?

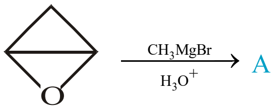
16. Give the product of the reaction of Ph_2CHCH_2OH with HBr and explain its formation.

17. Complete the following reaction

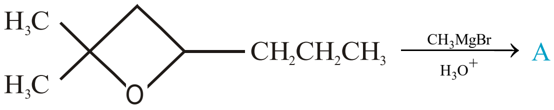


18. Complete the following reactions

(a)

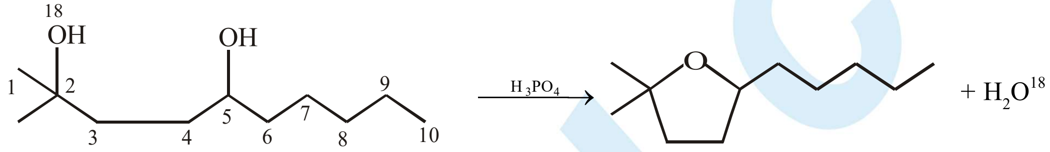


(b)

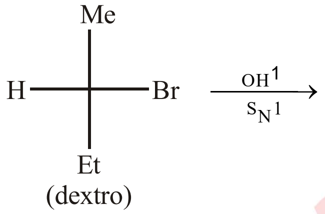


(c) $CH_3CH{=}CH_2 \xrightarrow{mCPBA} A \xrightarrow[H_3O^+]{C_2H_5MgBr} B$

19. In the following dehydration of diol with H_3PO_4, following product is formed such that isotopic ^{18}O goes with H_2O. Explain.



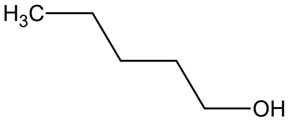
20. In the following S_N1 reaction :

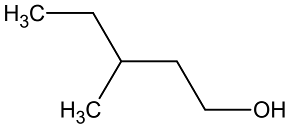


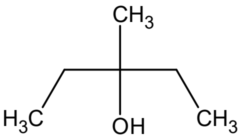
(A) is

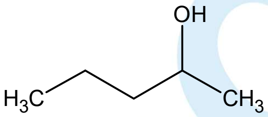
Exercise # 5 Part # I [Previous Year Questions] [AIEEE/JEE-MAIN]

1. Among the following compound which can be dehydrated very easily is : **[AIEEE-2004]**

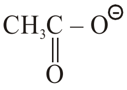
(1)


(2)


(3)


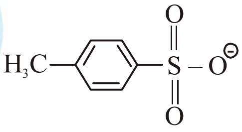
(4)


2. The decreasing order of nucleophilicity among the nucleophiles : **[AIEEE-2005]**

(A)

$CH_3\underset{\underset{O}{\|}}{C}-O^{\ominus}$

(B) $CH_3O^{\ominus}$

(C) $CN^{\ominus}$

(D)


(1) (C), (B), (A), (D) **(2)** (B), (C), (A), (D) **(3)** (D), (C), (B), (A) **(4)** (A), (B), (C), (D)

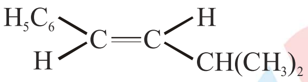
3. Reaction of trans 2–phenyl –1 – bromocyclopentane on reaction with alcoholic KOH produces: **[AIEEE-2006]**

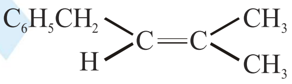
(1) 2–phenylcyclopentene **(2)** 1–phenylcyclopentene

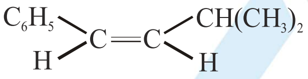
(3) 3-phenylcyclopentene **(4)** 4-phenylcyclopentene

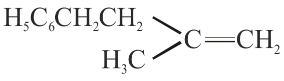
4. The main product of the following reaction is : **[AIEEE-2010]**

$$C_6H_5CH_2CH(OH)CH(CH_3)_2 \xrightarrow{\text{conc. } H_2SO_4}$$

(1)


(2)


(3)


(4)


5. From amongst the following alcohols the one that would react fastest with conc. HCl and anhydrous $ZnCl_2$, is **[AIEEE-2010]**

(1) 2-Butanol **(2)** 2-Methylpropan-2-ol **(3)** 2-Methylpropanol **(4)** 1-Butanol

6. Consider thiol anion ($RS^{\ominus}$) and alkoxy anion ($RO^{\ominus}$). Which of the following statement is correct ? **[AIEEE-2011]**

(1) $RS^{\ominus}$ is less basic but more nucleophilic than $RO^{\ominus}$.

(2) $RS^{\ominus}$ is more basic and more nucleophilic than $RO^{\ominus}$.

(3) $RS^{\ominus}$ is more basic but less nucleophilic than $RO^{\ominus}$.

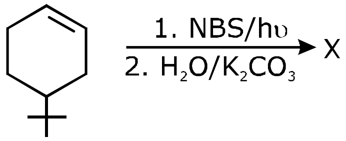
(4) $RS^{\ominus}$ is less basic and less nucleophilic than $RO^{\ominus}$.

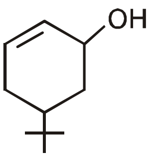
7. An unknown alcohol is treated with the "Lucas reagent" to determine whether the alcohol is primary, secondary or tertiary. Which alcohol reacts fastest and by what mechanism : **(JEE (Mains) 2013)**

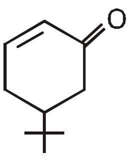
(1) secondary alcohol by S_N1 **(2)** tertiary alcohol by S_N1

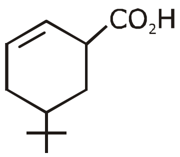
(3) secondary alcohol by S_N2 **(4)** tertiary alcohol by S_N2

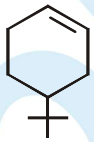
8. The product of the reaction given below is :



(1) 

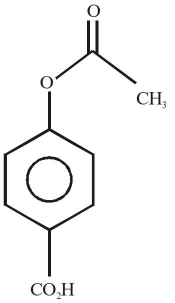
(2) 

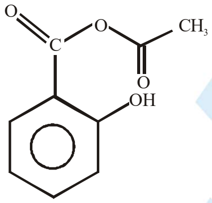
(3) 

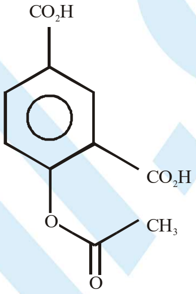
(4) 

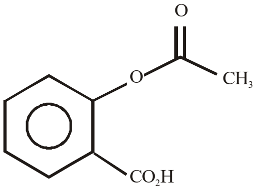
9. Phenol on treatment with CO_2 in the presence of NaOH followed by acidification produces compound X as the major product. X on treatment with $(CH_3CO)_2$ O in the presence of catalytic amount of H_2SO_4 produces :

(JEE (Mains) 2018)

(1) 

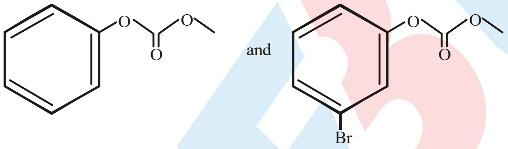
(2) 

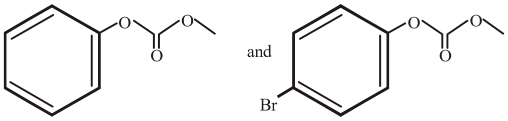
(3) 

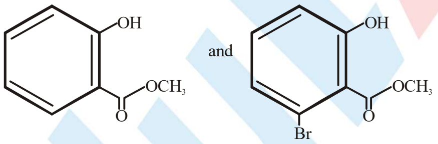
(4) 

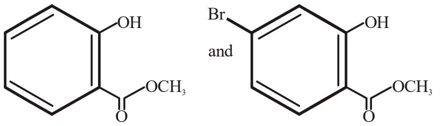
10. Phenol reacts with methyl chloroformate in the presence of NaOH to form product A. A reacts with Br_2 to form product B. A and B are respectively :

(JEE (Mains) 2018)

(1) 

(2) 

(3) 

(4) 

Part # II [Previous Year Questions][IIT-JEE ADVANCED]

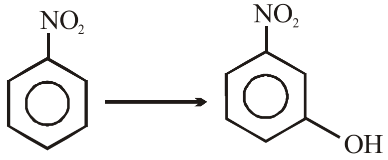
1. On acid catalysed hydration, 2-phenyl propene gives : **[IIT-2004]**

(A) 3-phenyl-2-propanol
(B) 2-phenyl-1-propanol
(C) 1-phenyl-3-propanol
(D) 2-phenyl-2-propanol

2. Conversion of cyclohexanol into cyclohexene is most effective in : **[IIT-2005]**

(A) concentrated H_3PO_4
(B) concentrated HCl
(C) concentrated HCl / $ZnCl_2$
(D) concentrated HBr

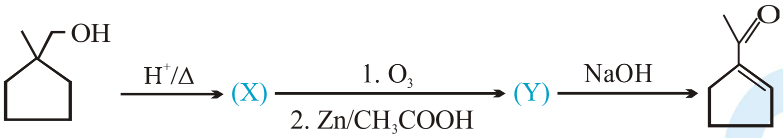
3. Carry out following conversion in four or less steps. Also mention all the reagents used and reaction conditions.



[IIT-2004]

4. An organic compound P($C_5H_{10}O$) reacts 10^{15} times faster then ethylene with dilute H_2SO_4 to give two products Q and R. Both Q and R give positive iodoform test. Identify P, Q and R and also give reason for very high reactivity of P. **[IIT-2004]**

5.



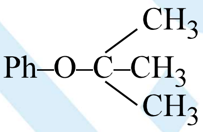
Identify (X) and (Y). **[IIT-2004]**

6. Phenyl magnesium bromide reacting with t-Butyl alcohol gives **[JEE - 2005]**

(A) Ph – OH

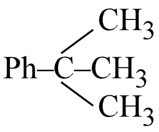
(B) Ph – H

(C)



$Ph–O–C(CH_3)_3$

(D)



$Ph–C(CH_3)_3$

7. **Statement-1**: p-Hydroxybenzoic acid has a lower boiling point than o-hydroxybenzoic acid. **[JEE - 2007]**

Statement-2 : o-Hydroxybenzoic acid has intramolecular hydrogen bonding.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1.

(C) Statement-1 is True, Statement-2 is False.

(D) Statement-1 is False, Statement-2 is True.

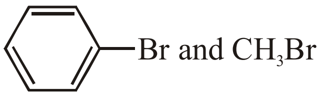
8. In the reaction

the products are **[JEE -2010]**

(A)

Br–C_6H_4–OCH_3 and H_2

(B)

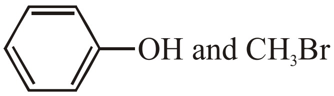


C_6H_5–Br and CH_3Br

(C)

C_6H_5–Br and CH_3OH

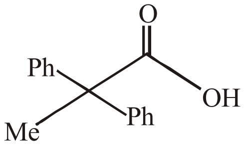
(D)



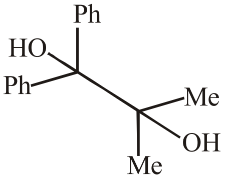
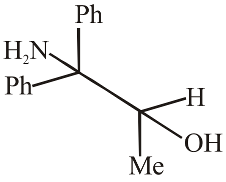
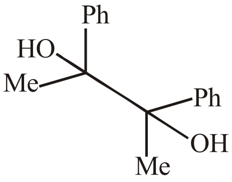
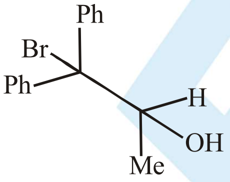
C_6H_5–OH and CH_3Br

9. The desired product X can be prepared by reacting the major product of the reaction in LIST-I with one or more appropriate reagents in LIST - II.

(given, order of migratory aptitude : aryl > alkyl > hydrogen) **[JEE Advanced 2018]**



X

LIST – I			**LIST – II**	
(A)		+ H_2SO_4	(1)	I_2, NaOH
(Q)		+ HNO_2	(2)	$[Ag(NH_3)_2]OH$
(R)		+ H_2SO_4	(3)	Fehling solution
(S)		+ $AgNO_3$	(4)	HCHO, NaOH
			(5)	NaOBr

The correct option is

(A) P → 1 ; Q → 2, 3 ; R → 1, 4 ; S → 2, 4

(B) P → 1, 5 ; Q → 3, 4 ; R → 4, 5 ; S → 3

(C) P → 1, 5 ; Q → 3, 4 ; R → 5 ; S → 2, 4

(D) P → 1, 5 ; Q → 2, 3 ; R → 1, 5 ; S → 2, 3

MOCK TEST

SECTION - I : STRAIGHT OBJECTIVE TYPE

1. Consider the following reaction sequence,

$$CH_3C\equiv CH \xrightarrow[\text{2 mole}]{HCl} A \xrightarrow[\text{Heat}]{aq.KOH} B$$

The products **(A)** and **(B)** are, respectively,

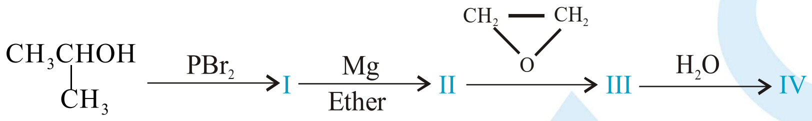
(A) $CH_3CH_2CHCl_2$ and CH_3CH_2CHO

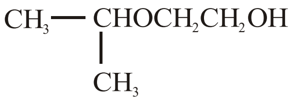
(B) $CH_3CCl_2CH_3$ and CH_3COCH_3

(C) $CH_3CCl_2CH_3$ and $CH_3C\equiv CH$

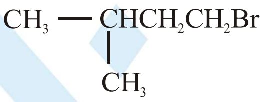
(D) $CH_3CHClCH_2Cl$ and $CH_3CHOHCH_2OH$

2. The final product (IV) in the sequence of reactions is :

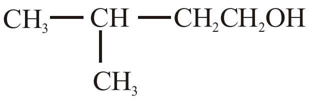


(A) 

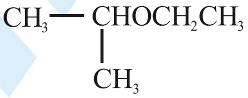
$CH_3-\underset{\underset{CH_3}{|}}{C}HOCH_2CH_2OH$

(B) 

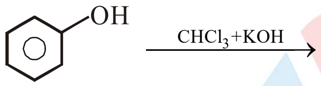
$CH_3-\underset{\underset{CH_3}{|}}{C}HCH_2CH_2Br$

(C) 

$CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2CH_2OH$

(D) 

$CH_3-\underset{\underset{CH_3}{|}}{C}HOCH_2CH_3$

3. 

$\xrightarrow{CHCl_3+KOH}$ Product :

about above reaction the incorrect statement is

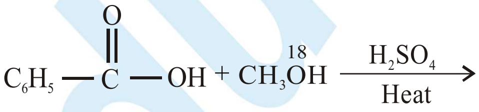
(A) The name of reaction is Reimer tiemann's reaction

(B) The intermediate in the reaction is dichloro carbene

(C) The final product is o-hydroxy benzaldehyde

(D) the final product is benzyl chloride

4. The products formed in the reaction are :



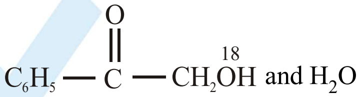
$$C_6H_5-\overset{\overset{O}{||}}{C}-OH + CH_3\overset{18}{O}H \xrightarrow[\text{Heat}]{H_2SO_4}$$

(A) 

$C_6H_5-\overset{\overset{O}{||}}{C}-\overset{18}{O}CH_3$ and H_2O

(B) 

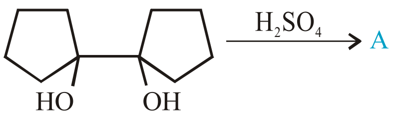
$C_6H_5-\overset{\overset{O}{||}}{C}-OCH_3$ and $H_2\overset{18}{O}$

(C) 

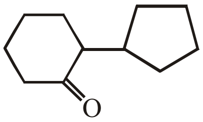
$C_6H_5-\overset{\overset{O}{||}}{C}-CH_2\overset{18}{O}H$ and H_2O

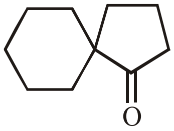
(D) $C_6H_5\overset{18}{O}CH_3$, CO and H_2O

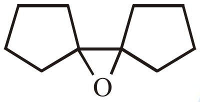
5. The major product **(A)** formed in the reaction

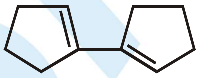


is :

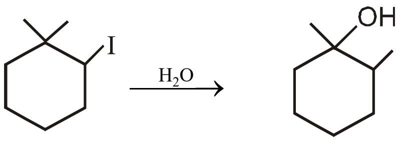
(A) 

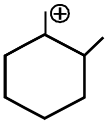
(B) 

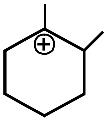
(C) 

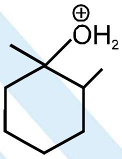
(D) 

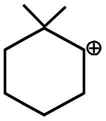
6. Which of the following is not expected to be intermediate of the following reaction ?



(A) 

(B) 

(C) 

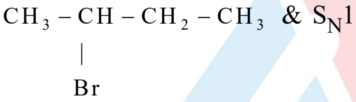
(D) 

7. $\underset{\text{1 – butanol}}{CH_3(CH_2)_2-CH_2OH} \xrightarrow{NaBr,\ H_2SO_4} X,$

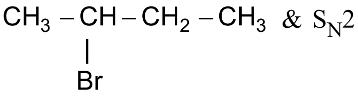
Identify X and the mechanism of the reaction

(A) $CH_3-CH_2-CH_2-CH_2-Br$ & S_N1

(B) $CH_3-CH_2-CH_2-CH_2-Br$ & S_N2

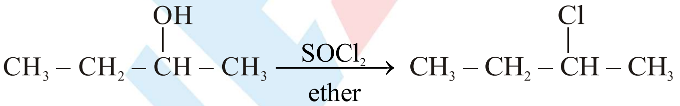
(C) 

$\underset{\underset{Br}{|}}{CH_3-CH-CH_2-CH_3}$ & S_N1

(D) 

$\underset{\underset{Br}{|}}{CH_3-CH-CH_2-CH_3}$ & S_N2

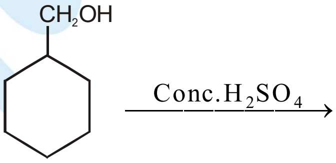
8. Consider the following reaction.



$$CH_3-CH_2-\overset{\overset{OH}{|}}{CH}-CH_3 \xrightarrow[\text{ether}]{SOCl_2} CH_3-CH_2-\overset{\overset{Cl}{|}}{CH}-CH_3$$

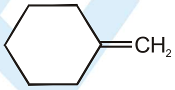
In the above reaction which phenomenon will take place :

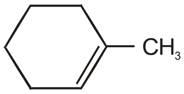
(A) Inversion **(B)** Retention **(C)** Racemisation **(D)** Isomerisation

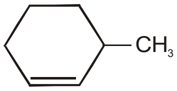
9. In the given reaction : 

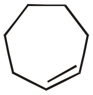
[X] as major product

[X] will be :

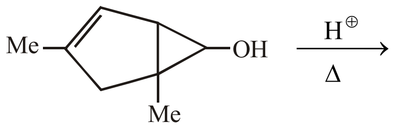
(A) 

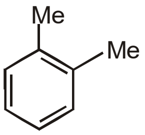
(B) 

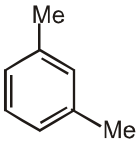
(C) 

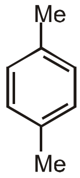
(D) 

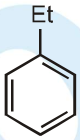
10. Write the product of the following reaction



(A) 

(B) 

(C) 

(D) 

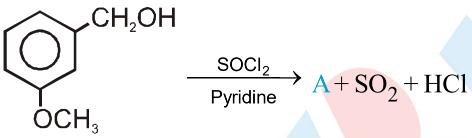
11. Which of the following statement is not true ?

(A) Nucleophiles possess unshared pairs of electron which are utilized in forming bonds with electrophilic substrate.

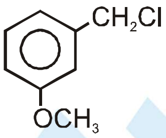
(B) The cyanide ion is an ambident nucleophile and causes nucleophilic substitution of alkyl halide by either of its carbon atom or nitrogen atom.

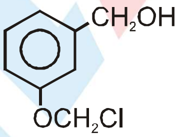
(C) The nitrite ion is an ambident nucleophile and causes nucleophilic substitution of alkyl halide by either of its oxygen atoms or nitrogen atom.

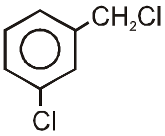
(D) Strength of Nucleophile generally decreases on going down a group in the periodic table.

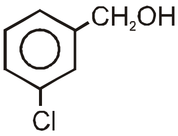
12. 

The product A in the above reaction is

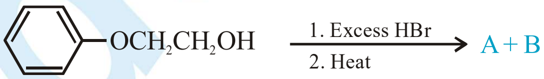
(A) 

(B) 

(C) 

(D) 

13. What are the products of the following reaction ?



(A) p $Br-C_6H_4-OCH_2CH_2-Br$

(B) $Ph-Br+Br–CH_2CH_2–OH$

(C) $Ph-Br+Br-CH_2CH_2-Br$

(D) $Ph-OH+CH_3–CHBr_2$

SECTION - II : MULTIPLE CORRECT ANSWER TYPE

14. Which of these statements are correct about nucleophiles :

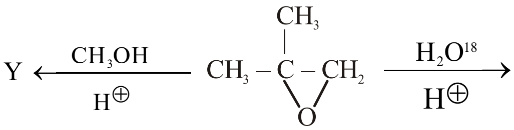
(A) Nucleophiles have an unshared electron pair and can make use of this to react with an electron deficient species.

(B) The nucleophilicity of an element (as electron donor) generally increases on going down a group in the periodic table.

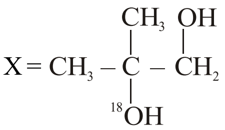
(C) A nucleophile is electron-deficient species

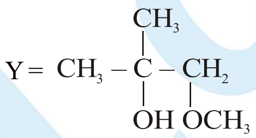
(D) All good nucleophiles are good bases when we deal across the period.

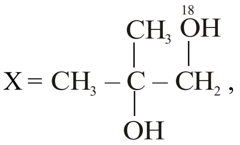
15.

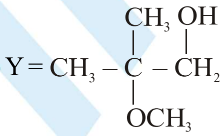


X, Identify X & Y :

(A)

$X = CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{^{18}OH}{|}}{C}}-\overset{\overset{OH}{|}}{CH_2}$

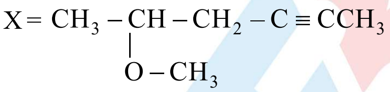
(B)

$Y = CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{OH}{|}}{C}}-\underset{\underset{OCH_3}{|}}{CH_2}$

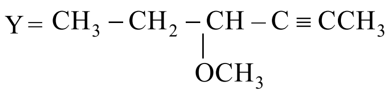
(C)

$X = CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{OH}{|}}{C}}-\overset{\overset{\overset{18}{O}H}{|}}{CH_2}$,

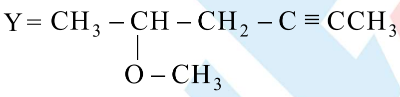
(D)

$Y = CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{OCH_3}{|}}{C}}-\overset{\overset{OH}{|}}{CH_2}$

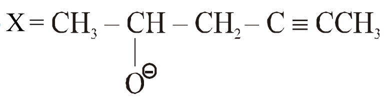
16.

Identify X & Y :

(A)

$X = CH_3-\underset{\underset{O-CH_3}{|}}{CH}-CH_2-C\equiv CCH_3$

(B)

$Y = CH_3-CH_2-\underset{\underset{OCH_3}{|}}{CH}-C\equiv CCH_3$

(C)

$Y = CH_3-\underset{\underset{O-CH_3}{|}}{CH}-CH_2-C\equiv CCH_3$

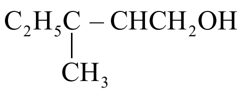
(D)

$X = CH_3-\underset{\underset{O^{\ominus}}{|}}{CH}-CH_2-C\equiv CCH_3$

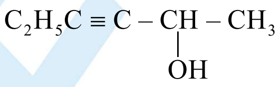
17. Consider the following sequence of reactions.

$$C_2H_5C\equiv CH \xrightarrow{CH_3MgBr} A \xrightarrow[2.H_3O^+]{1.HCHO} B$$

The product **(B)** is

(A) CH_3CH_2OH

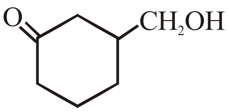
(B)

$C_2H_5\underset{\underset{CH_3}{|}}{C}-CHCH_2OH$

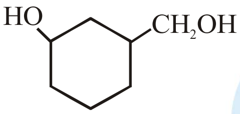
(C)

$C_2H_5C\equiv C-\underset{\underset{OH}{|}}{CH}-CH_3$

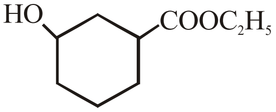
(D) $C_2H_5C\equiv C-CH_2OH$

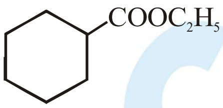
18. The product formed in the following reaction

is

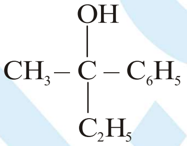
(A)


(B)


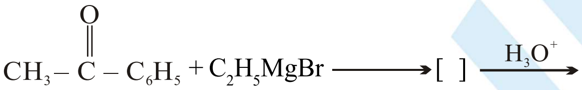
(C)


(D)


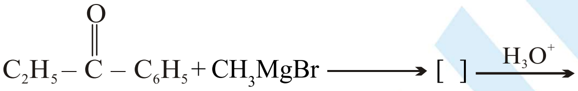
19. Which of the following reactions can be used to prepare



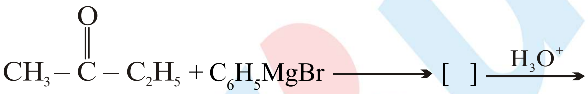
$CH_3-\overset{OH}{\underset{C_2H_5}{C}}-C_6H_5$



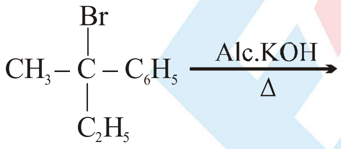
(A) $CH_3-\overset{O}{\overset{\|}{C}}-C_6H_5+C_2H_5MgBr \longrightarrow [\ \ ] \xrightarrow{H_3O^+}$



(B) $C_2H_5-\overset{O}{\overset{\|}{C}}-C_6H_5+CH_3MgBr \longrightarrow [\ \ ] \xrightarrow{H_3O^+}$



(C) $CH_3-\overset{O}{\overset{\|}{C}}-C_2H_5+C_6H_5MgBr \longrightarrow [\ \ ] \xrightarrow{H_3O^+}$



(D) $CH_3-\overset{Br}{\underset{C_2H_5}{C}}-C_6H_5 \xrightarrow[\Delta]{Alc.KOH}$

20. Which of the following groups will increase the acidity of Phenol?

(A) $-NO_2$ **(B)** –CN **(C)** –X (halogen) **(D)** None of these

21. Which of the following will result in the formation of an ether?

(A) $(CH_3)_3C\overset{-}{O}\overset{+}{N}a + CH_3CH_2Br \longrightarrow$

(B) $(CH_3)_3CBr + C_2H_5\overset{-}{O}\overset{+}{N}a \longrightarrow$

(C) $C_6H_5ONa + CH_3Br \longrightarrow$

(D) $C_6H_5Br + CH_3\overset{-}{O}\overset{+}{N}a \longrightarrow$

SECTION - III : ASSERTION AND REASON TYPE

22. **Statement-1 :** The anti-periplanar transition state is the most commonly seen in E^2 reactions.

Statement-2 : The transition state for the anti-periplanar arrangement is a staggered conformation, with the base far away from the leaving group. In most cases, this transition state is higher in energy than that for the syn-periplanar elimination.

23. **Statement-1 :** Tertiary-butyl methyl ether is not prepared by the reaction of tertiary-butyl bromide with sodium methoxide.

Statement-2 : Tertiary alkyl halide gives elimination with strong base.

24. **Statement-1 :** Alcohols cannot be converted into alkyl bromides by reaction with NaBr.

Statement-2 : Br^- being very weak base cannot displace strong base OH^-.

25. **Statement-1 :** S_N2 reaction is carried out in the presence of polar aprotic solvents.

Statement-2 : Polar aprotic solvents do not contain acidic hydrogen.

26. **Statement-1 :** Iodide (I^-) is the strongest nucleophile (in protic solvent) among the halide anions

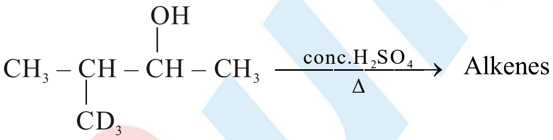
Statement-2 : Iodide is the largest halide anion and is the most weakly solvated in a protic solvent

SECTION - IV : COMPREHENSION TYPE

Read the following comprehensions carefully and answer the questions.

Alcohols undergo acid catalysed elimination reactions to produce alkenes. Because water is lost in the elimination, this reaction is called dehydration reaction. Secondary and tertiary alcohols always give E^1 reaction in dehydration. Primary alcohols whose β-carbon is branched also give E^1 reaction. The reactivity of alcohol for elimination reaction is tertiary alcohol > Secondary alcohol > Primary alcohol.

27. In the given reaction :



$$CH_3-\underset{\underset{CD_3}{|}}{CH}-\overset{\overset{OH}{|}}{CH}-CH_3 \xrightarrow[\Delta]{conc.H_2SO_4} \text{Alkenes}$$

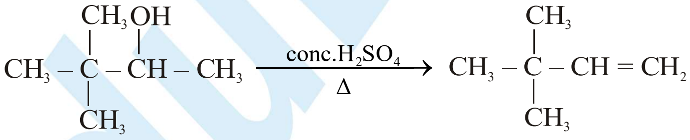
Total number of alkenes (Including stereo isomers) formed will be

(A) Two **(B)** Six **(C)** Four **(D)** Five

28. Which of the following dehydration product (major) is incorrect ?

(A)

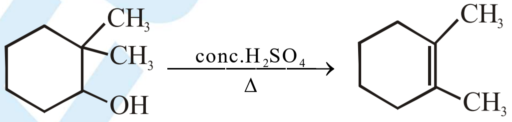
(B)



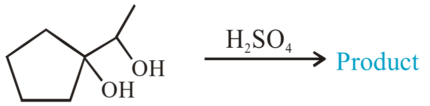
$$CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-\overset{\overset{OH}{|}}{CH}-CH_3 \xrightarrow[\Delta]{conc.H_2SO_4} CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH=CH_2$$

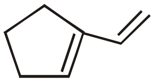
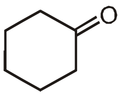
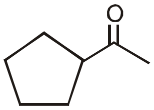
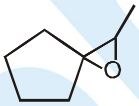
(C) $CH_3CH_2CH_2CH_2OH \xrightarrow[\Delta]{conc.H_2SO_4} CH_3\text{–}CH\text{=}CH\text{–}CH_3$

(D)



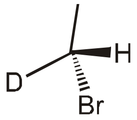
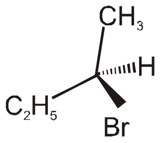
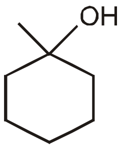
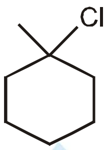
29. Identify the product in the given reaction :



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

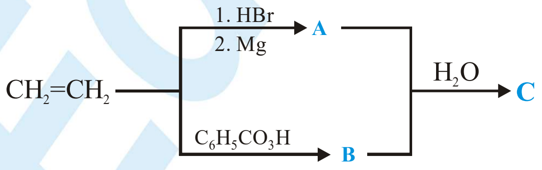
SECTION - V : MATRIX - MATCH TYPE

30. Match the column I and II.

Column I Reaction		**Column II** Type of reaction
(A) 	$\xrightarrow{KSH}$	**(p)** S_N1
(B) 	$\xrightarrow[\Delta]{Alc.KOH}$	**(q)** S_N2
(C) 	$\xrightarrow[\Delta]{H_2SO_4}$	**(r)** E^1
(D) 	$\xrightarrow{H_2O}$	**(s)** E^2

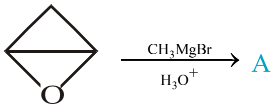
SECTION - VI : SUBJECTIVE TYPE

31. Complete the following reaction

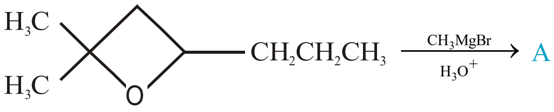


32. Complete the following reactions

(a)

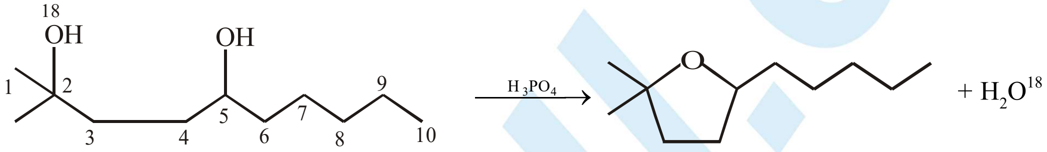


(b)

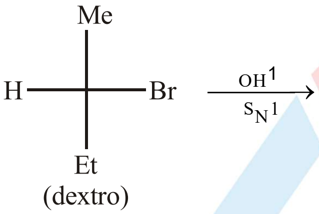


(c) $CH_3CH{=}CH_2 \xrightarrow{\text{mCPBA}} A \xrightarrow[H_3O^+]{C_2H_5MgBr} B$

33. In the following dehydration of diol with H_3PO_4, following product is formed such that isotopic ^{18}O goes with H_2O. Explain.



34. In the following S_N1 reaction :



(A) is

ANSWER KEY

EXERCISE - 1

1. C **2.** A **3.** C **4.** C **5.** B **6.** C **7.** C **8.** D **9.** B **10.** C **11.** A **12.** C **13.** B
14. C **15.** D **16.** A **17.** A **18.** A **19.** B **20.** A **21.** B **22.** D **23.** A **24.** C **25.** A **26.** B
27. D **28.** C **29.** A **30.** A **31.** C **32.** D **33.** C **34.** A **35.** B **36.** A **37.** B **38.** A **39.** A
40. B **41.** A **42.** A **43.** A **44.** B **45.** B **46.** C **47.** C **48.** A **49.** B **50.** B **51.** D **52.** C
53. C **54.** C **55.** D **56.** B **57.** A **58.** A **59.** B **60.** A **61.** D **62.** B **63.** C **64.** D

EXERCISE - 2 : PART # I

1. A, B, D **2.** C, D **3.** B, D **4.** A, B **5.** A, D **6.** A, B, D **7.** B, C, D **8.** A, B, C, D **9.** A, B
10. C, D **11.** B, C, D **12.** B, D **13.** A, B, C, D **14.** A, B, C, D **15.** D **16.** B **17.** A **18.** C **19.** A
20. C **21.** B **22.** B **23.** B **24.** B **25.** A, B, C **26.** A, B **27.** B **28.** A **29.** B **30.** A, B, C
31. A, B, C, D **32.** A, B, C, D **33.** B, D **34.** A, C

PART # II

1. B **2.** A **3.** C **4.** A **5.** A **6.** A **7.** C **8.** A **9.** A **10.** B **11.** A

EXERCISE - 3 : PART # I

1. A→ s, B→p, C→r, D→q **2.** A→q, B→p, C→r, D→q
3. A→q, r, B→p, s, C→p, D→r **4.** A→q, B→s, C→r, D→p

PART # II

Comprehension # 1 : **1.** B **2.** B **3.** C
Comprehension # 2 : **1.** A **2.** A **3.** B **4.** A **5.** B
Comprehension # 3 : **1.** A **2.** A **3.** B **4.** A **5.** B
Comprehension # 4 : **1.** A **2.** B **3.** B **4.** D **5.** C

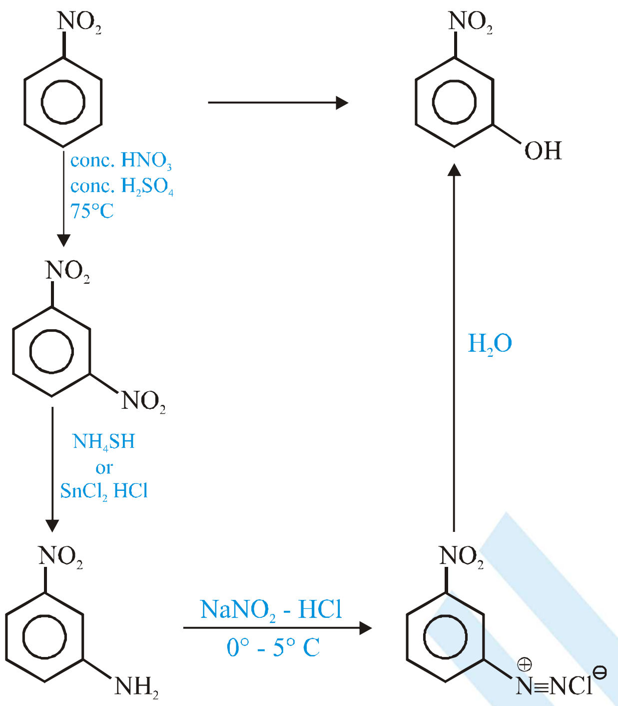
EXERCISE - 5 : PART # I

1. 3 **2.** 2 **3.** 3 **4.** 1 **5.** 2 **6.** 1 **7.** 2 **8.** 1 **9.** 4 **10.** 2

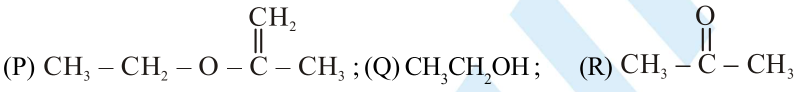
PART # II

1. D **2.** A

3.

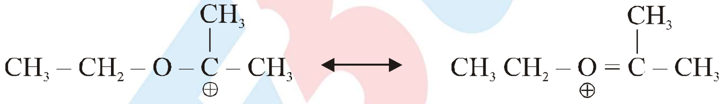


4.



$(P)\ CH_3-CH_2-O-\overset{\overset{CH_2}{\|}}{C}-CH_3\ ;\ (Q)\ CH_3CH_2OH\ ;\quad (R)\ CH_3-\overset{\overset{O}{\|}}{C}-CH_3$

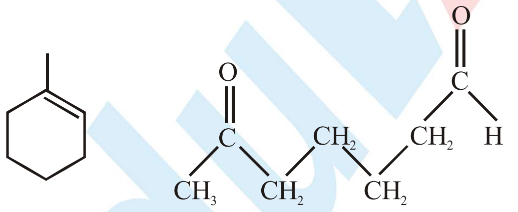
When ethylene reacts with dil. H_2SO_4 $CH_3CH_2^{\oplus}$ is produced during rate determining step, whereas P gives resonance stabilized intermediate.



$$CH_3-CH_2-O-\underset{\oplus}{\overset{\overset{CH_3}{|}}{C}}-CH_3 \longleftrightarrow CH_3CH_2-\underset{\oplus}{O}=\overset{\overset{CH_3}{|}}{C}-CH_3$$

Due to extra stability of intermediate the rate of reaction is very fast.

5.



(X) (Y)

6. B **7.** D **8.** D **9.** D

MOCK-TEST

1. B **2.** C **3.** D **4.** A **5.** A **6.** A **7.** B **8.** B **9.** B **10.** B **11.** D **12.** A **13.** D
14. A, B, D **15.** A, D **16.** C, D **17.** D **18.** C **19.** A, B, C **20.** A, B, C **21.** A, C **22.** C **23.** A
24. A **25.** B **26.** A **27.** B **28.** B **29.** C **30.** A→q; B→s; C→r; D→p