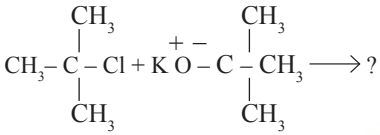
OPEN STUDENT FOUNDATION
STD:12th Chemistry
PRACTICE TEST-14

Date : 05/03/24

Section A

● **Choose correct answer from the given options. [Each carries 1 Mark]** **[10]**

1. What is the main product in below reaction ?



(A) t-butyl ethyl ether (B) 2, 2-Dimethyl butane (C) 2-Methyl Pent-1-en (D) 2-methyl prop-1-en

2. Given below are two statements:

Statement I : Phenols are weakly acidic.

Statement II : Therefore they are freely soluble in NaOH Solution and are weaker acids than alcohols and water.

Choose the most appropriate option.

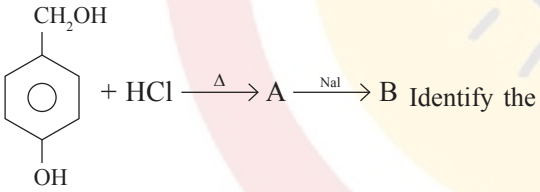
(A) Both Statement I and Statement II are correct. (B) Both Statement I and Statement II are incorrect.

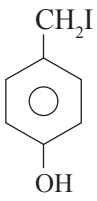
(C) Statement I is correct but Statement II is incorrect. (D) Statement I is incorrect but Statement II is correct.

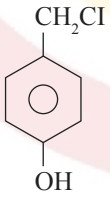
3. The difference in the reaction of phenol with bromine in chloroform in water medium is due to :

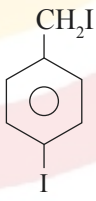
(A) Hyper conjugation in substrate (B) Polarity of solvent

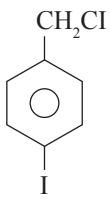
(C) Free radical formation (D) Electromeric effect of the substrate

4.  Identify the product B in above reaction.

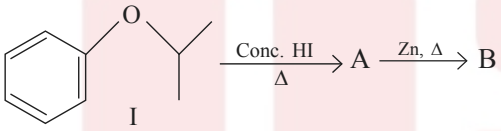
(A) 

(B) 

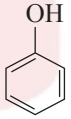
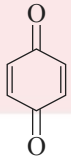
(C) 

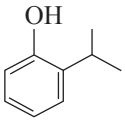
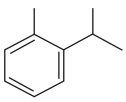
(D) 

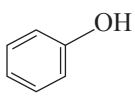
5. Compound I is heated with Conc. HI to give a hydroxy compound A which is further heated with Zn dust to give compound B. Identify A and B.



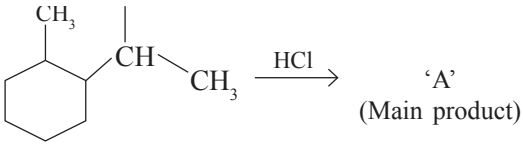
(A) A =  , B = 

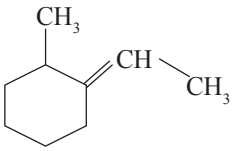
(B) A =  , B = 

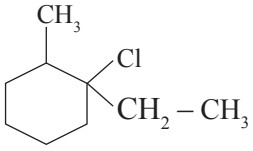
(C) A =  , B = 

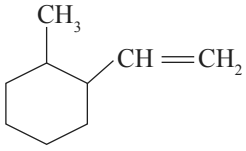
(D) A =  , B = 

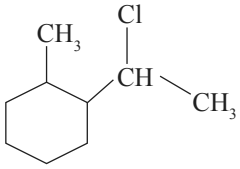
6. In given reaction identify the end (main) product?

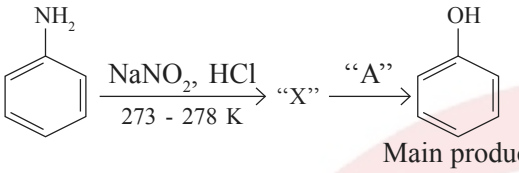


(A) 

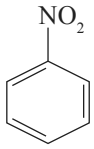
(B) 

(C) 

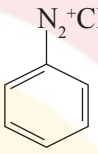
(D) 

7. 

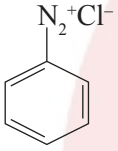
In given reaction what is X and A respectively ?

(A) X - 

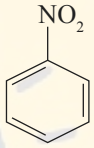
; A - H_2O/NaOH

(B) X - 

; A - H_2O/NaOH

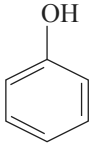
(C) X - 

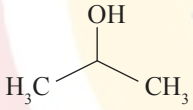
; A - H_2O/Δ

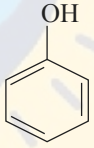
(D) X - 

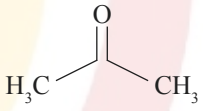
; A - H_2O/Δ

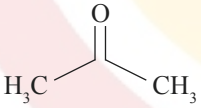
8. The product formed in the reaction of cumene with O_2 followed by treatment with dil. HCl are ?

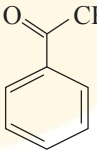
(A) 

and 

(B) 

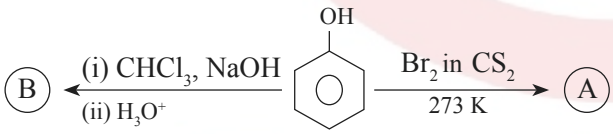
and 

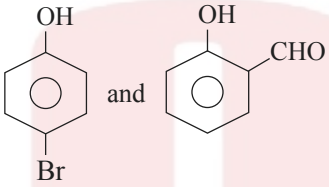
(C) 
and 

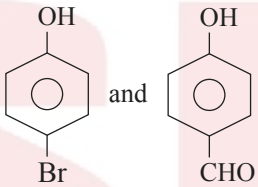
(D) 

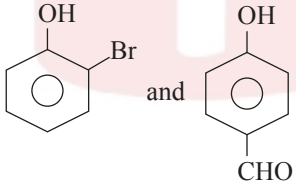
and $CH_3 - OH$

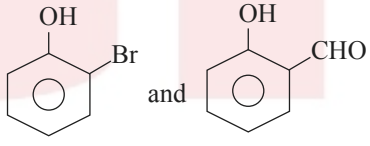
9. Identify the major products A and B respectively in the following reaction of phenol.



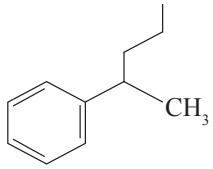
(A) 

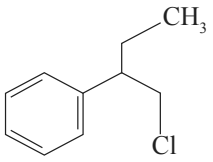
(B) 

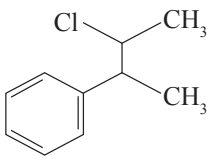
(C) 

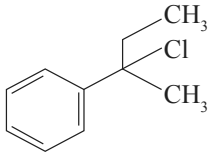
(D) 

10. Reaction of Grignard reagent C_2H_5MgBr with C_8H_8O followed by hydrolysis gives compound "A" which reacts instantly with Lucas reagent to give compound B, $C_{10}H_{13}Cl$. The compound B is:

(A) 

(B) 

(C) 

(D) 

Section B

● **Write the answer of the following questions. [Each carries 2 Marks]** **[8]**

1. 'Alcohols are versatile compounds' discuss exaction of this statement by giving suitable example.
2. Write a note on acidity of phenols.
3. Explain the following with an example
   (i) Reaction of phenol with zinc dust.
   (ii) Oxidation reaction of phenol.
4. Explain the preparation of alcohol by reduction of aldehydes and ketones.

Section C

● **Write the answer of the following questions. [Each carries 3 Marks]** **[6]**

5. Write a note on esterification of alcohols and phenols.
6. Explain nitration of phenol in detail.

Section D

● **Write the answer of the following questions. [Each carries 4 Marks]** **[8]**

7. State the preparation, properties and uses of ethanol.
8. (i) Draw the structures of all isomeric alcohols of molecular formula $C_5H_{12}O$ and give their IUPAC names.
   (ii) Classify the isomers of alcohols in question 11.3 (i) as primary, secondary and tertiary alcohols.

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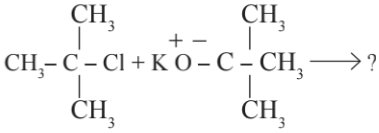
Section A

● **Choose correct answer from the given options. [Each carries 1 Mark]** **[10]**

1. What is the main product in below reaction ?



(A) t-butyl ethyl ether (B) 2, 2-Dimethyl butane (C) 2-Methyl Pent-1-en (D) 2-methyl prop-1-en

➠ Ans : (D)

2. Given below are two statements:

Statement I : Phenols are weakly acidic.

Statement II : Therefore they are freely soluble in NaOH Solution and are weaker acids than alcohols and water.

Choose the most appropriate option.

(A) Both Statement I and Statement II are correct. (B) Both Statement I and Statement II are incorrect.

(C) Statement I is correct but Statement II is incorrect. (D) Statement I is incorrect but Statement II is correct.

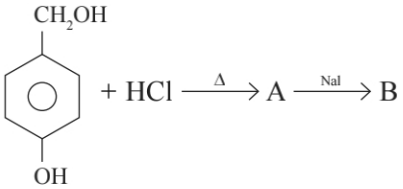
➠ Ans : (C)

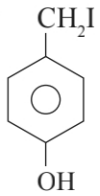
3. The difference in the reaction of phenol with bromine in chloroform in water medium is due to :

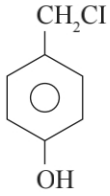
(A) Hyper conjugation in substrate (B) Polarity of solvent

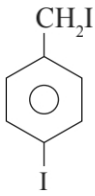
(C) Free radical formation (D) Electromeric effect of the substrate

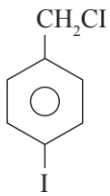
➠ Ans : (B)

4.  Identify the product B in above reaction.

(A) 

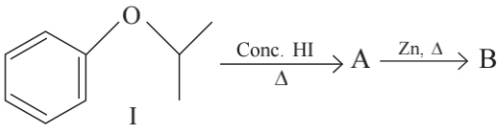
(B) 

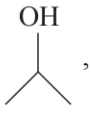
(C) 

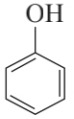
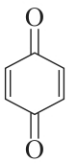
(D) 

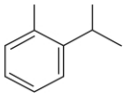
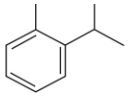
➠ Ans : (A)

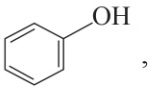
5. Compound I is heated with Conc. HI to give a hydroxy compound A which is further heated with Zn dust to give compound B. Identify A and B.



(A) A =  , B = 

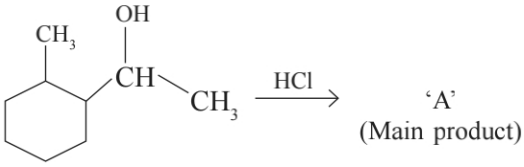
(B) A =  , B = 

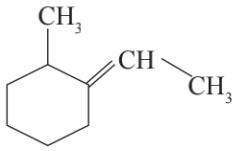
(C) A =  , B = 

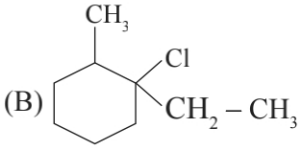
(D) A =  , B = 

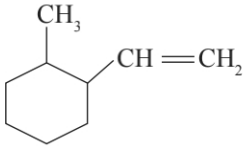
➠ Ans : (D)

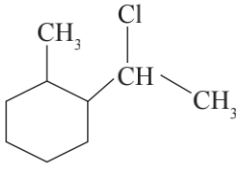
6. In given reaction identify the end (main) product?



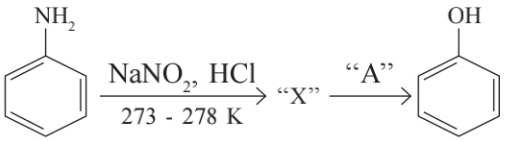
(A) 

(B) 

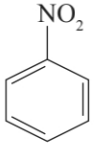
(C) 

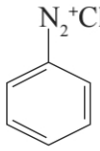
(D) 

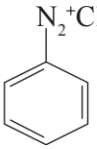
➠ Ans : (D)

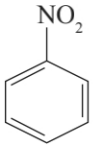
7. 

In given reaction what is X and A respectively ?

(A) X -  ; A - H_2O/NaOH

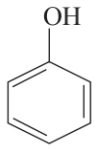
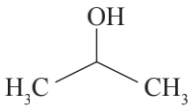
(B) X -  ; A - H_2O/NaOH

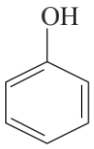
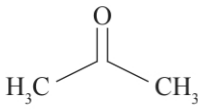
(C) X -  ; A - H_2O/Δ

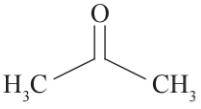
(D) X -  ; A - H_2O/Δ

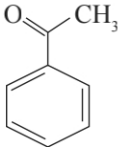
➠ Ans : (C)

8. The product formed in the reaction of cumene with O_2 followed by treatment with dil. HCl are ?

(A)  and 

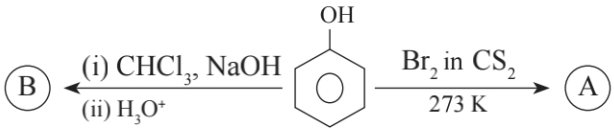
(B)  and 

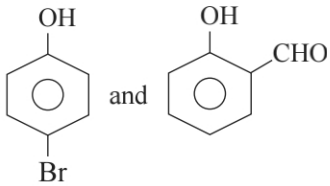
(C)  and 

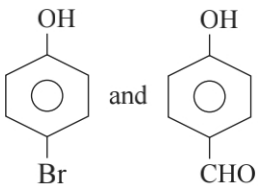
(D)  and $CH_3 - OH$

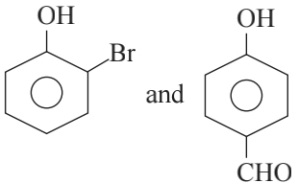
➠ Ans : (B)

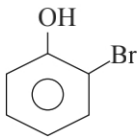
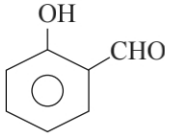
9. Identify the major products A and B respectively in the following reaction of phenol.



(A) 

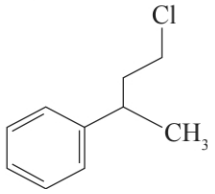
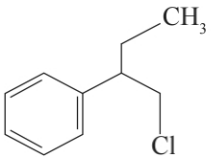
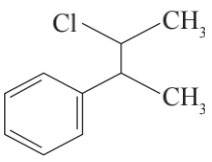
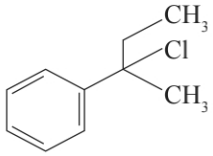
(B) 

(C)  and

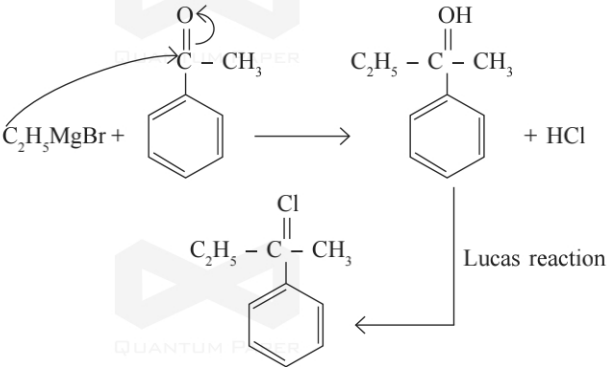
(D)  and 

➠ Ans : (A)

10. Reaction of Grignard reagent C_2H_5MgBr with C_8H_8O followed by hydrolysis gives compound "A" which reacts instantly with Lucas reagent to give compound B, $C_{10}H_{13}Cl$. The compound B is:

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

Ans (D)

➪ 

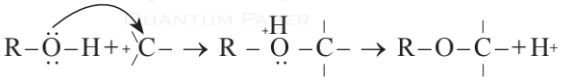
Section B

● **Write the answer of the following questions. [Each carries 2 Marks]** **[8]**

1. 'Alcohols are versatile compounds' discuss exaction of this statement by giving suitable example.

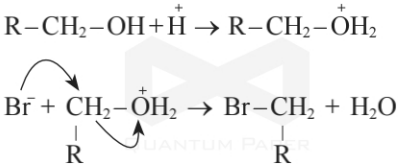
➪ Alcohols are versatile compounds. They react both as nucleophiles and electrophiles. The bond between O–H is broken when alcohols react as nucleophiles.

➪ Alcohols as nucleophiles

(i) 

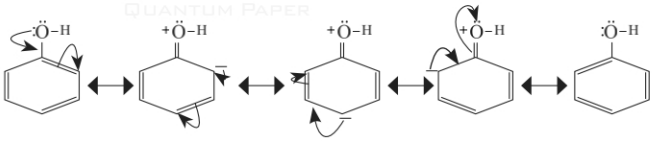
(ii) The bond between C – O is broken when they react as electrophiles. Protonated alcohols react in this manner.

➪ Protonated alcohols as electrophiles



2. Write a note on acidity of phenols.

➪ Acidity of phenols : The reactions of phenol with metals (e.g., sodium, aluminium) and sodium hydroxide indicate its acidic nature. The hydroxyl group, in phenol is directly attached to the sp^2 hybridised carbon of benzene ring which acts as an electron withdrawing group. Due to this, the charge distribution in phenol molecule, as depicted in its resonance structures, causes the oxygen of –OH group to be positive.



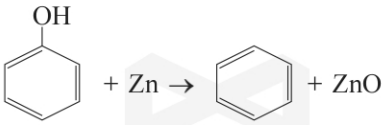
➪ The reaction of phenol with aqueous sodium hydroxide indicates that phenols are stronger acids than alcohols and water.

3. Explain the following with an example

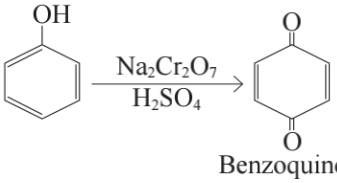
(i) Reaction of phenol with zinc dust.

(ii) Oxidation reaction of phenol.

➪ Reaction of phenol with zinc dust : Phenol is converted to benzene on heating with zinc dust.



➪ Oxidation : Oxidation of phenol with chromic acid produces a conjugated diketone known as benzoquinone. In the presence of air, phenols are slowly oxidised to dark coloured mixtures containing quinones.



Benzoquinone

4. Explain the preparation of alcohol by reduction of aldehydes and ketones.

➪ By reduction of aldehydes and ketones : Aldehydes and ketones are reduced to the correspoinding alcohols by addition of hydrogen in the presence of catalysts (catalytic hydrogenation). The usual catalyst is a finely divided metal such as platinum, palladium or nickel. It is also prepared by treating aldehydes and ketones with sodium borohydrode ($NaBH_4$) or lithium aluminium hydride ($LiAlH_4$). Aldehydes yield primary alcohols whereas ketones give secondary alcohols.

$$RCHO + H_2 \xrightarrow{Pd} RCH_2OH$$

$$RCOR' \xrightarrow{NaBH_4} R-\underset{\displaystyle OH}{\underset{|}{CH}}-R'$$

Section C

● **Write the answer of the following questions. [Each carries 3 Marks]** **[6]**

5. Write a note on esterification of alcohols and phenols.

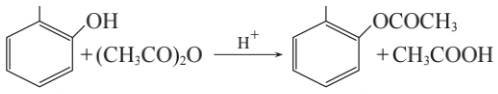
➪ Alcohols and phenols react with carboxylic acids, acid chlorides and acid anhydrides to form esters.

$$Ar/RO-H + R'\text{-}COOH \overset{H^+}{\rightleftharpoons} Ar/ROCOR' + H_2O$$

$$Ar/R\text{-}OH + (R'CO)_2O \overset{H^+}{\rightleftharpoons} Ar/ROCOR' + R'COOH$$

$$R/ArOH + R'COCl \xrightarrow{Pyridine} R/ArOCOR' + HCl$$

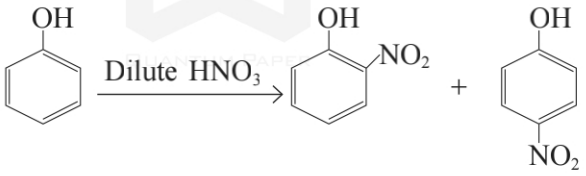
➪ The reaction with carboxylic acid and acid anhydride is carried out in the presence of a small amount of concentrated sulphuric acid. The reaction is reversible, and therefore, water is removed as soon as it is formed. The reaction with acid chloride is carried out in the presence of a base (pyridine) so as to neutralise HCl which is formed during the reaction. It shifts the equilibrium to the right hand side. The introduction of acetyl (CH_3CO) group in alcohols or phenols is known as acetylation. Acetylation of salicylic acid produces aspirin.



Salicylic acid Acetylsalicylic and (Aspirin)

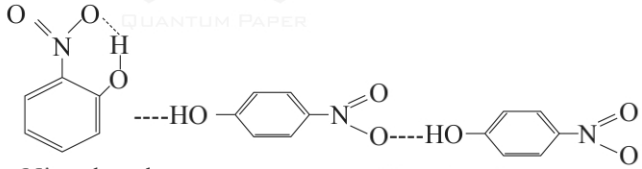
6. Explain nitration of phenol in detail.

➪ Nitration: With dilute nitric acid at low temperature (298 K), phenol yields a mixture of ortho and para nitrophenols.



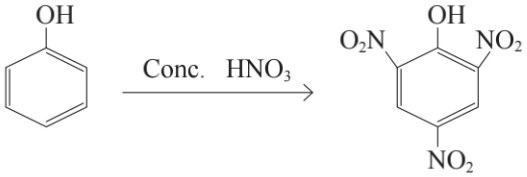
o-Nitrophenol *p*-Nitrophenol

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



o-Nitrophenol (Intramolecular H-bonding) *p*-Nitrophenol (Intramolecular H-bonding)

➪ With concentrated nitric acid, phenol is converted to 2,4,6-trinitrophenol. The product is commonly known as picric acid. The yield of the reaction product is poor.



2,4,6-Trinitrophenol (Picric acid)

➪ Nowadays picric acid is prepared by treating phenol first with concentrated sulphuric acid which converts in to phenol-2,4-disulphonic acid, and then with concentrated nitric acid to get 2,4,6-trinitrophenol.

Section D

● **Write the answer of the following questions. [Each carries 4 Marks]** **[8]**

7. State the preparation, properties and uses of ethanol.

➪ Ethanol, C_2H_5OH, is obtained commercially by fermentation, the oldest method is from sugars. The sugar in molasses, sugarcane or fruits such as grapes is converted to glucose and fructose, (both of which have the formula $C_6H_{12}O_6$), in the presence of an enzyme, invertase. Glucose and fructose undergo fermentation in the presence of another enzyme, zymase, which is found in yeast.

$$C_{12}H_{22}O_{11} + H_2O \xrightarrow{\text{Invertase}} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

$$C_6H_{12}O_6 \xrightarrow{\text{Zymase}} 2C_2H_5OH + 2CO_2$$

➪ In wine making, grapes are the source of sugars and yeast. As grapes ripen, the quantity of sugar increases and yeast grows on the outer skin. When grapes are crushed, sugar and the enzyme come in contact and fermentation starts. Fermentation takes place in anaerobic conditions i.e. in absence of air. Carbon dioxide

is released during fermentation.

➪ The action of zymase is inhibited once the percentage of alcohol formed exceeds 14 percent. If air gets into fermentation mixture, the oxygen of air oxidises ethanol to ethanoic acid which in turn destroys the taste of alcoholic drinks.

➪ Ethanol is a colourless liquid with boiling point 351 K. It is used as a solvent in paint industry and in the preparation of a number of carbon compounds. The commercial alcohol is made unfit for drinking by mixing in it some copper sulphate (to give it a colour) and pyridine (a foul smelling liquid). It is known as denaturation of alcohol.

8. (i) Draw the structures of all isomeric alcohols of molecular formula $C_5H_{12}O$ and give their IUPAC names.

(ii) Classify the isomers of alcohols in question 11.3 (i) as primary, secondary and tertiary alcohols.

➪ The structures, IUPAC names and classification of all isomeric alcohols of molecular formula $C_5H_{12}O$ is as below:

No.	Structure	IUPAC name	Type
(i)	$\overset{5}{CH_3} - \overset{4}{CH_2} - \overset{3}{CH_2} - \overset{2}{CH_2} - \overset{1}{CH_2} - OH$	Pentan-1-ol	Primary (1°)
(ii)	$\overset{4}{CH_3} - \overset{3}{CH}(\overset{|}{CH_3}) - \overset{2}{CH_2} - \overset{1}{CH_2} - OH$	3-Methylbutan-1-ol	Primary (1°)
(iii)	$\overset{4}{CH_3} - \overset{3}{CH_2} - \overset{2}{CH}(\overset{|}{CH_3}) - \overset{1}{CH_2} - OH$	2-Methylbutan-1-ol	Primary (1°)
(iv)	$\overset{3}{CH_3} - \overset{2}{C}(\overset{|}{CH_3})_2 - \overset{1}{CH_2} - OH$	2,2-Dimethylpropan-1-ol	Primary (1°)
(v)	$\overset{5}{CH_3} - \overset{4}{CH_2} - \overset{3}{CH_2} - \overset{2}{CH}(\overset{|}{OH}) - \overset{1}{CH_3}$	Pentan-2-ol	Secondary (2°)
(vi)	$\overset{4}{CH_3} - \overset{3}{CH}(\overset{|}{CH_3}) - \overset{2}{CH}(\overset{|}{OH}) - \overset{1}{CH_3}$	3-Methylbutan-2-ol	Secondary (2°)
(vii)	$\overset{1}{CH_3} - \overset{2}{C}(\overset{|}{OH})(\overset{|}{CH_3}) - \overset{3}{CH_2} - \overset{4}{CH_3}$	2-Methylbutan-2-ol	Tertiary (3°)
(viii)	$\overset{5}{CH_3} - \overset{4}{CH_2} - \overset{3}{CH}(\overset{|}{OH}) - \overset{2}{CH_2} - \overset{1}{CH_3}$	Pentan-3-ol	Primary (1°)