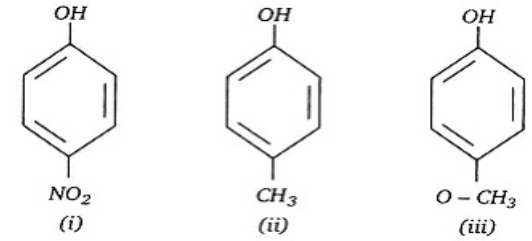
CBSE Test Paper-01

Class - 12 Chemistry (Alcohols, Phenols and Ethers)

1. Alcoholic compounds react
   a. Only as nucleophiles.
   b. both as nucleophiles and electrophiles.
   c. only as electrophiles
   d. None of these
2. The increasing order of acidic strength of the following is:



   a. (ii) < (iii) < (i)
   b. (iii) < (ii) < (i)
   c. (i) < (ii) < (iii)
   d. (i) < (iii) < (ii)
3. Dow's process involves
   a. Nucleophilic substitution
   b. Electrophilic addition
   c. Nucleophilic addition
   d. Electrophilic substitution
4. Aldehydes are reduced to the corresponding alcohols by addition of hydrogen in the presence of catalysts to form
   a. None of these
   b. tertiary alcohols
   c. primary alcohols
   d. secondary alcohols
5. What is the correct order of reactivity of alcohols in the following reaction?

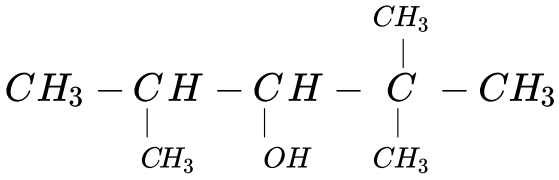
   $R-OH+HCl \xrightarrow{ZnCl_2} R-Cl+H_2O$

   a. 3° > 1° > 2°
   b. 1° > 2° > 3°

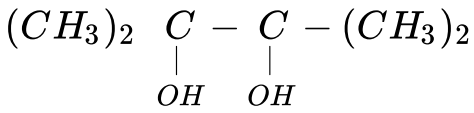
c. 1° < 2° > 3°

d. 3° > 2° > 1°

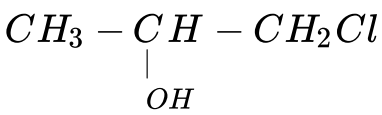
6. Write IUPAC names of the compounds.



7. Write IUPAC names of :-



8. Write IUPAC name of



9. What is Picric acid? How is it prepared from phenol?
10. Give the structural formula and name of the product of following reaction: phenol is treated with excess of aqueous bromine.
11. Write the chemical reaction in formation of l - propanol to 2 - bromo propane.
12. Write the equation of the reaction of hydrogen iodide with
    i. 1-Propoxypropane
    ii. methoxybenzene
    iii. benzylethyl ether
13. Write the structure of the major products expected from the following reactions:
    i. Mononitration of 3-methylphenoI
    ii. Dinitration of 3-methylphenol
    iii. Mononitration of phenyl methanoate
14. During preparation of ester from alcohol and acid, water has to be removed as soon as it is formed?
15. How is anisole prepared? What happens when it is treated with
    i. HI
    ii. Nitrating mixture
    iii. Br_2 dissolved in CS_2?

CBSE Test Paper-01

Class - 12 Chemistry (Alcohols, Phenols and Ethers)

Solutions

1. (a) Only as nucleophiles.

   Explanation: The functional group of the alcohols is the hydroxyl group, –OH. Unlike the alkyl halides, this group has two reactive covalent bonds, the C–O bond and the O–H bond. The electronegativity of oxygen is substantially greater than that of carbon and hydrogen. Consequently, the covalent bonds of this functional group are polarized so that oxygen is electron rich and both carbon and hydrogen are electrophilic.
2. (b) (iii) < (ii) < (i)

   Explanation: The nitro-group is an electron-withdrawing group. The presence of this group in the para position decreases the electron density on the benzene ring. which in turn decreases the electron density on the oxygen of O-H bond. As a result, it is easier to lose a proton. Also, the p-nitrophenoxide ion formed after the loss of protons is stabilized by resonance. Hence, ortho nitrophenol is a stronger acid. On the other hand, methoxy group is an electron-releasing group. Thus, it increases the electron density on the oxygen of the O-H bond and hence, the proton cannot be given out easily. For this reason, para-nitrophenol is more acidic than para-methoxyphenol.
3. (a) Nucleophilic substitution

   Explanation: The Dow process is the electrolytic method of bromine extraction from brine, and was Herbert Henry Dow's second revolutionary process for generating bromine commercially.

   Dow's Process may also refer to the hydrolysis of chlorobenzene in the preparation of phenol. Benzene can be easily converted to chlorobenzene by electrophilic aromatic substitution. It is treated with dilute sodium hydroxide at 350 °C and 300 bar to convert it to sodium phenoxide, which yields phenol upon acidification. This reaction is quickened manifold in the presence of electron withdrawing groups (such as $-NO_2$) ortho and/or para to the halogen group.
4. (c) primary alcohols

   Explanation: $RCHO + H_2 \rightarrow RCH_2OH$

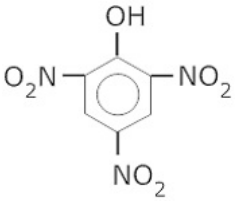
- Aldehydes and ketones are most readily reduced with hydride reagents.
- The reducing agents $LiAlH_4$ and $NaBH_4$ act as a source of 4 x H^- (hydride ion)
- Overall 2 H atoms are added across the C=O to give H-C-O-H
- Hydride reacts with the carbonyl group, C=O, in aldehydes or ketones to give alcohols.
- The substituents on the carbonyl dictate the nature of the product alcohol.
- Reduction of methanal (formaldehyde) gives methanol.
- Reduction of other aldehydes gives primary alcohols.
- Reduction of ketones gives secondary alcohols.

5. (d) 3° > 2° > 1°

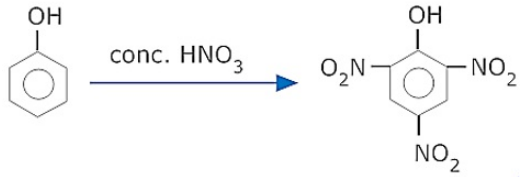
   Explanation: The mixture of HCl and $ZnCl_2$ is called the Lucas Reagent. Secondary and tertiary alcohols react via the S_N1 mechanism with the Lucas reagent. The $ZnCl_2$ coordinates to the hydroxyl oxygen and this generates a far superior leaving group. When alcohols react with a hydrogen halide, a substitution occurs, producing an alkyl halide and water:

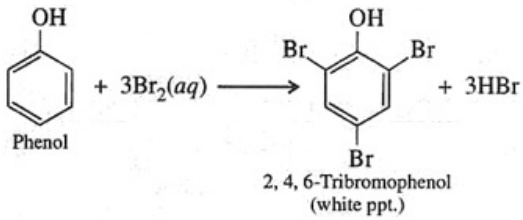
   Scope of Reaction: The order of reactivity of alcohols is 3° > 2° > 1°

6. 2, 2, 4-Trimethylpentane-3-ol
7. 2,3 - Dimethylbutan - 2, 3 -diol
8. 1-chloropropane - 2 - ol
9. Picric acid is 2,4,6 – trinitrophenol



It is prepared from phenol by nitration with conc. HNO_3.



10. 

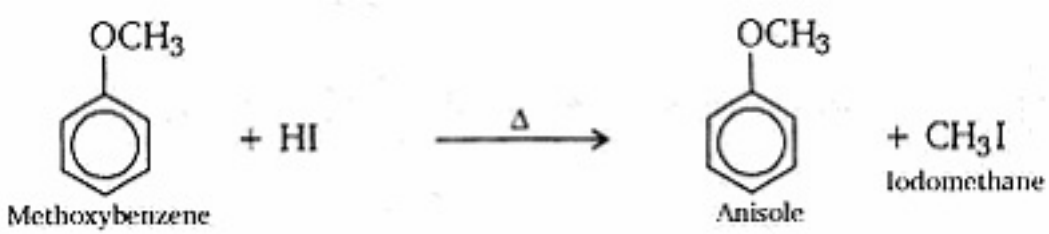
11. $\underset{\text{Propanol}}{CH_3CH_2CH_2OH} \xrightarrow[NaBr+H_2SO_4]{HBr} CH_3CH_2CH_2Br$

$\xrightarrow{al\ KOH} CH_3-CH=CH_2 \xrightarrow{HBr} \underset{\underset{2\ Bromopropane}{Br}}{CH_3-CH-CH_3}$

12. i. $\underset{1-Propoxypropane}{C_2H_5CH_2-O-CH_2C_2H_5} + HI$

$\xrightarrow{573K} \underset{Propan-1-ol}{CH_3CH_2CH_2-OH} + \underset{1-Iodopropane}{CH_3CH_2CH_2-I}$

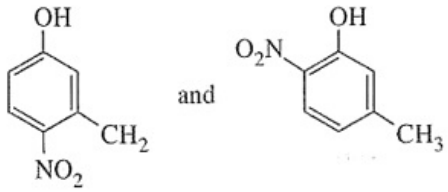
ii.



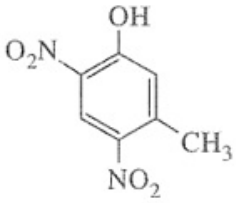
iii.

13. The combined influence of -OH and -CH_3 groups determine the position of the incoming group. Keeping in view that both -OH and -CH_3 are o- and p-directing groups, the following products are obtained:

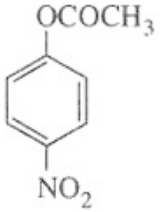
a.



b.



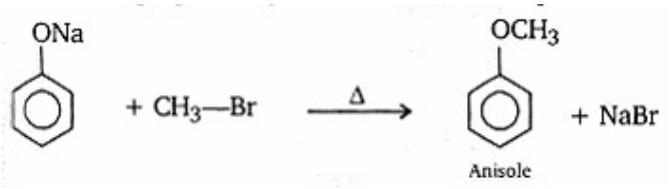
c.



14. The reaction between alcohol and carboxylic acid is reversible and goes in backward direction if water is not removed as soon as it is formed. ROH + RCOOH RCOOR' + H_2O

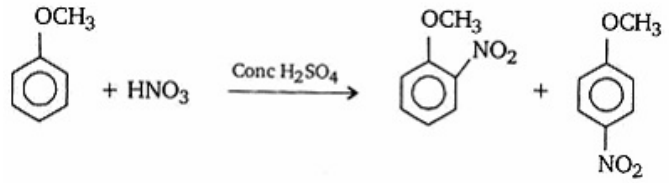
$$ROH + RCOOH \overset{H^+}{\rightleftharpoons} RCOOR' + H_2O$$

15. Anisole is prepared by reaction of sodium phenoxide with methylbromide.

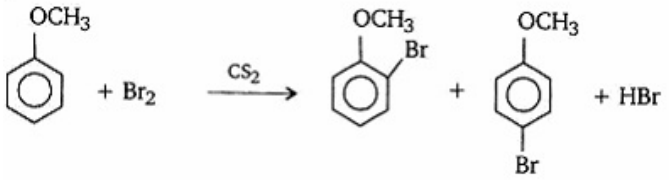


i.

ii.



iii.



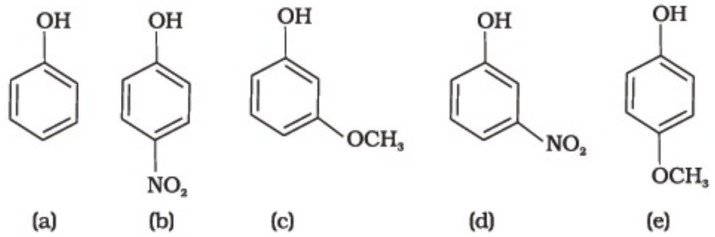
CBSE Test Paper-02

Class - 12 Chemistry (Alcohols, Phenols and Ethers)

1. Which of the following reactions will not result in the formation of carbon-carbon bond?

    1. Friedel Crafts acylation
    2. Wurtz reaction
    3. Cannizzaro reaction
    4. Reimer-Tieman reaction

2. What will be the correct order of acidity of the following compounds?



    a. b>d>c>e>a
    b. b>d>c>a>e
    c. d>b>c>a>e
    d. b>d>a>c>e

3. An organic compound X is oxidised by using acidified $K_2Cr_2O_7$. The product obtained reacts with Phenyl hydrazine but does not answer silver mirror test. The possible structure of X is

    a. $(CH_3)_2CHOH$
    b. None
    c. CH_3CHO
    d. CH_3CH_2OH

4. 3-Pentanol is an example of

    a. Primary alcohol

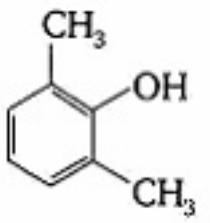
b. Secondary alcohol
c. Tertiary alcohol
d. Aromatic alcohol

5. IUPAC name of the following compound is $CH_3 - \underset{\underset{CH_3}{|}}{CH} - OCH_3$

   a. 2 – methoxy – 2 – methylethane
   b. 2 – methoxypropane
   c. isopropylmethyl ether
   d. 1 – methoxy – 1 – methylethane

6. Write IUPAC names of the compounds.
   $CH_3 - O - CH_2 - \underset{\underset{CH_3}{|}}{CH} - CH_3$

7. Write IUPAC names of:-
   $Br - - CH_2 - - \underset{\underset{OH}{|}}{CH} - - \underset{\underset{CH_2Cl}{|}}{CH} - - Br$

8. Write IUPAC names of the compounds.
   

9. How are the following conversions carried out? (Write reactions with conditions).

   a. 1-propanol to l-chloro-2-propanol
   b. phenol to salicylic acid.

10. Write structural formula and give IUPAC name:-
    Methylpropylether

11. Write structural formula and give IUPAC name:-
    Ethylphenylether

12. Explain why is ortho nitrophenol more acidic than ortho methoxyphenol?

13. The following is not an appropriate reaction for the preparation of tert-butylethyl ether.

$$C_2H_5 - ONa + CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - Cl \rightarrow CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - OC_2H_5$$

    i. What should be the major product of this reaction?
    ii. Write a suitable reaction for the preparation of terf-butylethyl ether.

14. How are the following conversions carried out:

    i. 1-propanol to 1-chloro-2-propanol.
    ii. Phenol to salicylic acid.

15. Write equations of the following reactions:

    i. Friedel-Crafts reaction-alkylation of anisole.
    ii. Nitration of anisole.
    iii. Bromination of anisole in ethanoic acid medium.
    iv. Friedel-Craft's acetylation of anisole.

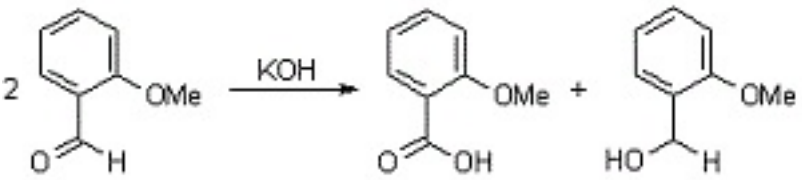
CBSE Test Paper-02

Class - 12 Chemistry (Alcohols, Phenols and Ethers)

Solutions

1. (c) Cannizzaro reaction

   Explanation: The Cannizzaro reaction, named after its discoverer Stanislao Cannizzaro, is a chemical reaction that involves the base-induced disproportionation of an aldehyde lacking a hydrogen atom in the alpha position.

   This redox disproportionation of non-enolizable aldehydes to carboxylic acids and alcohols is conducted in concentrated base.

2. (b) b>d>c>a>e

   Explanation: The acidity of phenols depends on the group attached to the benzene ring. Groups showing electron withdrawing nature i.e. -I and -R effect will increase the acidity while group showing electron donating nature like +I and +R effect will decrease acidity. Resonance effect of group (-R or +R) attached to benzene system is operative only ortho and para position of the benzene system, while at meta position only inductive effect is operative.

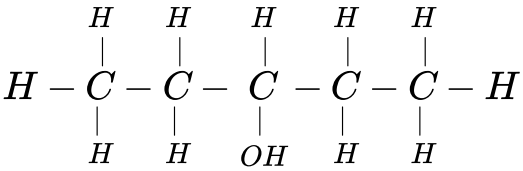
   Clearly, b will be most acidic because $-NO_2$ group attached will show strong -R effect. In d, $-NO_2$ is present at meta position where only -I is effective. -I effect of $-NO_2$ is more than $-OCH_3$ group so, d will be more acidic than c, e will be least acidic as $-OCH_3$ group is attached at para position and shows +R effect.

3. (a) $(CH_3)_2CHOH$

   Explanation: Secondary alcohol on oxidation forms ketone which reacts with hydrazine bus doesnot gives silver mirror test.

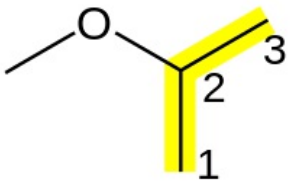
4. (b) Secondary alcohol

   Explanation: A secondary alcohol is a compound in which a hydroxy group, –OH, is attached to a saturated carbon atom which has two other carbon atoms attached to it.



5. (b) 2 – methoxypropane

   Explanation:



2-methoxypropane
(isopropyl methyl ether)

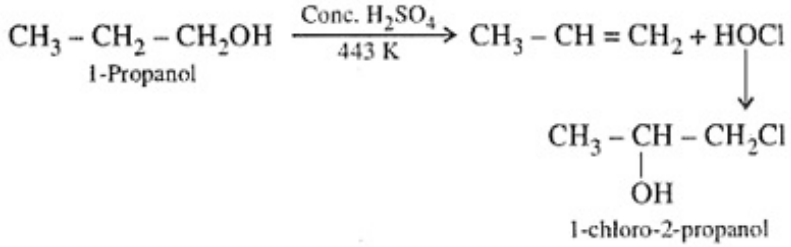
   If the oxygen is not attached to the end of the main alkane chain, then the whole shorter alkyl-plus-ether group is treated as a side-chain and prefixed with its bonding position on the main chain. Thus $CH_3OCH(CH_3)_2$ is 2-methoxypropane.

6. 1-Methoxy 2-Methylpropane

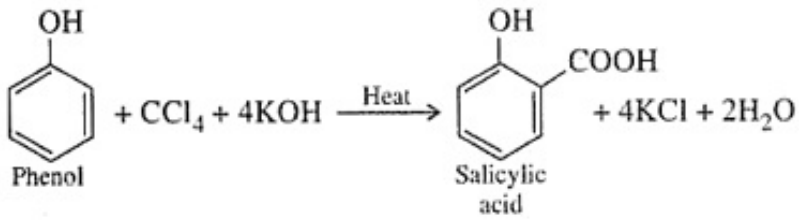
7. 1,3 -- Dibromo - 4 - chloro - 2 - butanol

8. 2, 6-Dimethylphenol

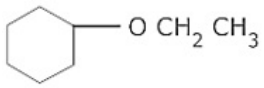
9. a. 1-propanol to l-chloro-2-propanol:



   b. Phenol to salicylic acid:



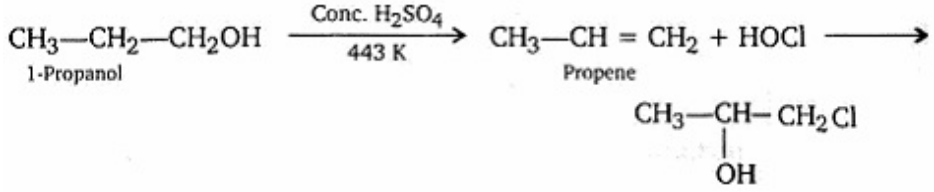
10. CH_3 - CH_2 - CH_2 - O - CH_3 Methoxypropane

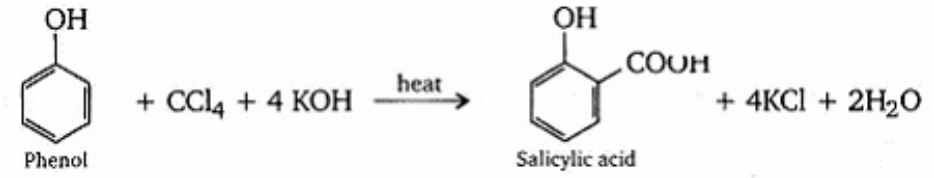
11.  Ethoxybenzene

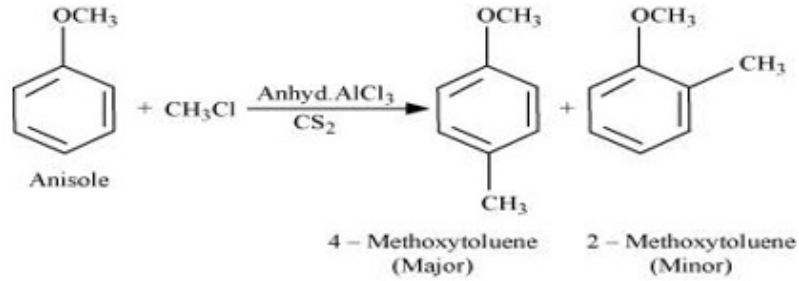
12. The nitro-group is an electron-withdrawing group. The presence of this group in the ortho position decreases the electron density in the O-H bond. As a result, it is easier to lose a proton. Also, the o-nitrophenoxide ion formed after the loss of protons is stabilized by resonance. Hence, ortho nitrophenol is a stronger acid.
On the other hand, methoxy group is an electron-releasing group. Thus, it increases the electron density in the O-H bond and hence, the proton cannot be given out easily. For this reason, ortho-nitrophenol is more acidic than ortho-methoxyphenol.

13. i. The major product of the given reaction is 2-methylprop-l-ene. It is because sodium ethoxide is a strong nucleophile as well as a strong base. Thus, elimination reaction predominates over substitution.

ii. $$CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-{}^{-}\ddot{O}Na^{+}+CH_3CH_2Cl\rightarrow CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-OC_2H_5$$
Sodium tert. butoxide — $2-methyl-2-methoxypropane$ $(tert-butylethyl\ ether)$

14. i. 

ii. 

15. i. 

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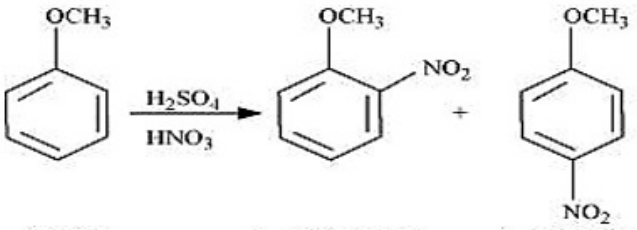
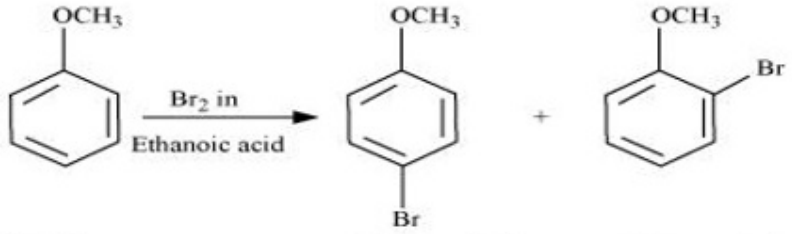


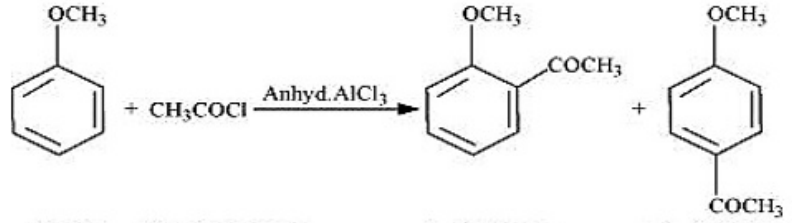
Anisole — 2 – Nitroanisole (Minor) — 4 – Nitroanisole (Major)

iii.



Anisole — *p* – Bromoanisole (Major) — *o* – Bromoanisole (Minor)

iv.



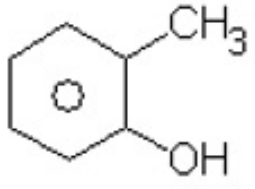
Anisole — Ethanoyl chloride — 2 – Methoxy – acetophenone (Minor) — 4 – Methoxy – acetophenone (Major)

CBSE Test Paper-03

Class - 12 Chemistry (Alcohols, Phenols and Ethers)

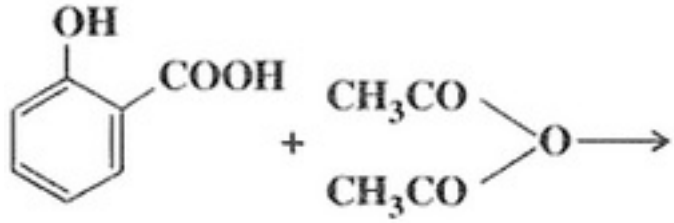
1. One mole of an organic compound 'A' with the formula C_3H_8O reacts completely with two moles of HI to form X and Y. When 'Y' is boiled with aqueous alkali forms Z. Z answers the iodoform test. The compound 'A' is _____.
   a. methoxyethane
   b. ethoxyethane
   c. Propan – 2 – ol
   d. Propan – 1 – ol
2. The compound formed as a result of oxidation of ethyl benzene by $KMnO_4$ is
   a. Acetophenone
   b. Benzoic acid
   c. Benzophenone
   d. Benzyl alcohol
3. Phenol on distillation with zinc dust gives
   a. benzaldehyde
   b. benzophenone
   c. benzene
   d. benzonic acid
4. Primary alcohols are prepared by reduction of carboxylic acids. Though lithium aluminium hydride is a strong reducing agent, it is not used in the reaction. Because
   a. yield is low
   b. it is an expensive reagent
   c. only used for secondary and tertiary alcohols
   d. None of these
5. $C_6H_5OCH_2CH_3$ is called
   1. Ethyl phenyl ether
   2. All of these
   3. Ethoxybenzene
   4. Phenetole
6. What is Lucas reagent? For what purpose is it used?

7. What is the IUPAC Name of given compound?



8. What is wood sprit? Why is it so called?
9. Write structural formula and give IUPAC name:-
   Ethylene Glycol
10. Phenol to Benzyl Alcohol
11. Draw the structures of 4-methyl pent-3-en-2-one
12. Name the reagents which are used in the following conversions:
    i. A primary alcohol to an aldehyde
    ii. Butan-2-one to butan-2-oI
    iii. Phenol to 2, 4, 6-tribromophenol
13. Phenol is acidic in nature.
14. What is fermentation? How is ethanol obtained by fermentation of molecules giving chemical equations?
15. a. Complete the following reactions:

    i. $(CH_3)_2CO \xrightarrow{LiAlH_4}$

    ii. 

    b. Write the structure formulae of the organic compounds 'A', 'B', 'C' and 'D' in the following sequence of reactions:

    'A' + $CH_2MgBr \xrightarrow{H_2O}$

    $$CH_3 - CH_2 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_3 \xrightarrow[H_2SO_4]{Conc.}$$

    $$'B' \xrightarrow{Br_2\ '} C' \xrightarrow{alc.KOH\ '} D'$$

CBSE Test Paper-03

Class - 12 Chemistry (Alcohols, Phenols and Ethers)

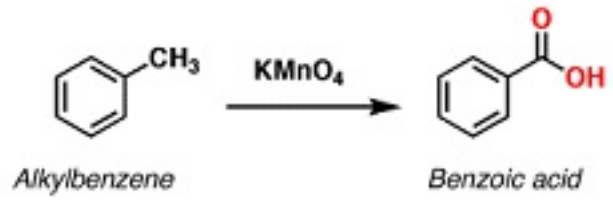
Solutions

1. (a) methoxyethane

   Explanation: Ether react with HI to form alcohol and alkyl iodide. Alcohol on oxidation will give iodoform test.

2. (b) Benzoic acid

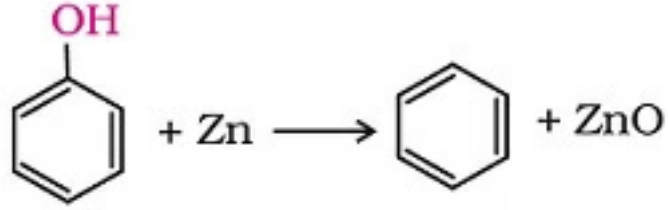
   Explanation: Oxidation of aromatic alkanes with KMnO4 to give carboxylic acids.
   Description: Treatment of an alkylbenzene with potassium permanganate results in oxidation to give the benzoic acid.



Key bonds formed	Key bonds broken
C-O(π)	C-H
C-O	C-H
C-OH	C-H

3. (c) benzene

   Explanation: Phenol is reduced to benzene when it is distilled with zinc dust or its vapour is passed over granules of zinc at 400^{o}C.



4. (b) it is an expensive reagent

   Explanation: Carboxylic acids are reduced to primary alcohols in excellent yields by lithium aluminium hydride, a strong reducing agent.
   However, $LiAlH_4$ is an **expensive reagent,** and therefore, used for preparing **special chemicals only.** Commercially, acids are reduced to alcohols by converting

them to the esters followed by their reduction using hydrogen in the presence of catalyst (catalytic hydrogenation).

5. (b) All of these

   Explanation: $C_6H_5OCH_2CH_3$ is ethyl phenyl ether or phenetole is an organic compound that is an ether. Ethyl phenyl ether has the same properties as some other ethers, such as volatility, explosive vapors, and the ability to form peroxides.

   IUPAC name : Ethoxybenzene

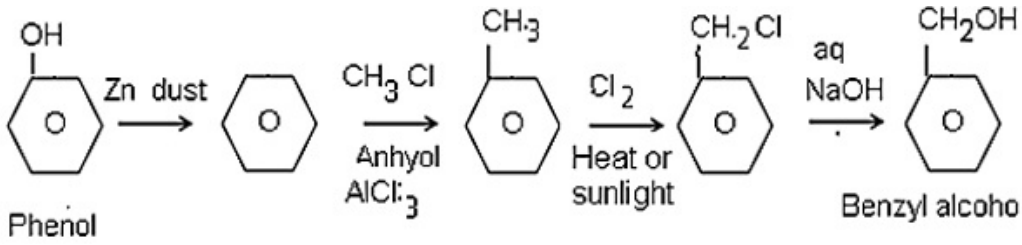
   Other names : Phenetole, Ethyl Phenyl Ether

6. Lucas' reagent is a solution of anhydrous zinc chloride in concentrated hydrochloric acid. This solution is used to classify alcohols of low molecular weight. The reaction is a substitution in which the chloride replaces a hydroxyl group. It is used to distinguish between 1°, 2°, and 3° alcohols.

7. 2- Methyl phenol.

8. Methanol, also called methyl alcohol, wood alcohol, or wood spirit, the simplest of a long series of organic compounds called alcohols; its molecular formula is CH_3OH. It is so called because earlier it was obtained from destructive distillation of wood only.

9. $\begin{array}{l} CH_2-OH \\ | \\ CH_2-OH \end{array}$ Ethane - 1, 2 - diol

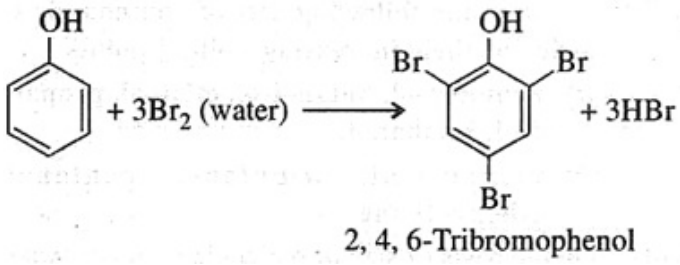
10. 

11. $CH_3-\overset{O}{\overset{||}{C}}-CH=\overset{CH_3}{\overset{|}{C}}-CH_3$

12. i. Reagent is pyridium chlorochromate (PCC), a complex of chromium trioxide with pyridine and HCl.
    ii. Reagent is $NaBH_4$, sodium borohydride

$$\underset{\text{Butan - 2 - one}}{CH_3CH_2-\overset{\overset{O}{||}}{C}-CH_3} \xrightarrow{NaBH_4} \underset{\text{Butan - 2 - ol}}{CH_3CH_2\overset{\overset{OH}{|}}{C}HCH_3}$$

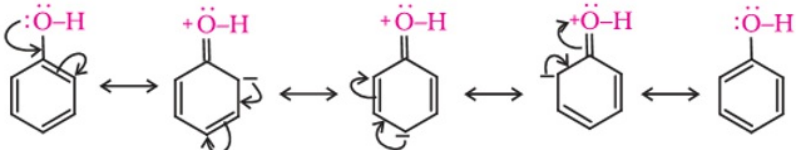
iii. Reagent is bromine water:



2, 4, 6-Tribromophenol

13. Phenol is acidic in nature because

i. phenol, due to resonance, the positive charge rests on oxygen making the shared pair of electrons more towards oxygen and hydrogen as H^+



ii. The carbon attached to OH is SP^2 hybridize and is more electronegative, this decreases the electron density on oxygen, increasing the polarity of O-H bond and ionization of phenol. The phenoxide ion formed by loss of H^+ is more resonance stabilized than phenol itself.

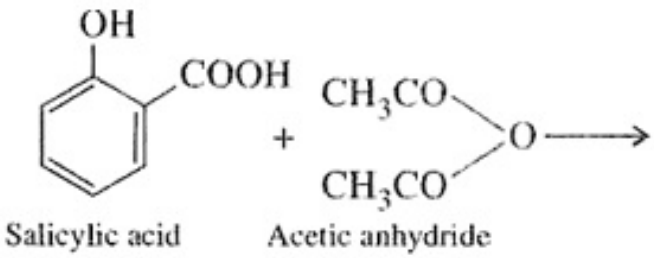
14. The process of fermentation involves breaking down of large molecules into simpler ones in presence of enzymes.
In India, ethanol is mainly prepared by fermentation of molecules a dark brown coloured group left after crystallization of sugar.

$$\underset{Maltose}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow[(from\ yeast)]{Maltase} 2\underset{Glucose}{C_6H_{12}O_6}$$

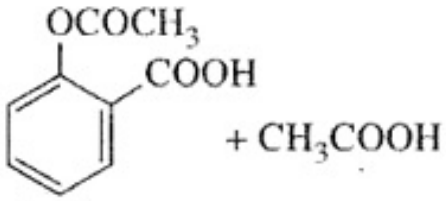
$$\underset{Glucose}{C_6H_{12}O_6} \xrightarrow{Zymase} 2\underset{Ethyl\ alcohol}{C_2H_5OH} + 2CO_2$$

15. a. i. $\underset{\text{Propanone}}{CH_3-\overset{\overset{O}{||}}{C}-CH_3} \xrightarrow[2[H]]{LiAlH_4} \underset{\text{Propan - 2 - ol}}{CH_3-\overset{\overset{OH}{|}}{C}H-CH_3}$

ii.



Salicylic acid Acetic anhydride



Aspirin

b.