

Define alcohols

1. Hydroxy derivatives of aliphatic hydrocarbons are called as alcohols.
2. Example : Methyl alcohol = CH_3OH

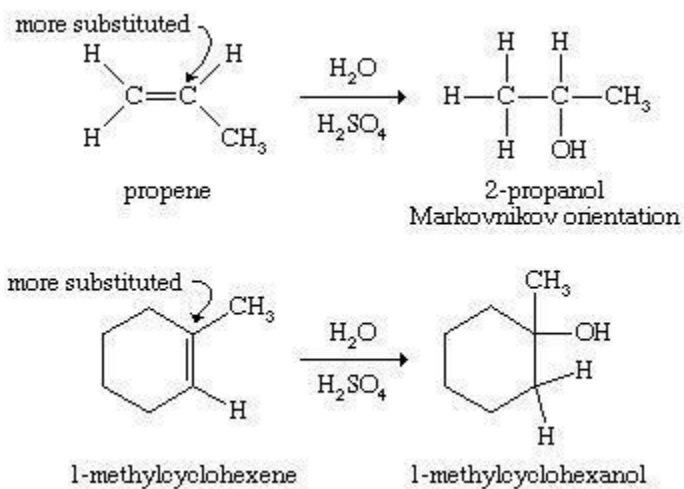
Functional isomerism of alcohol

1. The isomers differ in the type of functional group present in them but their molecular formula is same is called as functional isomerism.
2. Example : Ethanol and Methoxymethane

Optical isomerism of alcohol

1. Monohydric alcohols containing four or more carbon atoms show optical isomerism when carbon atom carrying the OH group is asymmetric.
2. For example : d-Butan-2-ol and l-Butan-2-ol.

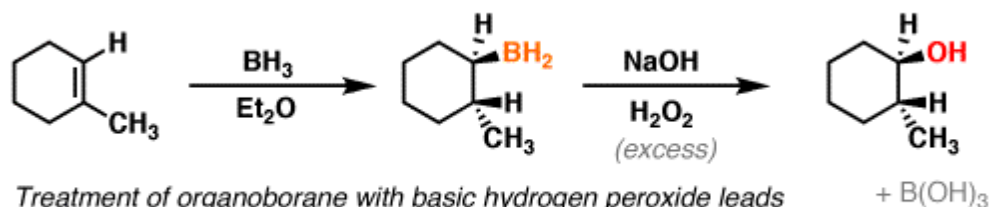
Alcohols through hydration



Alkenes can be converted to alcohols by direct or indirect addition of water in the presence of mineral acid by Markovnikoff's or anti-Markovnikoff's rule.

Alcohols through hydration-oxidation of alkenes

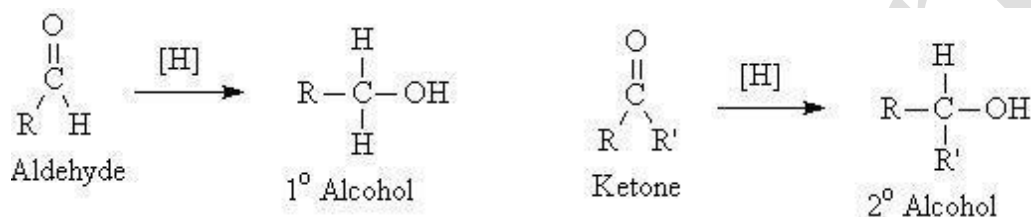
Hydroboration - oxidation



Stereochemistry is preserved!

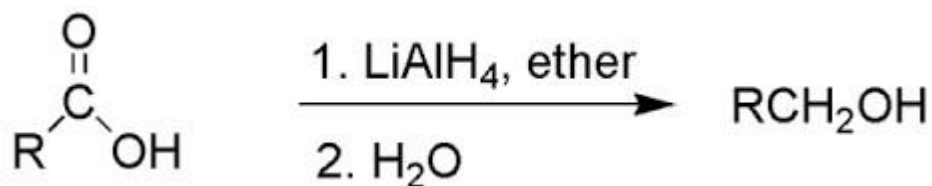
In this process, the alkene is treated with diborane and the product obtained is oxidised with alkaline hydrogen peroxide.

Preparation of alcohols by reduction of aldehydes and ketones



Carbonyl compounds such as aldehydes and ketones can be reduced to alcohols by using reducing agents such as lithium aluminium hydride etc. Aldehyde always form primary alcohols while ketone form secondary alcohol.

Alcohols preparation by carboxylic acid and ester

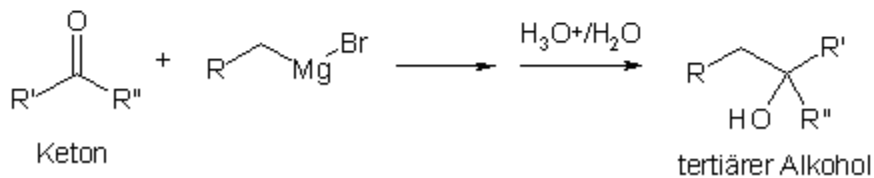
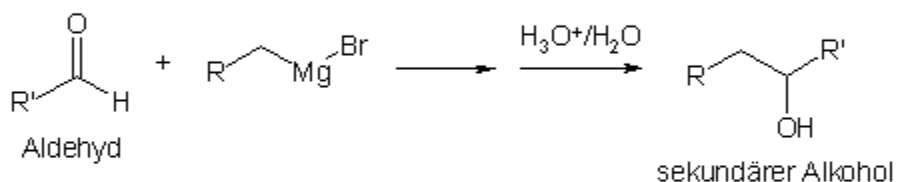
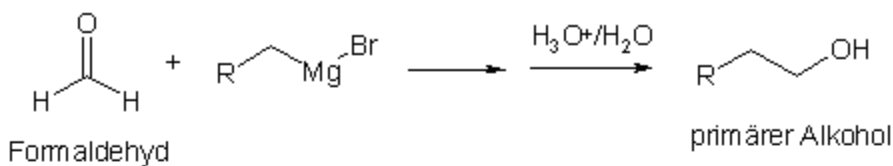


Carboxylic acid can be reduced to give primary alcohols while esters give mixture of alcohols on reduction.

Hydrogenolysis

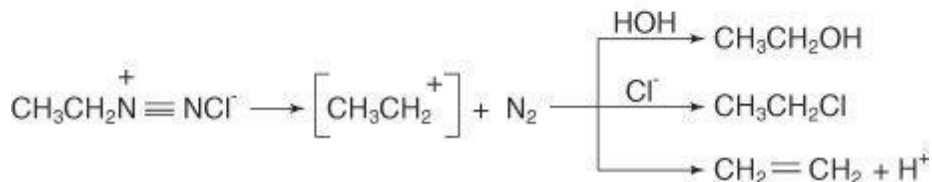
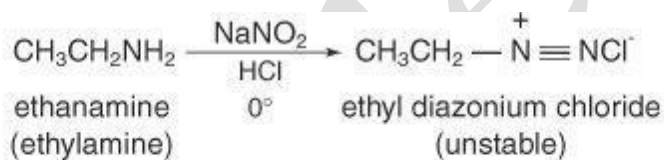
Hydrogenolysis is a chemical reaction whereby a carbon carbon or carbon heteroatom single bond is cleaved or undergoes "lysis" by hydrogen. The heteroatom may vary, but it usually is oxygen, nitrogen, or sulfur. A related reaction is hydrogenation, where hydrogen is added to the molecule, without cleaving bonds.

Preparation of alcohols by grignard reagent



Aldehyde with grignard reagent gives primary alcohol whereas ketone gives secondary and tertiary alcohol.

Alcohols from aliphatic primary amines



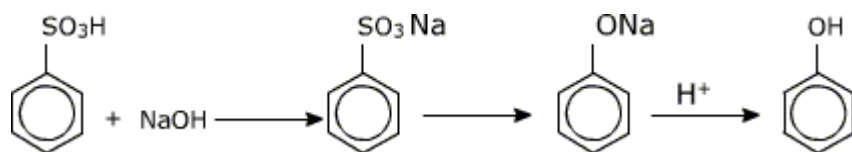
When an aliphatic primary amine is treated with nitrous acid, primary alcohol is prepared.

Alcohol by fermentation of carbohydrates

Fermentation is the oldest chemical process for the preparation of ethanol from carbohydrates such as sucrose, fructose by adding salt and acid solutions and yeast and the temperature is

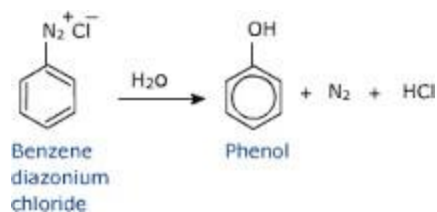
maintained at about 30 degree for few days. The enzymes invertase and zymase present in yeast convert the sugars into ethyl alcohol.

Prepare phenol by benzenesulphonic acid



When sodium salts of aromatic sulphonic acids are fused with sodium hydroxide, sodium derivatives of phenol is obtained which on acidification yields phenol.

Phenol from diazonium salt

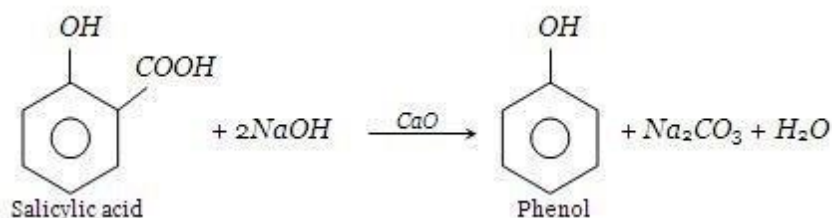


In this method hydrolysis of diazonium salt either in the presence of sulphuric acid or by steam distillation is done to prepare alcohol.

Preparation of phenol from haloarenes

When chlorobenzene is heated with excess of NaOH and the formed product is hydrolysed by dil HCl, phenol is formed.

Phenol from decarboxylation of salicylic acid



When sodium salt of salicylic acid i.e., sodium salicylate is distilled with sodalime, it undergoes decarboxylation to give sodium phenoxide which upon acidification gives phenol.

Properties of alcohols

Alcohols are soluble in water. This is due to the hydroxyl group in the alcohol which is able to form hydrogen bonds with water molecules. As the length of the hydrocarbon chain increases, the solubility in water decreases.

Physical state of alcohol and phenols

The lower alcohols are colorless liquids having alcoholic odor and burning taste. The higher members are waxy solids.

Simple phenols are either colorless liquids or crystalline solids having low melting points.

Boiling point of alcohol and phenols

The boiling point of alcohol are considerably higher than those of hydrocarbon. The boiling point of alcohol increases with increase in the molecular mass.

Boiling point of phenols are higher due to their capability of forming intermolecular hydrogen bonds.

Intermolecular hydrogen bonding in alcohol

Alcohols are polar in nature due to the presence of -OH group which is attached to an alkyl group. Since oxygen is more electronegative than both hydrogen and carbon, it tries to pull the shared electrons of O-H bond towards its own side. The presence of a partial positive charge on hydrogen and a partial negative charge on oxygen permit alcohol for formation of intermolecular hydrogen bonding.

Solubility of alcohol and phenols

The lower member alcohol are completely miscible with water, solubility decreases with increase in molecular mass. Unlike alcohols, phenols are only slightly soluble in water.

Physiological action of alcohol

Alcohol (when used commonly refers to ethanol) is consumed widely around the world for numerous reasons. Its properties have been both praised and demonized. In humans it generally acts as a depressant with, conversely, mild stimulating effects of some parts of the brain. At low levels of consumption alcohol has minimal effects on a person; at higher levels it leads to disorientation, coma, and death. Most alcohol that is consumed is removed from the body via the liver, which breaks alcohol down before removal. However, alcohol can readily cross any cell

membrane. Ethanol is widely used as a solvent and disinfectant. It is used as a solvent because it breaks down many proteins and other molecules, such as lipids, which form the main structure of cell walls. It is used as a disinfectant for the same reasons it breaks down bacteria and many viruses.

Toxic nature of alcohols

When consumed, alcohol has similar effects on cells in the body. It can break down the lipids and proteins that form the walls of cells. Body tissue left in alcohol will dissolve over time. Most of the time as alcohol continues to be consumed it can have lasting effects on the body. This is one of the effects that leads to sclerosis of the liver; eventually the toxicity and solvent effects of alcohol are too much for the liver. In the brain, alcohol easily crosses the blood brain barrier, which serves to protect the brain from harmful substances and directly affects the neurotransmitters and receptors of neurons. At high enough concentrations (or over time) alcohol can weaken the blood brain barrier by damaging the tight junctions of blood vessels in the brain that form the barrier.

Acidic character of alcohol

The acidic character of alcohols is due to the electronegative oxygen atom which withdraws the electrons of the O-H bond towards itself. As a result, the O-H bond becomes weak and hence a proton can be easily abstracted by a strong base. Actually, alcohols are very weak acids even weaker than water.

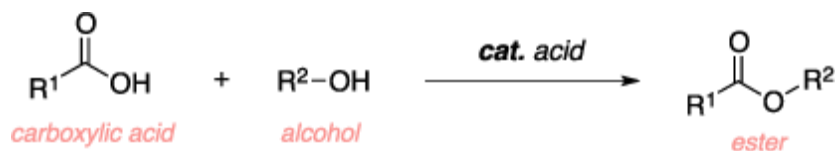
Acidic character of alcohols and water

1. Those Alcohols where the conjugate base is resonance stabilized will be more acidic.
2. The classic example is cyclohexanol and phenol.
3. Cyclohexanol has the pKa of a typical alcohol (about 16).
4. The pKa of phenol, however, is about 10.
5. In case of water it is amphoteric in nature.
6. They can behave as acid as well as base.

Reaction with metal hydrides

Alcohols react with metal hydrides to form metal alkoxides with the evolution of hydrogen gas.

Fisher-Speier esterification



Fischer esterification or Fischer-Speier esterification is a special type of esterification in which a carboxylic acid is refluxed with an alcohol in the presence of an acid catalyst.

Dehydration of alcohols

The process of elimination of a water molecule from a compound is known as dehydration. The alcohols can be dehydrated either by heating them with concentrated sulphuric acid.

Dehydration of alcohols at different temperature

At 443K concentrated sulphuric acid and alcohol produces alkene.

At 440 K concentrated sulphuric acid and alcohol produces alkene.

At 413 K concentrated sulphuric acid and alcohol produces ether.

Alcoholates

Alcoholate: The crystalline form of a salt in which alcohol takes the place of water of crystallization. For example, a tincture or alcoholic extract of plant material, an alkoxide etc.

Why phenols being stronger acids than alcohols

The alcohols are less acidic than phenols because it is very tough to remove the H ion from alcohol. Phenol can lose hydrogen ion easily because phenoxide ion formed is stabilized to some extent as negative charge on the oxygen atom is delocalised around the ring. De-localized charge means negative charge is distributed almost equally through the compounds. The more stable ion is, the more likely it is to form.

Effect of substituents on acidity of phenol

If strong electron withdrawing group is attached to phenol, the acidity of phenol increases, because electron-withdrawing group has the ability to de-localize negative charge, more than phenoxide ion itself.

Acidic strength of nitrophenols

1. The acidic nature of the three nitrophenols increases in the order: meta < ortho < para.
2. Para nitrophenol is the most acidic among the three.
3. The nitro group attached to a conjugated system shows strong -M effect, and this decreases the electron density more at the ortho and para positions than at the meta position.
4. This factor helps greater stabilization of the conjugate base (nitro phenoxide ion) of the ortho and para isomers than that of the meta isomer.
5. So, meta nitrophenol is the weakest in terms of acidity.

Acidic strength of cresols

The decreasing order of acidic strength: Phenol > m-Cresol > o-Cresol > p-Cresol.

acidic strength of methoxy and amino nitrophenols

As amino and methoxy both are electron donating group and exert +R effect. Such group pumps electrons into the ring and thus intensify the negative charge of the phenoxide ion. This groups decreases the acidic strength of the phenol.

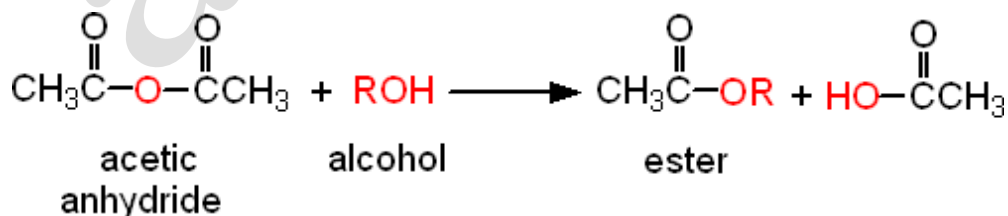
Acidic strength of halophenols

As halogens are electron-withdrawing groups they withdraw electrons from the ring and results in dispersal of the negative charge of phenoxide ion and thus an increase in the stability of the ion. Consequently, acidic strength of the phenol increases.

Acylation of alcohols and phenols

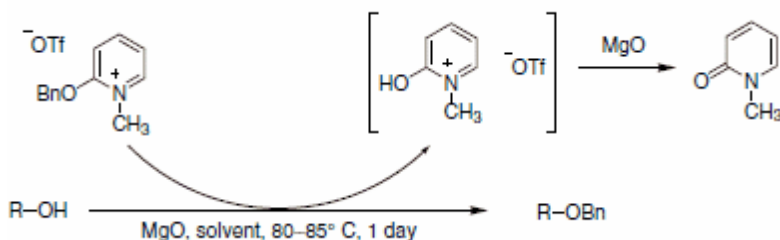
Alcohols and phenols react with acid chlorides and acid anhydrides in the presence of bases like pyridine as catalyst to form esters. This reaction is known as acylation.

Acetylation of alcohol and phenols



When acetyl chlorides or acetic anhydrides reacts with alcohol or phenols the reaction is called as acetylation of alcohol or phenol.

Benzylation of alcohols and phenols



When phenol is treated with benzyl alcohol in the presence of sulphuric acid. The effect of variation of temperature, molar ratio of phenol to benzyl alcohol, time of reaction, concentration and amount of sulphuric acid have been studied on the reaction.

Schotten-Baumann reaction



Phenols when treated with phenyl acid chlorides gives phenyl benzoate.

Reactions involving cleavage of C-OH bond

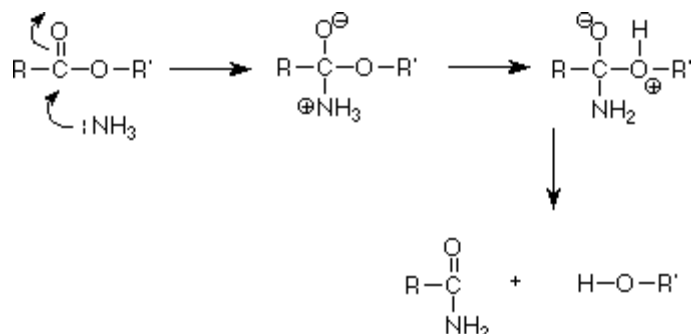
1. Reaction with hydrogen halides.
2. Reaction with phosphorus halide.
3. Reaction with thionyl chloride.
4. Reaction with ammonia.

Haloalkanes from alcohols and halogen acids



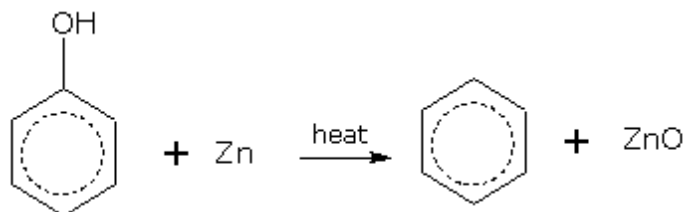
Alcohols react with hydrogen halide to form the haloalkanes.

Amines from alcohol or phenol and ammonia



When a mixture of alcohol vapour and ammonia is passed over alumina or thoria at 633K, a mixture of primary, secondary, tertiary amines is obtained.

Benzene from phenols and zinc dust



1. Phenol on reaction with zinc dust gives benzene and zinc oxide as by product.

Different reaction involving alcohol molecule as whole

1. Dehydration
2. Oxidation
3. Dehydrohalogenation
4. Reaction with halogens

Products of oxidation of alcohols

The oxidation of alcohols is different at different conditions.

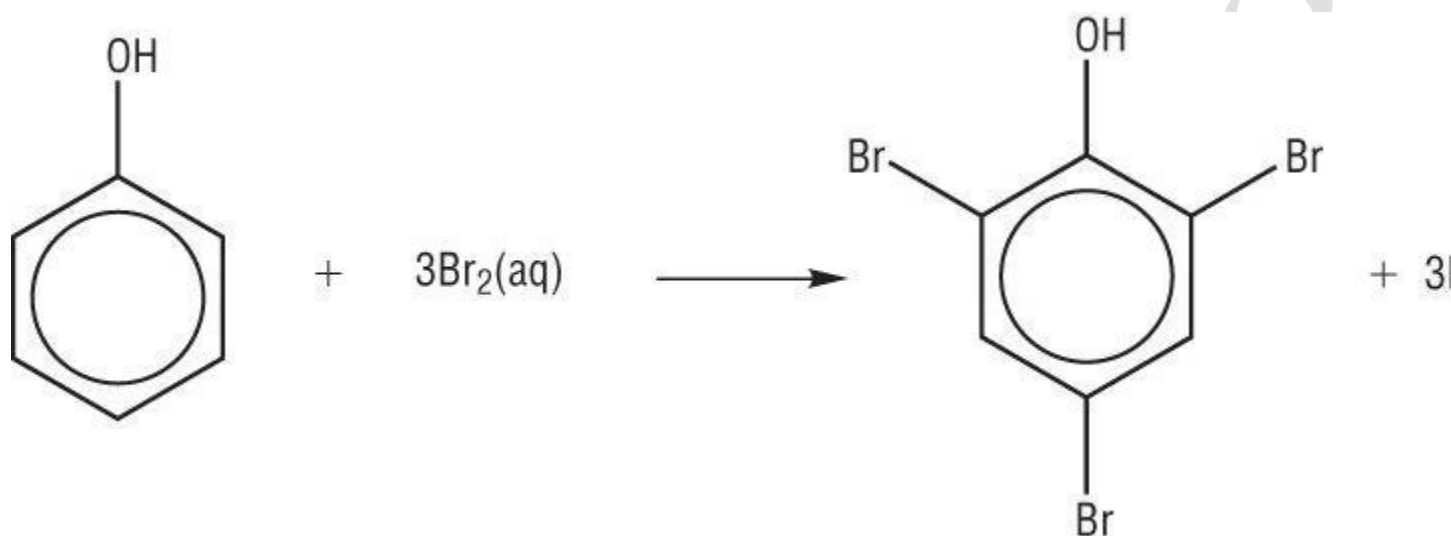
Primary alcohols give aldehyde, secondary alcohols give ketone's and tertiary alcohol also gives ketone.

Electrophilic substitution reaction of phenols

Electrophilic aromatic substitution reactions are the reactions where an electrophile replaces one or more hydrogen atoms attached to the aromatic ring. Phenols are highly prone to electrophilic

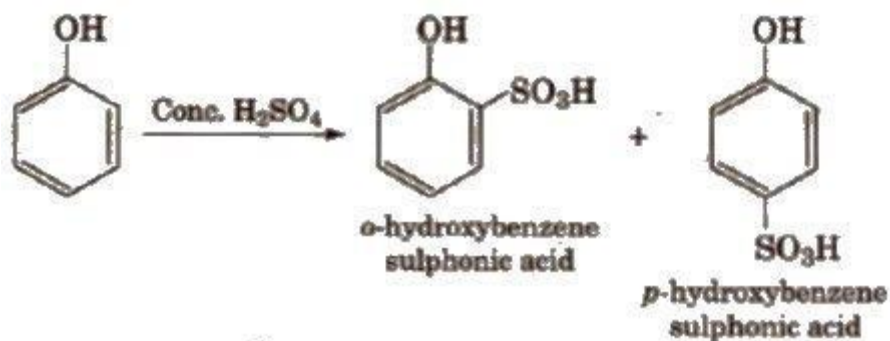
substitution reactions due to rich electron density. The hydroxyl group attached to the aromatic ring in phenol facilitates the effective delocalization of the charge in the aromatic ring. Thus, it stabilizes the arenium ion through resonance. The hydroxyl group also acts as ortho para directors.

Halogenation of phenol



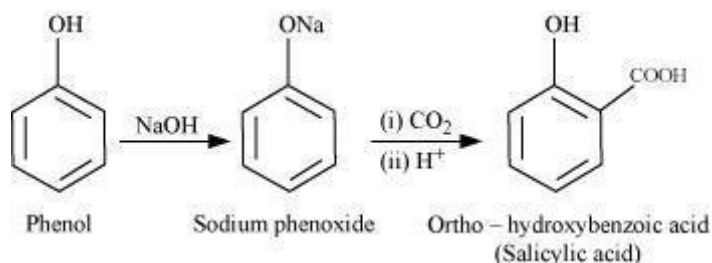
Phenols when treated with halogens undergo halogenation readily to form polyhalogen derivatives.

Sulphonation of phenol



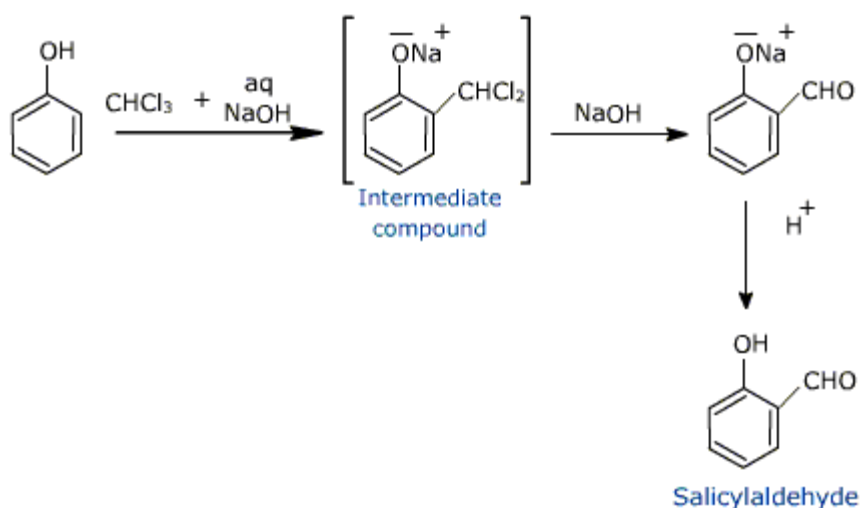
Phenols can be sulphonated readily at O-(ortho) and P(para) positions by the action of concentrated sulphuric acid.

Kolbe's reaction of phenols



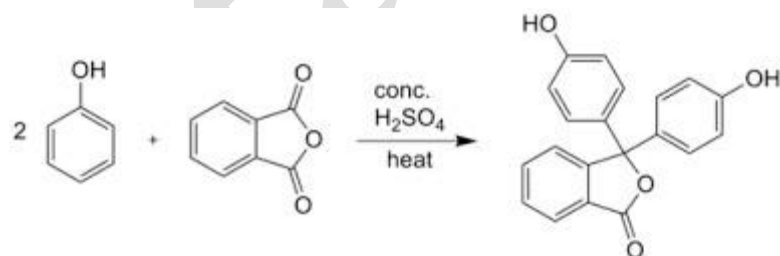
When sodium salt of phenol, is heated with carbon dioxide at about 400 K under a pressure of 4-7 atmosphere, a carboxyl group is introduced mainly at ortho position and sodium salicylate is a measure product.

Reimer-Tiemann reaction



When phenol is treated with chloroform in the presence of aqueous sodium hydroxide at 340 K followed by hydrolysis, an aldehyde group is introduced into the ring mainly at O-position .

Condensation of phenol with phthalic anhydride



When phenol is condensed with phthalic anhydride in the presence of of conc.sulphuric acid, Phenolphthalein is obtained.

Oxidation and reduction of phenols

Phenols readily oxidisable substances and may be oxidised even by atmospheric air. They give different products under different conditions.

Phenols can be hydrogenated in the presence of nickel at about 473-533K when they get reduced into corresponding cyclic alcohols.

Distinguish between primary, secondary and tertiary alcohol

1. Oxidation test : The oxidation behavior of the three types of alcohols is markedly different from one another. Hence they can distinguish by their oxidation behavior.

2. Lucas reagent: This test is based upon the fact that reactivity of primary, secondary and tertiary alcohols towards hydrochloric acid follows the order tertiary greater than secondary greater than primary.

Victor Meyer test

In this test, the unknown alcohol is converted into corresponding nitroalkane, which is then treated with nitrous acid followed by alkalinizing the solution.

If blood red coloration appears, the given alcohol is primary, if blue then it is secondary, if solution remains colorless it is tertiary.

Lucas test

This test is based upon the fact that the reactivity of primary, secondary and tertiary alcohols towards HCl is 3 greater than 2 greater than 1. The alcohol reacts with HCl to form an alkyl chloride which being insoluble in water, forms turbidity in the test solution.

Convert secondary alcohol into tertiary alcohol

Secondary alcohol on oxidation gives ketone, which on reaction with grignard reagent and water, gives tertiary alcohol.

Methanol

Methanol, also known as methyl alcohol, wood alcohol, methyl hydrate, or wood spirits. Methanol acquired the name "wood alcohol" because it was once produced chiefly as a byproduct of the destructive distillation of wood. Today, industrial methanol is produced in a catalytic process directly from carbon monoxide, carbon dioxide, and hydrogen.

Methods of preparation of methanol

1. By destructive distillation of wood.
2. From water gas.
3. From natural gas.

Chemical properties of methanol

It is a typical monohydric alcohol and gives all the reaction characteristic of monohydric alcohol.

Uses of methanol

Methanol is highly toxic and unfit for consumption. At room temperature, it is a polar liquid, and is used as an antifreeze, solvent, fuel, and as a denaturant for ethanol. It is also used for producing biodiesel via transesterification reaction.

Different methods of manufacturing of phenols

1. From Dow's process
2. From cumene

Physical properties of phenol

Phenol is a colourless, hygroscopic, crystalline solid having a characteristic carbolic odour. It turns pink on exposure to air and sunlight. It melts at 315K and boils at 455 K. It is partially soluble in water.

Chemical properties of phenol

Chemically phenol gives reaction such as halogenation, sulphonation, nitration, acylation, alkylation etc.

Uses of phenol

Phenols are widely used in the manufacture of dyes, plastic, explosive etc. They provide starting materials for the preparation of large number of drugs. Phenols are used in perfumery.

Describe ethanol

Ethanol also commonly called alcohol, ethyl alcohol, and drinking alcohol, is the principal type of alcohol found in alcoholic beverages, produced by the fermentation of sugars by yeasts. It is one of the oldest recreational drug.. It can cause alcoholic intoxication when consumed in sufficient quantity.

Methods involved in preparation of ethanol

1. From ethylene
2. From acetylene
3. From fermentation of carbohydrate

Properties of ethanol

Ethyl alcohol is a colorless liquid with boiling point 351 K. It has a characteristic smell and burning taste. It is miscible in water. It is good solvent for fats, oils, paints etc. Ethyl alcohol is typical monohydric alcohol gives all general monohydric alcohol reactions.

Physical properties of ethanol

Ethyl alcohol is a colorless liquid with boiling point 351 K. It has a characteristic smell and burning taste. It is miscible in water. It is good solvent for fats, oils, paints etc.

Chemical properties of ethanol

It is a typical monohydric alcohol hence the reaction like Halogenation, oxidation, reduction etc. will remain same.

Uses of ethanol

Ethanol act as solvent for paints, varnishes , cosmetics,drugs, tinctures etc.

it is used in the manufacture of alcoholic beverages.

it is used as a fuel for spirit lamps and stoves.

it is also used as a substitute of petrol in internal combustion engines.

Reactions of ethanol

Ethanol readily reacts with sodium to form sodium ethoxide and hydrogen gas. Ethanol on heating to a temperature of 443 K with excess concentrated sulphuric acid, gives ethene. Ethanol undergoes oxidation in presence of potassium dichromate to form initially ethanal and finally is oxidised to ethanoic acid. Reaction of ethanol with carboxylic acids is called esterification reaction. The product formed in this reaction is an ester along with water.

Absolute alcohol

It is 100% pure ethanol and is obtained by azeotropic distillation of rectified spirit.

Glycol

The simplest form of dihydric alcohol is known as glycol. Ethylene-1,2-diol is the example.

Methods of prepration of glycol

- 1.Laboratory methods: Includes preparation from ethylene and ethylene bromide.
- 2.Industrial method: Includes prepration from ethene.

Physical properties of glycol

It is a colourless, viscous, and hygroscopic liquid, with sweet taste.

It is highly soluble in water, soluble in polar solvent but insoluble in non-polar solvent.

Boiling point is very high due to intermolecular hydrogen bonding.

Uses of glycol

It is used for making synthetic fibers in textile industry.

Used in manufacture of dioxane and diethylene glycol also used as preservatives.

Glycerol

Propane-1,2,3-triol is commonly known as glycerol or glycerine. It is the simplest and one of the most important trihydric alcohols.

Different method of preparation of glycerol

A Industrial Preparation

- 1.From oils and fats
- 2.From propene

Physical properties of glycerol

Glycerol is a colorless, hygroscopic, highly viscous syrupy liquid.

It is miscible with water and alcohol in all proportions.

The boiling point of glycerol is 563 K which is quite high.

Glycerol is non-toxic in nature.

Uses of glycerol

Glycerol is used for the manufacture of nitroglycerine.

Used in manufacture of sweetening agents.

Used for lubricating fine machinery such as watches and locks etc.

Power alcohol

The alcohol used for the generation of power is called as power alcohol. It is a mixture petrol and alcohol in the ratio 4:1.

Methylated or denatured spirit

Ethyl alcohol is largely used for making alcoholic beverages. Therefore, the manufacture and sale of ethyl alcohol is controlled by the government and heavy excise duty is levied on alcoholic beverages. Industrial alcohol is made poisonous by the addition of poisonous substances like

methyl alcohol, pyridine. Such sample of alcohol is called methylated spirit or denatured alcohols.

Different method of preparation of ether

1. From halo alkanes: This includes Williamson's synthesis and heating halo alkanes with dry silver oxide.
2. From alcohols: This method includes Acid catalyzed and catalytic dehydration .
3. By the action of diazo methane on alcohols.

Ether by catalytic dehydration of alcohols

The dehydration of alcohols involving the formation of ethers can be carried out by passing the vapors of alcohols over heated alumina at 525 K.

Preparation of ether by direct addition of alcohol to reactive alkene.

Alkenes on reaction with alcohol in presence of reducing agents provides hydrogen and forms ether.

Ether from alkyl halide

Ether can be prepared by heating halo alkanes with dry silver oxide.

Limitations of williamson synthesis

The acid-catalyzed dehydration of alcohols for the preparation of ether is only suitable for primary ether because secondary alcohols give a mixture of alkene and ether while tertiary alcohols only alkenes under similar conditions.

Ether by alkyl halides and silver oxide

Ether can be prepared by heating halo alkanes with dry silver oxide. The method is suitable for the preparation of both simple as well as mixed ethers.

Ether using grignard reagent

Higher ethers can be prepared by treating lower halogenated ethers with suitable grignard reagent. This is good method of converting lower ether into higher one.

Physical properties of ether

Dimethyl ether and ethyl methyl ether are gases at ordinary temperatures, while other ethers are colorless liquids with pleasant characteristic ethereal odour.

Dipolar nature of ether

The polar character of ethers can be understood on the basis of their electronic structure. The central oxygen atom is electronegative than that of carbon, C-O bonds are slightly polar in ethers. An ether molecule is an angular molecule having C-O-C bond angle about 110 degrees. Thus the geometry of ether molecule does not permit the mutual cancellation of the two dipoles. Hence it shows dipolar nature.

Boiling trends of ether

The boiling points of ethers are much lower than those of isomeric alcohols. This is due to the absence of intermolecular hydrogen bonding. The boiling points are closer to those of alkanes having comparable molecular mass.

Solubility of ethers

Ethers are sparingly soluble in water but dissolve readily in organic solvents such as benzene, chloroform, etc. The solubility of ethers in water decreases with increase in the molecular mass.

Density of ether

The densities of ethers increase gradually with increase in the molecular mass. But their densities are less than 1. Hence, all ethers are lighter than water.

Electronic structure of ethers

The structure of an ether molecule is almost similar to that of a water molecule. The ethereal oxygen is in a state of sp^3 hybridization.

The two sp^3 hybrid orbitals of oxygen possess one unpaired electron each and overlap with the singly filled orbitals of alkyl groups to form two O-C sigma bonds. The remaining two sp^3 hybrid orbitals contain a lone pair of electrons.

Ethereal oxygen reactions

The oxygen atom present in ethers possesses two lone pair of electrons. Therefore, ethers behave as Lewis base and can coordinate with an electron deficient species by donating a lone pair of electrons to it. Some important reactions of this type are given as,

1. Formation of peroxides
2. Formation of oxonium salts
3. Formation of coordination compounds

Reactions involving the cleavage of C-O bond of ethers

1. Reaction with halogen acids.
2. Reaction with sulphuric acid.
3. Reaction with phosphorus pentachloride.
4. Hydrolysis.
5. Reaction with acid chlorides and acid anhydrides.
6. Dehydration.

Dehydration of ether

When ether vapors are passed over alumina heated at 633K, they undergo dehydration to form alkenes.

Estimate alkoxy groups using ziegler method

In this method the organic compound containing alkoxy group is treated with hydrogen iodide and the alkyl halide formed is further treated with silver nitrate to precipitate silver iodide. In this reaction only hydrogen iodide can be used because it consists of an ionic bond, while HF, HCl, HBr contain covalent bond where an iodide ion is liberated which forms a precipitate with silver nitrate. The silver iodide can be weighed and from its weight the number of alkoxy groups can be estimated.

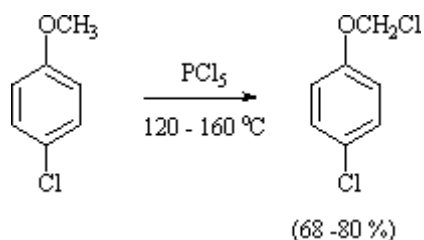
Reaction of ether with sulphuric acid

- (A) When boiled with dilute sulphuric acid under pressure, ethers get hydrolyzed to form corresponding alcohols.
- (B) When treated with cold and concentrated sulphuric acid, ethers form oxonium salts.
- (C) When heated with concentrated sulphuric acid, ethers form alcohols and alkyl hydrogen sulphates.

Reaction between ethers and acid chlorides

Ethers react with acid chlorides in the presence of anhydrous acid chlorides to form alkyl halide and esters.

List different reaction of ethers involving alkyl group

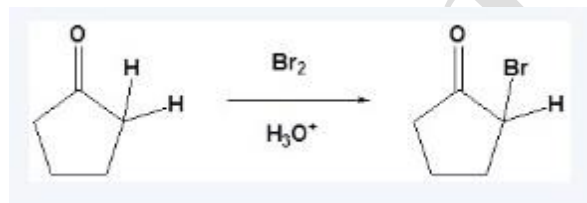


1. Halogenation.
2. Combustion.

Products obtained by action of air and light on ether

When ethers are treated without light highly substituted ether is obtained and with air carbon dioxide and water is obtained.

Halogenation of ethers



When ethers are treated with chlorine or bromine in dark, substitution mainly takes place at alpha carbon atom.

Combustion of ethers

Ethers are volatile and highly inflammable. They burn in air or oxygen to form carbon dioxide and water.

Electrophilic substitution reaction of ethers

The alkoxy group present in arylalkyl exerts +R effect and increases electron density at o- and p-positions.

Due to an increase in electron density at o-and p-positions,arylalkyl ethers undergo substitution reactions in benzene ring at o-and p-positions.

Halogenation of phenyl alkyl ethers

When anisole (methyl phenyl ether) is treated with bromine in the presence of a halogen carrier such as Fe; 2,4,6-tribromoanisole is obtained.

Friedel-crafts reaction of phenyl alkyl ether

Aromatic ethers undergo Friedel-Crafts alkylation to give o-and p- alkyl anisole and with acylation it gives o- and p- alkoxy acetophenone.

Nitration of phenyl alkyl ethers

When treated with a mixture of conc.nitric acid and conc.sulphuric acid phenyl alkyl ether form a mixture of o- and p- nitro phenyl alkyl ether.

Uses of ethers

- 1.Ethers are widely used as laboratory and industrial solvents for fats, oils, gums, resins etc.
- 2.Ethers can also be used as refrigerants.
- 3.Diethyl ether is used as a general anesthetic in surgery.

Methods of preparation of diethyl ethers

Laboratory preparation: In the lab, diethyl ether is prepared by heating excess of ethyl alcohol with conc.sulphuric acid at 413 K.

Physical properties of ethers

- 1.Diethyl ether is a colorless , highly volatile liquid.It boils at 308 K.It is lighter than water.
2. It has a pleasant odour and burning taste.Its vapors causes unconsciousness when inhaled.
- 3.It is slightly soluble in water but readily miscible with alcohol, benzene , etc.

Chemical properties of ether

It is typical member of the ether family and gives almost all the general reactions of ethers like halogenation, combustion, etc.

Uses of diethyl ether

It is largely used as solvents for oils, fats, gums, resins, plastics, etc.

It is used as refrigerant.

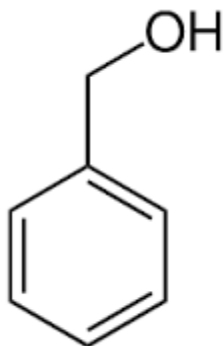
It is used as general anesthetic in surgery.

Mixed with alcohol, it is used as a substitute for petrol under the name Natalite.

Sources of alcohol

1. Ethanol is commercially produced using a process called fermentation.
2. Many other alcohols can be made this way, but are more likely to be produced by synthetic routes - from natural gas, oil or coal.
3. Fermentation is the process in which yeast breaks down sugar into alcohol and carbon dioxide.

Aromatic alcohol



1. The alcohols in which -OH group is present in the side chain attached to aromatic ring is called as aromatic alcohol.

Example : Phenylmethanol.

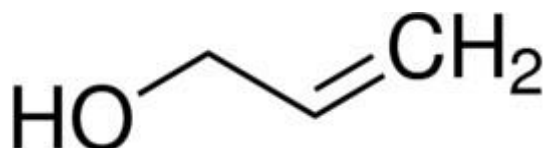
Trihydric alcohol or phenols

1. Alcohols containing three hydroxyl groups attached to an aliphatic carbon chain are called trihydric alcohol.
2. For example, Glycerol.

Polyhydric alcohol or phenols

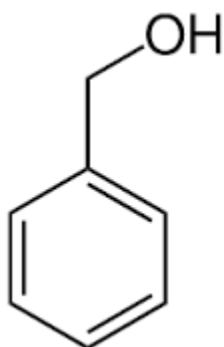
1. Alcohols containing more than three hydroxyl groups attached to an aliphatic carbon chain are called polyhydric alcohols.
2. For example , mannitol.

Allylic alcohols



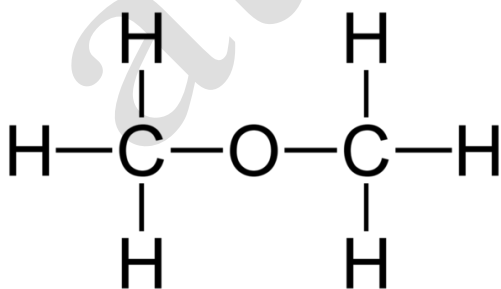
The alcohol in which -OH group is attached to a sp³ hybridized carbon next to the carbon-carbon double bond is called as allylic alcohol.

Benzyllic alcohol



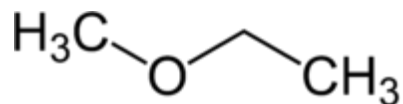
1. The alcohol in which -OH groups is present in the side chain attached to an aromatic ring are called benzylic alcohols.
2. The -OH group is attached to a sp³ hybridised carbon atom next to an aromatic ring.
3. For example, Phenylmethanol.

simple ether



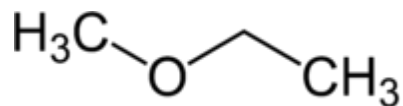
1. When alkyl or aryl group attached to central oxygen atom is same, ether is called as simple ether. For example: Dimethyl ether.

Mixed ether



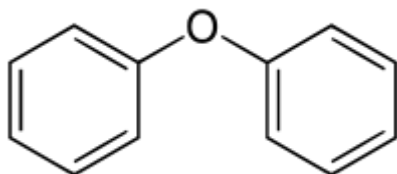
1. When both groups attached to central oxygen atom is different, ether is called as mixed ether.
2. For example: ethyl methyl ether.

Aliphatic ether



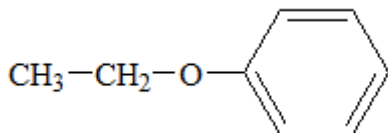
1. The ether which contain alkyl group on both side of central oxygen atom, is called as aliphatic ether.

Aromatic ether



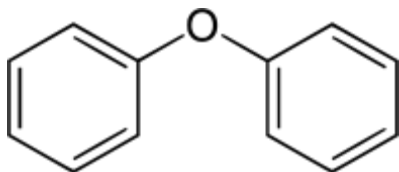
1. The ether which contain benzene or aromatic ring on both side of central oxygen atom, is called as aromatic ether.

Define alkyl aryl ether



1. Ether in which central oxygen atom contain alkyl as well as aryl chain on sides, is called as alkyl aryl ether.

Diaryl ether



1. When central oxygen atom contain 2 benzene ring on both side is called as diaryl ether.

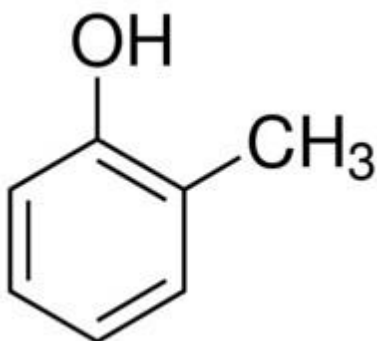
IUPAC nomenclature of dihydric alcohol

1. These are compound containing two hydroxyl groups.
2. These are dihydroxy derivatives of alkanes.
3. For dihydric alcohol, the word alkandiol are used in IUPAC nomenclature.
4. In common name system alkylene glycol term is used for naming dihydric alcohol.

Trihydric phenol nomenclature

1. For trihydric alcohols, there is no general rule in the system. Their names are generally derived from their source of origin.
2. For example, Glycerol.
3. In IUPAC nomenclature trihydric alcohols are named as alkanetriols.

Nomenclature of monohydric phenol



1. The simplest hydroxy derivative of benzene is phenol. In IUPAC system monohydric alcohols are named as alkyl derivative of phenol.
2. The position to which -OH group is attached is given 1st position and according to that alkyl substituents provide numbering.

Example : 2-Methylphenol