IFEANYI-OBI ADAEZE CLARE
19/MHS01/193
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CHEMISTRY ASSIGNMENT

1) a) CH_3OCH_3 - Methoxymethane

   b) $CH_3CH_2OCH_2CH_3$ - Ethoxyethane

   c) $(CH_3CH_2CH_2CH_2)_2O$ - Dimethy

   d) $CH_3CH_2OCH_3$ – Methoxyethane

   e) $CH_3CH_2CH_2OCH_2CH_3$ – Ethoxypropane

2) PROPERITIES OF ETHER

PHYSICAL PROPERTIES OF ETHER

A) An ether molecule has a net dipole moment due to the polarity of C-O bonds.
B) The boiling point of ethers is comparable to the alkanes but much lower than that of alcohols of comparable molecular mass despite the polarity of the C-O bond. The miscibility of ethers with water resembles those of alcohols.
C) Ether molecules are miscible in water. This is attributed to the fact that like alcohol, the oxygen atom of ether can also form hydrogen bonds with a water molecule.

CHEMICAL PROPERTIES OF ETHER

Ethers generally undergo chemical reactions in two ways:

A) Cleavage of C-O bond

Ethers are generally very unreactive in nature. When an excess of hydrogen halide is added to the ether, cleavage of C-O bond takes place leading to the formation of alkyl halides. The order of reactivity is given as HI>HBr>HCl

R-O-R + HX → RX + R-OH

B) Electrophilic Substitution

The alkoxy group in ether activates the aromatic ring at ortho and para positions for electrophilic substitution. Common electrophilic substitution reactions are halogenation, Friedel Craft's reaction etc.

C) Halogenation of Ethers

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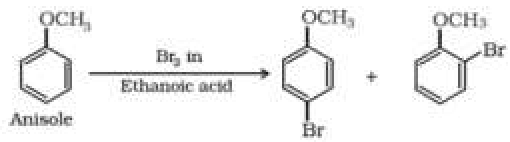
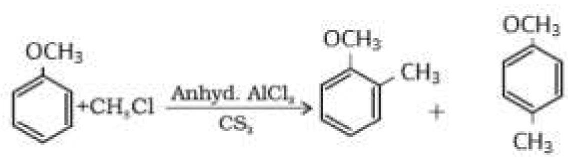
Aromatic ethers undergo halogenation, for example, bromination, upon the addition halogen in the presence or absence of a catalyst.



D) Friedel Craft's Reaction of Ethers

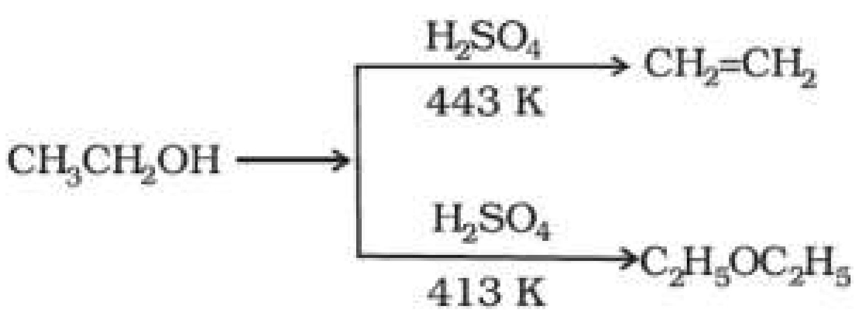
Aromatic ethers undergo Friedel Craft's reaction for example addition of alkyl or acyl group upon the reaction with alkyl or acyl halide in the presence of a Lewis acid as catalyst.



3) METHODS OF PREPARATION OF ETHERS

A) Preparation of Ethers by Dehydration of Alcohols

In the presence of protic acids (sulphuric acid), alcohols undergo dehydration to produce alkenes and ethers under different conditions. For example: in the presence of sulphuric acid, dehydration of ethanol at 443 K yields ethene whereas it yields ethoxyethane at 413 K. This is an ideal method of preparation through primary alcohols.



The preparation of ethers by dehydration of alcohol is a nucleophilic substitution reaction. The alcohol involved in reaction plays two roles: one alcohol molecule acts as a substrate while the other acts as a nucleophile. It can follow either an S_N1 or S_N2 mechanism. The choice of the mechanism depends on whether the protonated alcohol loses water before or simultaneously upon the attack of a second alcohol molecule. Generally, the secondary and tertiary alcohols follow the S_N1 mechanism while the primary alcohols follow the S_N2 mechanism.

B) Preparations of Ethers by Williamson Synthesis

Williamson synthesis is an important method for the preparation of symmetrical and asymmetrical ethers in laboratories. In this method, an alkyl halide is reacted with sodium alkoxide which leads to the formation of ether. The reaction generally follows the S_N2 mechanism for primary alcohol.

$$R{-}X + R'{-}\ddot{\underset{\cdot\cdot}{O}}^{-}\,\overset{+}{Na} \longrightarrow R{-}\ddot{\underset{\cdot\cdot}{O}}{-}R' + Na\,X$$

As we know alkoxides are strong bases and they can react with alkyl halides leading to elimination reactions. Williamson synthesis exhibits higher productivity in the case of primary alkyl halides. In the case of secondary alkyl halides, elimination competes with substitution whereas, we observe the formation of elimination products only in the case of tertiary alkyl halides.

4) USES OF ETHYLENE OXIDE

A) Consumer Applications

Most ethylene oxide is used as an intermediate in the **production of other chemicals** used to manufacture products, such as fabrics for clothes, upholstery, carpet and pillows. It is used to produce ethylene glycols for **engine antifreeze** that keeps our automobiles performing. Other ethylene oxide derivatives are used in **household cleaners** and personal care items such as **cosmetics and shampoos**.

B) Medical Applications

Ethylene oxide sterilization processes can **sanitize medical and pharmaceutical products** that cannot support conventional, high-temperature steam sterilization procedures. Delicate, heat-sensitive medical devices that incorporate plastics and electronics could be warped or otherwise damaged by steam sterilization. A low-temperature sterilizer, ethylene oxide gas will not damage these types of medical devices.

Ethylene oxide also is used to sterilize other healthcare products, such as bandages and ointments, reducing potential damage to the product that may occur from other means of sterilization. Approximately 50 percent of medical supplies are sterilized with ethylene oxide, making it critical to the U.S. healthcare industry.

C) Industrial Applications

Ethylene glycol, which is derived from ethylene oxide, is used to manufacture fiberglass used in products ranging from jet skis to bathtubs to bowling balls, as well as polyethylene terephthalate (PET) plastic resin to make beverage containers and packaging film. Ethylene oxide derivatives are used as ingredients in industrial cleaners, heat transfer liquids, polyurethanes and plasticizers.