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ASSIGNMENT.

1. Give the IUPAC names of the following organic compounds.

a. CH_3OCH_3 - Methoxy methane.

b. $CH_3CH_2OCH_2CH_3$ - Ethoxy ethane.

c. $(CH_3CH_2CH_2CH_2)_2O$ - Methoxy Propane.

d. $CH_3CH_2OCH_3$ - Methoxy ethane.

e. $CH_3CH_2CH_2OCH_2CH_3$ - Ethoxy methane.

2. Discuss the Properties of Ethers.

Physical Properties:

i. An ether molecule has a net dipole moment. We can attribute this to the Polarity of C-O bonds.

ii. The boiling Point of ethers is comparable to the alkanes. However, it is much lower compared to that of alcohols of comparable molecular Mass. This is despite the fact of the Polarity of the C-O bond.

iii. The miscibility of ethers with water resembles those of alcohols.

iv. Ether molecules are miscible in water. We can attribute this to the fact that like alcohols, the oxygen atom of ether can also form hydrogen bonds with a water molecule.

Chemical Properties.

i. Cleavage of C-O bond: Ethers are generally very unreactive in nature. When we add excess of hydrogen halide to the ether, cleavage of C-O bond takes place. It leads to the formation of alkyl halides. The order of reactivity is as follows: HI > HBr > HCl

$$R-O-R + HX \longrightarrow RX + R-OH$$

ii. 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.

iii. Halogenation of ethers: Aromatic ethers undergo halogenation, for example, bromination, when we add a hydrogen halogen in the presence or absence of a catalyst.

iv. Friedel Craft's reaction of ethers: Aromatic ethers undergo Friedel Craft's reaction for example addition of alkyl or acyl group when we introduce it to an alkyl or acyl halide in the presence of a lewis acid as catalyst.

3. Discuss explicitly two methods of preparing ethers and shows equations of reactions.

i. Dehydration of Alcohols: In the presence of sulphuric acids, alcohols undergo dehydration to produce alkenes and ethers under different conditions. For example: In the presence of sulphuric acid, dehydration of ethanol at 443k yields Ethene whereas it yields Ethoxyethane at 413k. This is an ideal method

of Preparation through Primary alcohols.

$$CH_3CH_2OH \longrightarrow \begin{cases} \xrightarrow[443K]{} CH_2=CH_2 \\ \xrightarrow[413K]{H_2SO_4} C_2H_5OC_2H_5 . \end{cases}$$

The Preparation of ethers by dehydration of alcohol is a nucleophilic substitution reaction. The alcohol involved in reaction play two roles: one alcohol molecule acts as a substrate while the act 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.

2. By Williamson Synthesis: It 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.

$$R-X + R'-\ddot{O}Na^+ \longrightarrow R-\ddot{O}-R' + NaX$$

As we know alkoxides are strong bases and they can react with alkyl halides leading to elimination reactions. It exhibits higher Productivity in the case of Primary alkyl halides. In the case of secondary alkyl halides, elimination completes with substitution whereas, we observe the formation of elimination products only in the case of tertiary alkyl halides.

4. State three uses of ethylene oxide.

(i) It is used in the production of ethylene glycerol

(ii) It can be used in the production of glycol ethers.

(iii) It is used as a fumigant.