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1) Give the IUPAC names of the following organic compound

- i) $\text{CH}_3\text{OCH}_3 \rightarrow$ Dimethyl Ether
- ii) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3 \rightarrow$ Ethoxyethane
- iii) $\text{CH}_3\text{CH}_2(\text{CH}_2\text{CH}_2)_2\text{O} \rightarrow$ Butoxymethane
- iv) $\text{CH}_3\text{CH}_2\text{OCH}_3 -$ Methoxyethane
- v) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3 -$ Ethoxypropane

2) Discuss the properties of ethers

a) Physical Properties of Ethers:-

- 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.} alkanes.
- iii) The miscibility of ethers with water resembles those of alcohols.
- iv) Ether molecules are miscible in water.

b) Chemical Properties of Ether

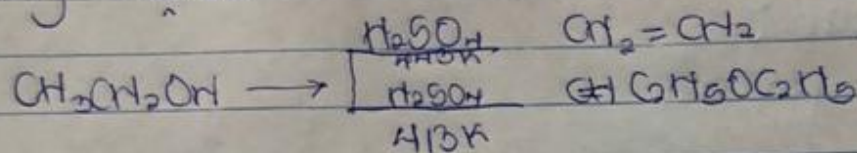
- i) Cleavage of C-O Bond:- Ethers are generally very unreactive in nature. When an excess of hydrogen halide is added to the ether, cleavage of C-O bond takes place leading to the formation of alkyl halides. The order of reactivity is given as $\text{HI} > \text{HBr} > \text{HCl}$.
- ii) Electrophilic Substitution:- The alkoxy group in ether activates the aromatic ring at ortho and para positions for electrophilic substitution reactions are halogenation, Friedel-Craft's reaction etc.
- iii) Halogenation of ethers:- Aromatic ethers undergo halogenation, for example, bromination, upon the addition of halogen in the presence or absence of a catalyst.

3) Discuss explicitly two methods of preparing ethers and show equations of reaction.

i) Preparation of Ethers by Dehydration of Alcohols:-

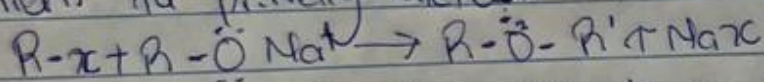
In the presence of protic acids (sulphuric acid), alcohols undergo dehydration to produce alkenes and ethers under different conditions.

For example: In the presence of sulphuric acid, dehydration of ethanol at 413K. This is an ideal method of preparation through primary alcohols



ii) Preparation 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 $\text{S}_\text{N}2$ mechanism for primary alcohols.



As we know alkoxides are strong bases and they can react with alkyl halides leading to elimination reactions.

4) Write 3 uses of ethylene oxide

i) It is used to make antifreeze

ii) It is used as a sterilization agent for medical equipment

iii) It is used as a fumigant and pesticides.