Chemistry Study Materials for Class 12

(NCERT Based Notes of Chapter - 11)

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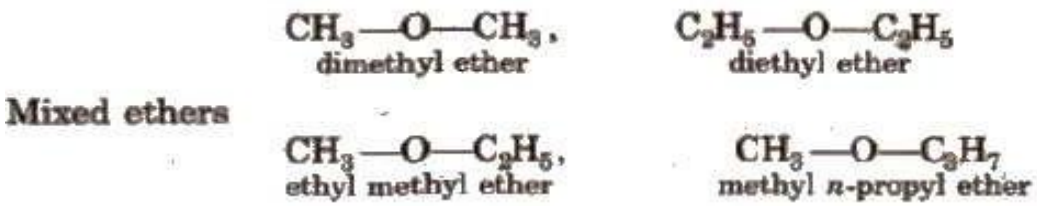
Alcohols, Phenols and Ethers

Ethers: Ethers are the organic compounds in which two alkyl or aryl groups are attached to a divalent oxygen. known as ethereal oxygen. These are represented by the general formula R–O-R" where R may be alkyl or aryl groups. e.g.,

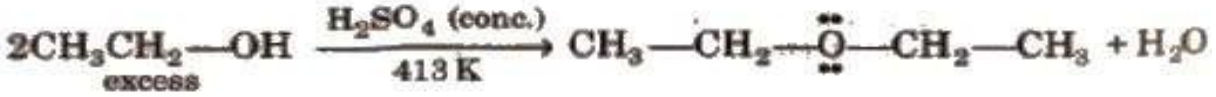


These are the functional isomers of alcohols. These also exhibit chain isomerism and metamerism.

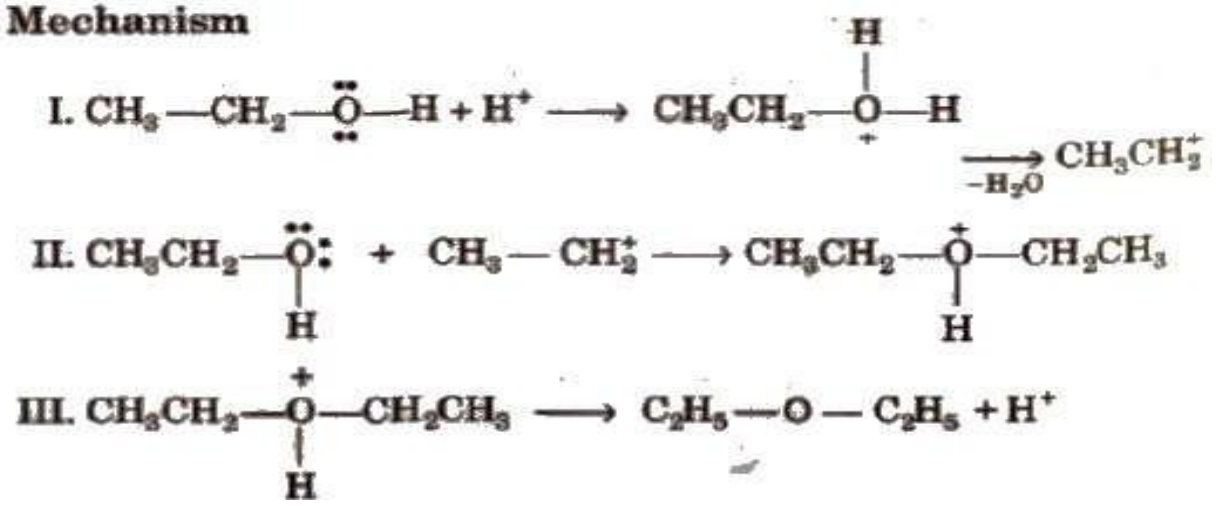
Nomenclature of Ethers: In the IUPAC system, ethers are regarded as 'alkoxy alkanes' in which the ethereal oxygen is taken along with smaller alkyl group while the bigger alkyl group is regarded as a part of the alkane.

Preparation of Ethers

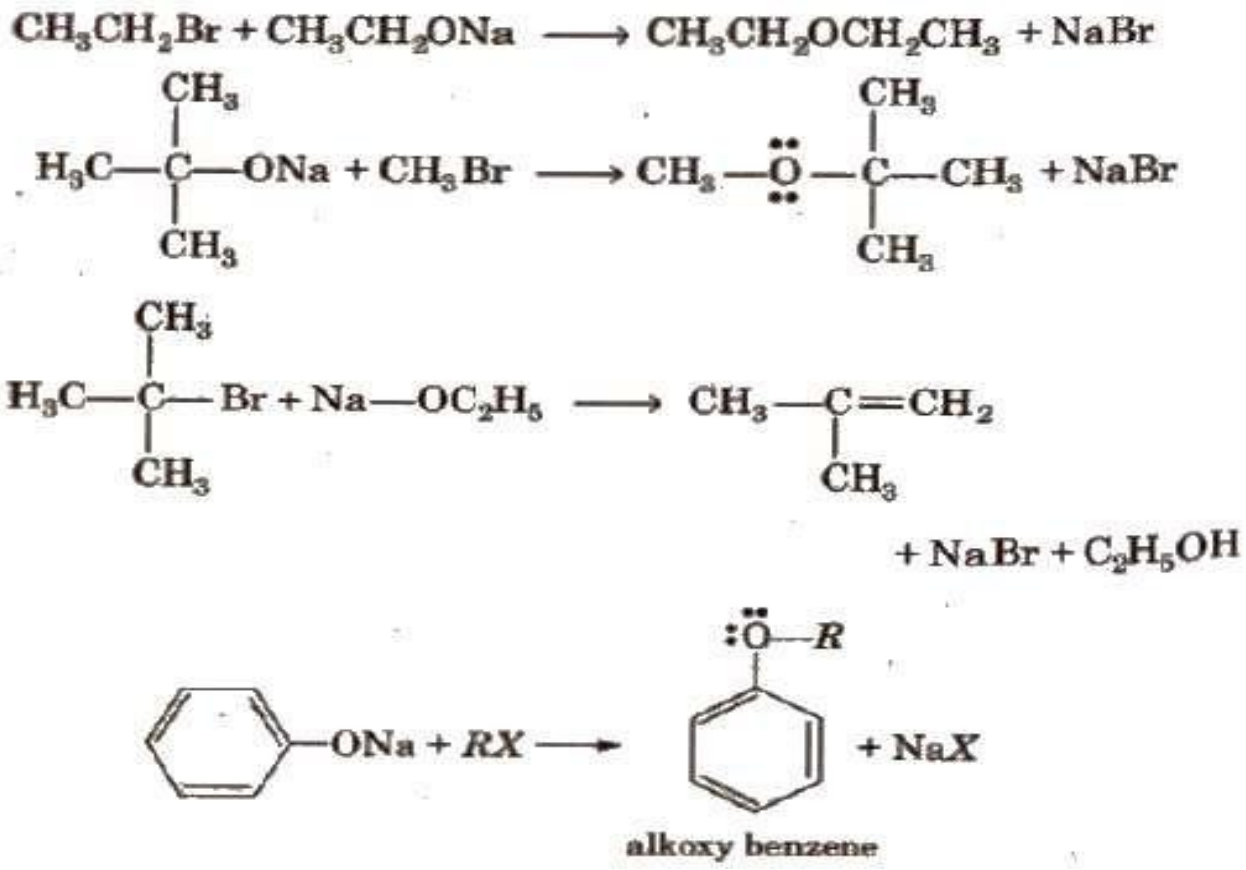
(i) By dehydration of alcohols



Mechanism



(ii) **Williamson's synthesis** Only primary alkyl halides when react with sodium alkoxide give ether while tertiary alkyl halides give alkene due to steric hindrance.

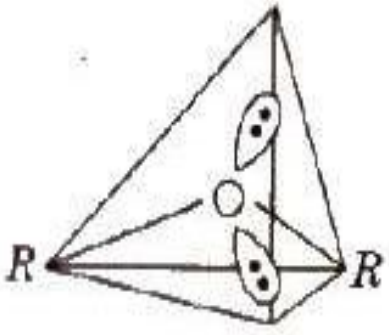


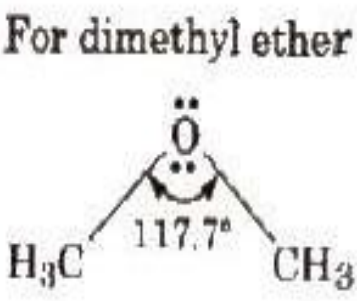
Physical Properties of Ethers

Ethers are polar but insoluble inH20 and have low boiling point than alcohols of comparable molecular masses because ethers do not form hydrogen bonds with water.

Structure of Ether

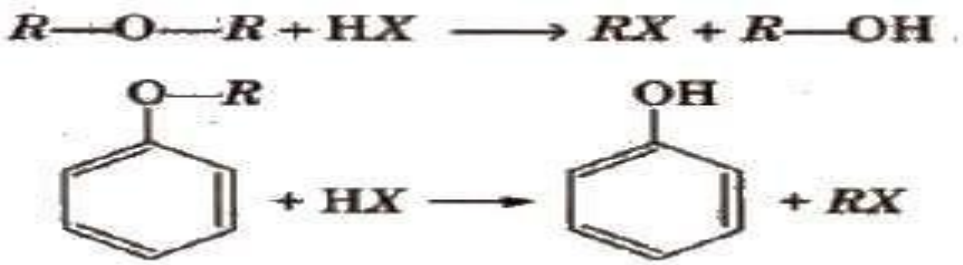
The hybridisation of 0 atom in ethers is sp^3 (tetrahedral) and its shape is V-shape.





Chemical Reactions of Ether

(i) Reaction with HX



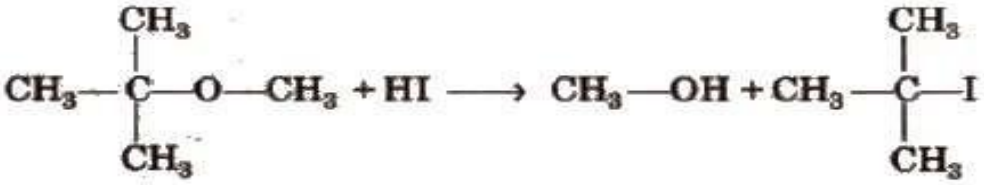
Ethers with two different alkyl groups are also cleaved in the same manner and results in the formation of a primary halide (or smaller and less complex alkyl halide) by S_N2 mechanism.

$$R\text{-}O\text{-}R' + HX \rightarrow RX + R'OR$$

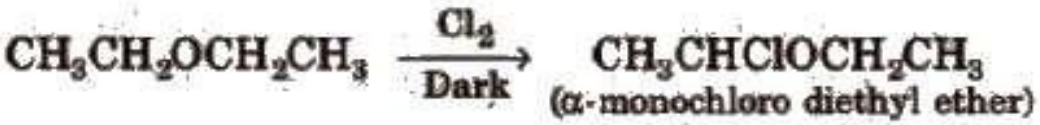
The order of reactivity of hydrogen halides is as follows

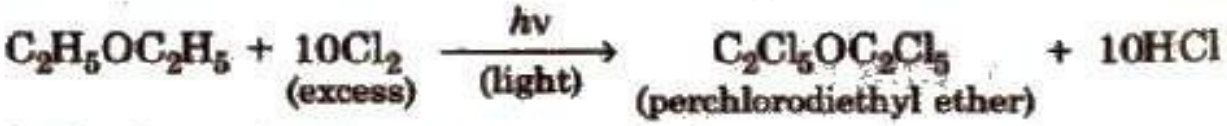
HI > HBr > HCl

In ethers if one of the alkyl groups is a tertiary group, the halide formed is a tertiary halide by SN^1 mechanism.



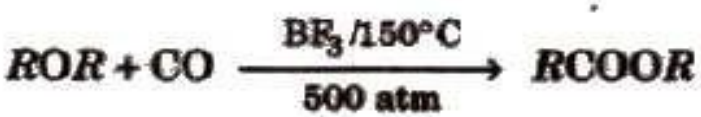
(ii) Halogenation



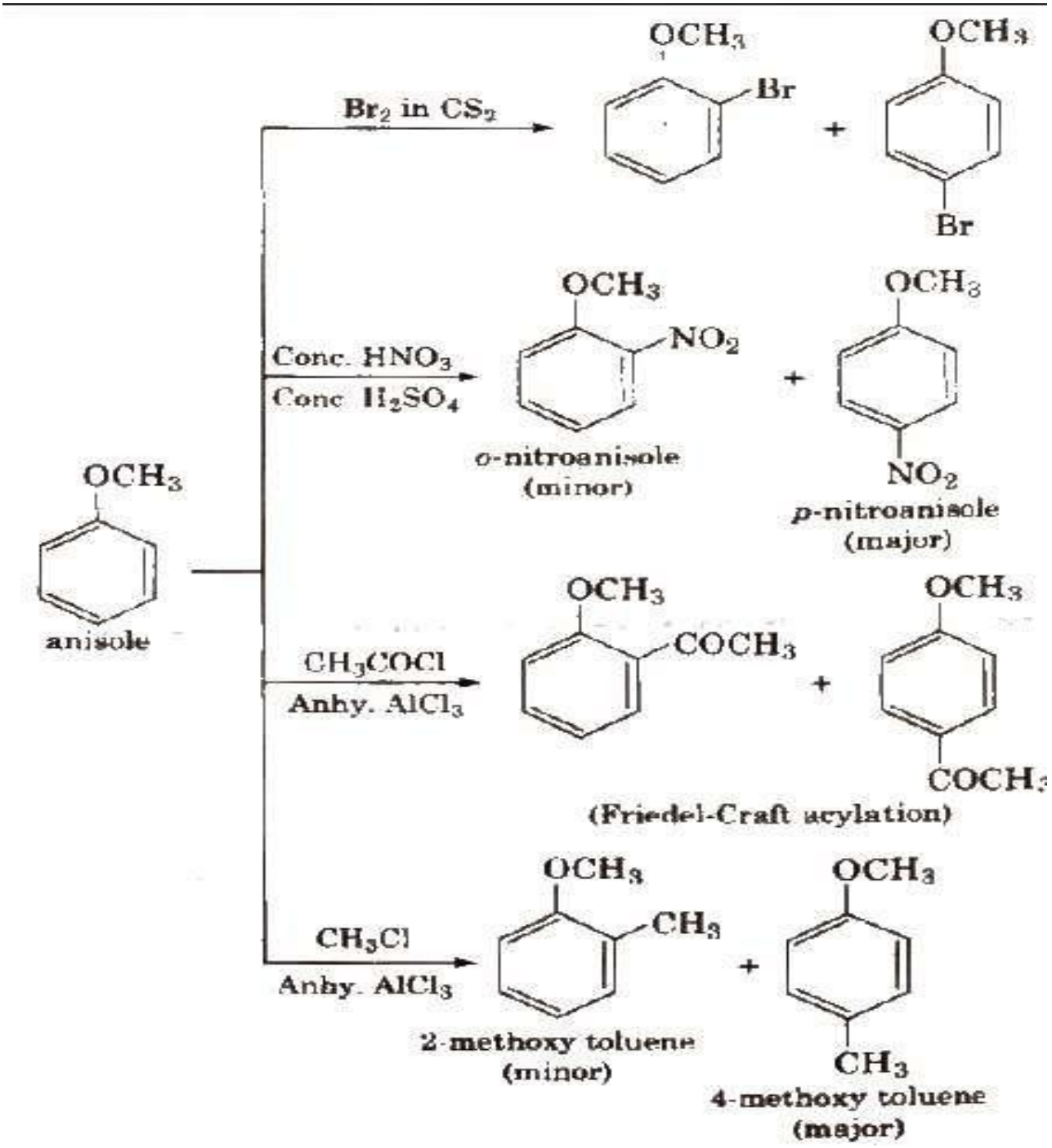


(iii) Reaction with PCl_5

(iv) Reaction with CO



(v) Electrophilic 8ublititution reactions In ethers,-OR is ortho, para directing group and activate, the aromatic ring towards electrophilic substitution reactions



Ethyl phenyl ester $C_6H_5OC_2H_5$ is also, known as phenetole.

Uses of Ethers

1. Dimethyl ether is used as refrigerant and as a solvent at low temperature.
2. Diethyl Ether is used as an anaesthesia in surgery .

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