

Ethers

①

cleavage of carbon-oxygen bond

Reaction of Halogen acid with ethers

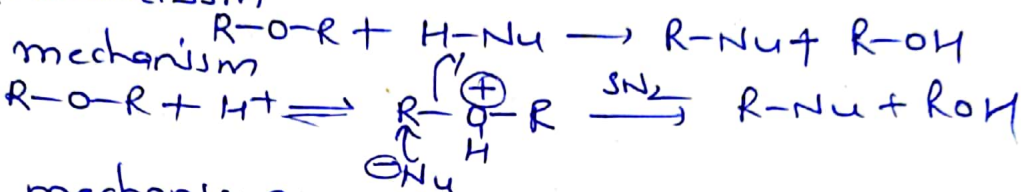
Ethers are readily cleaved by hydroiodic acid or hydrobromic acid at 373K to form an alcohol and an alkyl halide



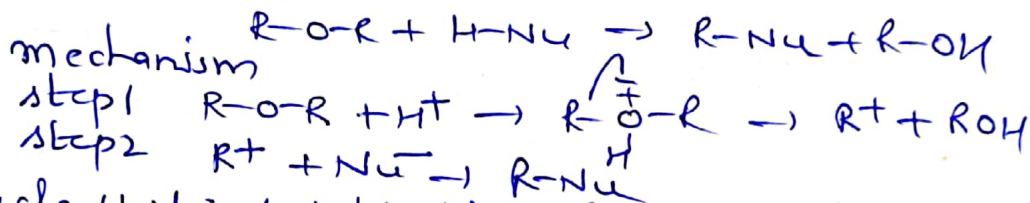
Ether gives nucleophilic substitution reactions in the presence of proton acid. Only with those reagents which on dissociation give electrophile as well as nucleophile

Ethers give $S_N1 + S_N2$ reaction both, depending upon the structure of ether

S_N2 mechanism

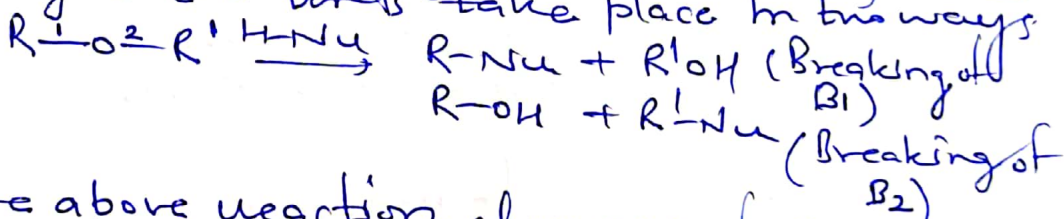


S_N1 mechanism



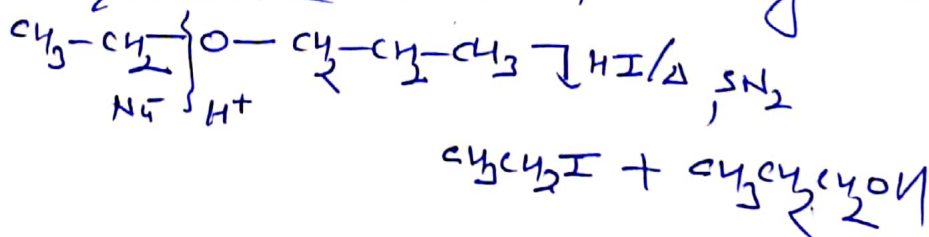
Nucleophilic substitution reaction of unsymmetrical ethers

Nucleophilic substitution reactions of ether take place due to the breaking of C-O bond. Ether has two C-O bonds (say bond 1 and bond 2). They breaking of C-O bonds take place in two ways

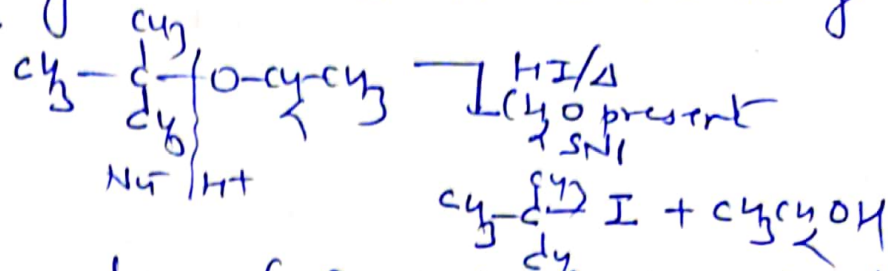


In the above reaction, cleavage of B_1 and B_2 depends upon the nature of R and R'

Case 1 If both alkyl groups are primary then rxn is S_N2 and nucleophile of the reagent attack on the alkyl group having lesser no. of carbon

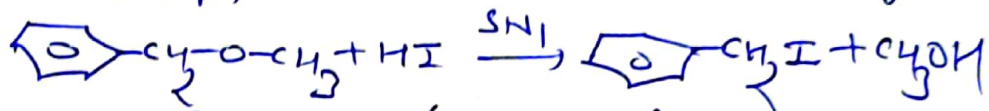


Case 2 If one of the alkyl groups is tertiary then the mechanism is S_N1 . Negative part of the reagent attacks on the tertiary alkyl group. (2)

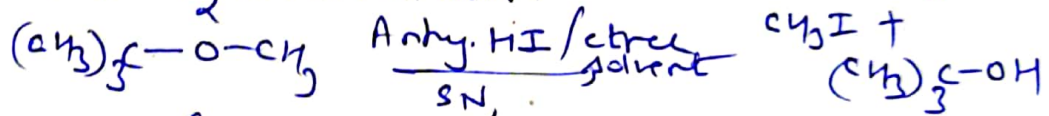


(As formation of Product is controlled by carbocation stability and 3° carbocation is more stable than primary)

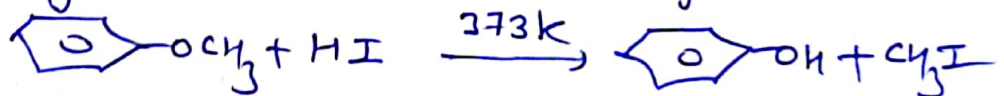
Case 3 If one of the alkyl groups is benzyl group, in the case of benzyl methyl ether, the rxn proceeds by S_N1 mechanism. Since benzyl carbocation is more stable than methyl carbocation



Case 4 cleavage of t-butyl methyl ether with the anhydrous HI in ether (low polarity solvent) favours S_N2 mechanism



Case 5 cleavage of alkyl aryl ether
In case of alkyl aryl ethers, the products are always phenol and an alkyl halide.



(In $\text{C}_6\text{H}_5-\text{O}-\text{CH}_3$, In this ion, the bond between $\text{O}-\text{CH}_3$ is weaker than the $\text{O}-\text{C}_6\text{H}_5$)

Case 6 $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3 \xrightarrow[\Delta]{2 \text{ moles of HI}}$

