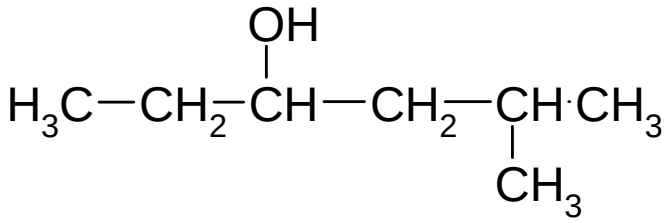
Alkohol dan Eter

Ikatan tunggal Karbon ke Oksigen

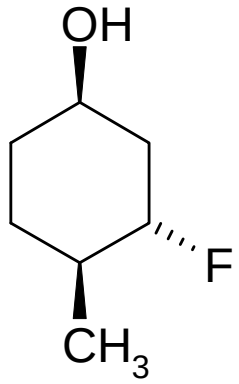
Tata Nama: AlKohol

- OH ditunjukkan oleh akhiran ol
- Rantai induk adalah rantai terpanjang yang mengandung C-OH
- Karbon dinomori dari ujung rantai yang terdekat –OH

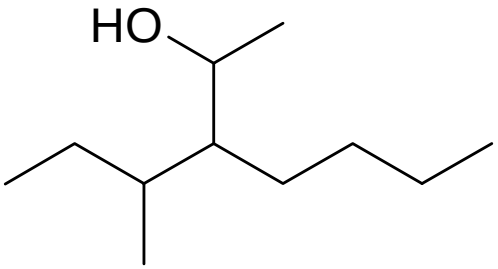
Contoh



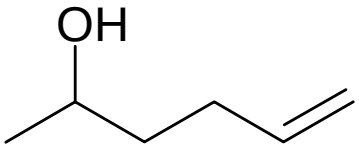
5-methyl-3-hexanol



(1R,3S,4S)3-fluoro-4-methylcyclohexanol, or
(1R,3S,4S)3-fluoro-4-methyl-1-cyclohexanol



3-(1-methylpropyl)-2-heptanol



hex-5-en-2-ol or
5-hexen-2-ol
(Note that the OH takes precedence over the pi bond in detemining the numbering.)

Tata Nama: Eter

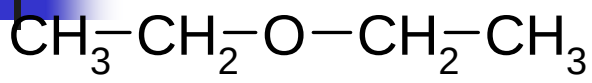
- Eter sederhana :

  nama dua gugus karbon sebagai substituen, diikuti dengan *eter*

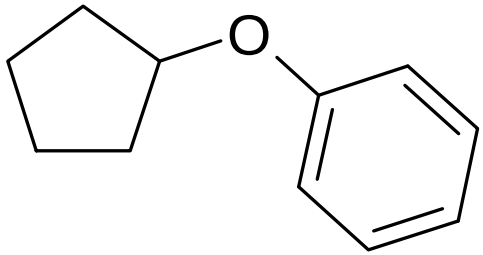
- Sistematik:

  nama sebagai alkoksi alkana

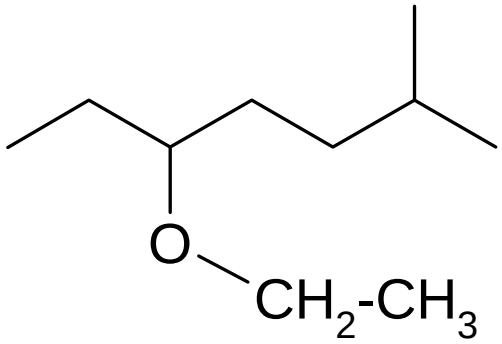
Contoh



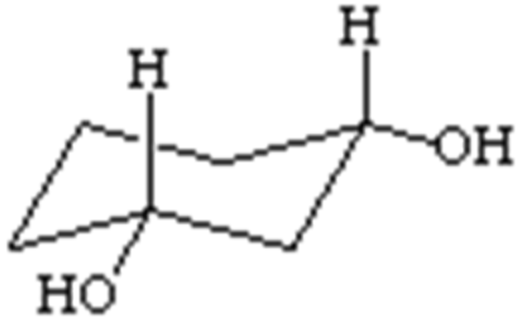
diethyl ether or
ethyl ether
(If both alkyl groups are the same, the "di" is often not used.)



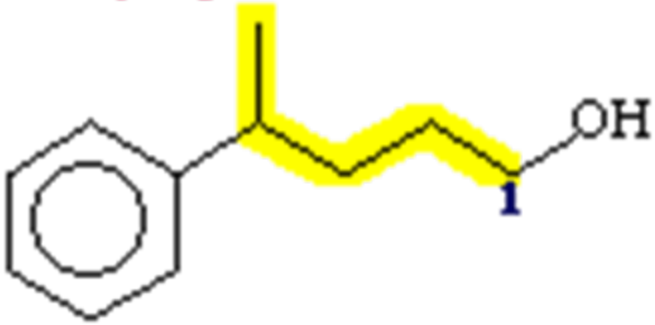
phenoxycyclopentane or
cyclopentyloxybenzene



5-ethoxy-2-methylheptane

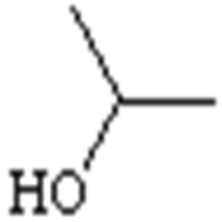


cis-1,3-cyclohexanediol

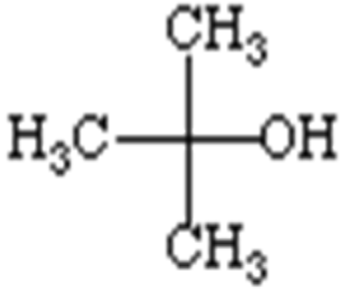


4-phenyl-1-pentanol

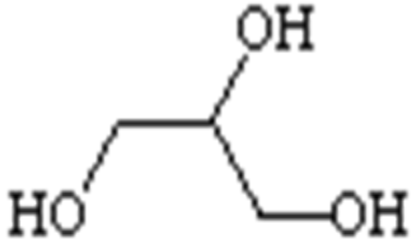
4,4-dimethylcyclohexanol



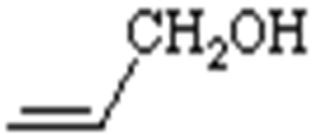
Isopropyl alcohol
(2-propanol)



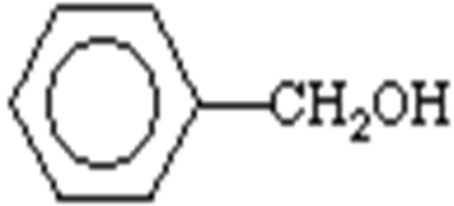
tert-Butyl alcohol
(2-methyl-2-propanol)



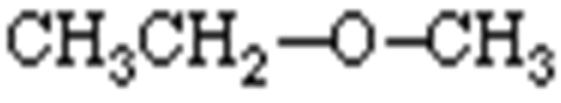
Glycerol
(1,2,3-propanetriol)



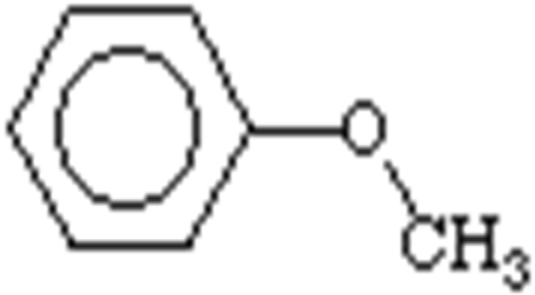
Allyl alcohol
(2-propen-1-ol)



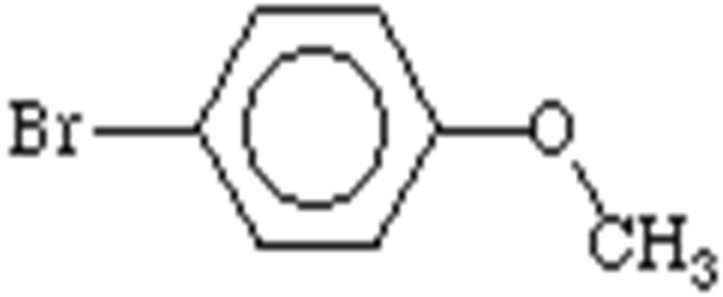
Benzyl alcohol
(phenylmethanol)



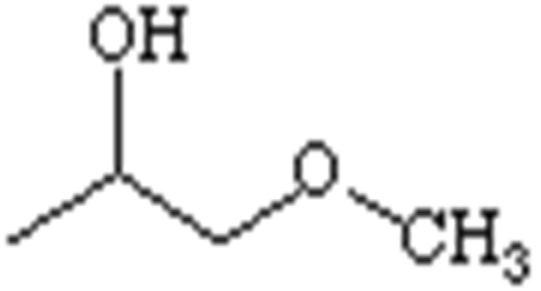
ethyl methyl ether



methyl phenyl ether



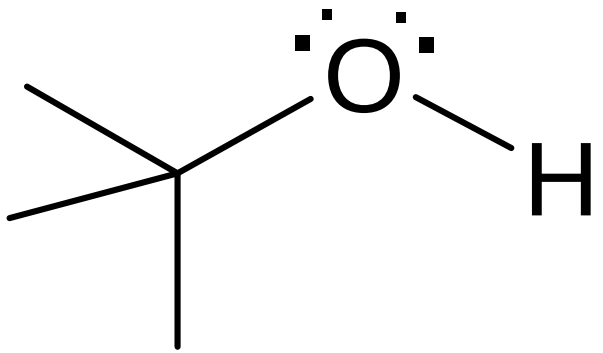
4-bromo-1-methoxybenzene



1-methoxy-2-propanol

Gugus Fungsional Alkohol

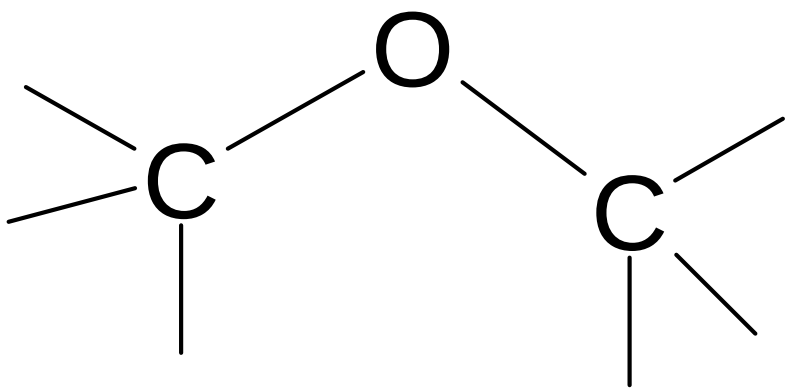
Tiga lokasi dimana kimia bisa terjadi



- Lokasi kaya elektron?
- Lokasi miskin elektron?

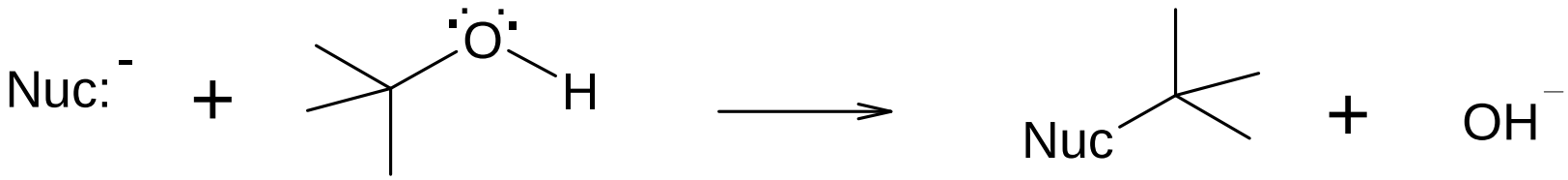
The Ether Functional Group

Same as Alcohols, but no O-H



Reactions of the C-O Bond

Does this happen?

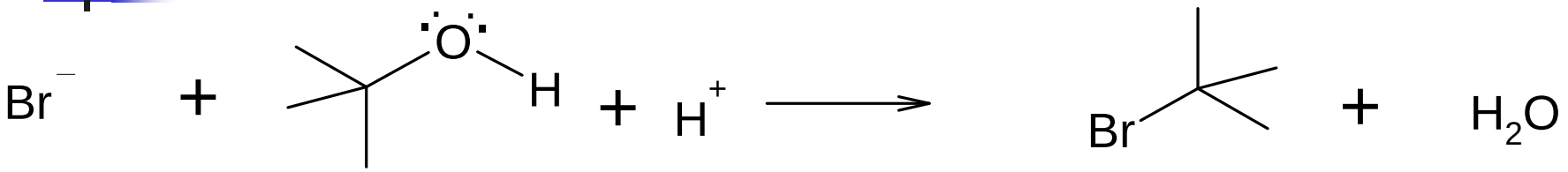


NO. The C-O is inert toward heterolytic cleavage.

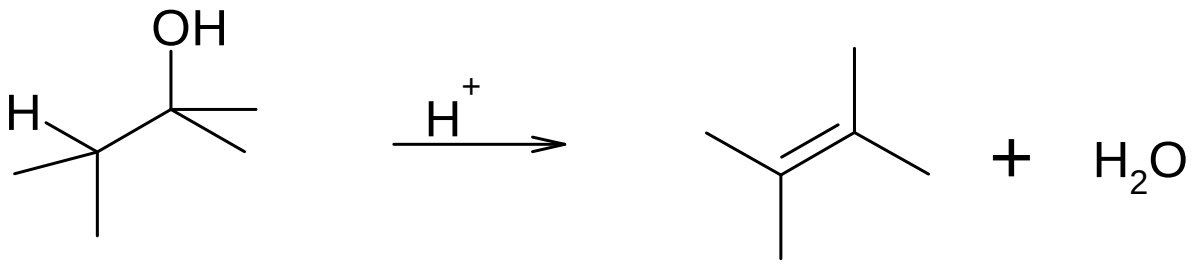
Why?

OH^{-} is too basic to be a leaving group.

Ikatan C-O putus pada kondisi asam

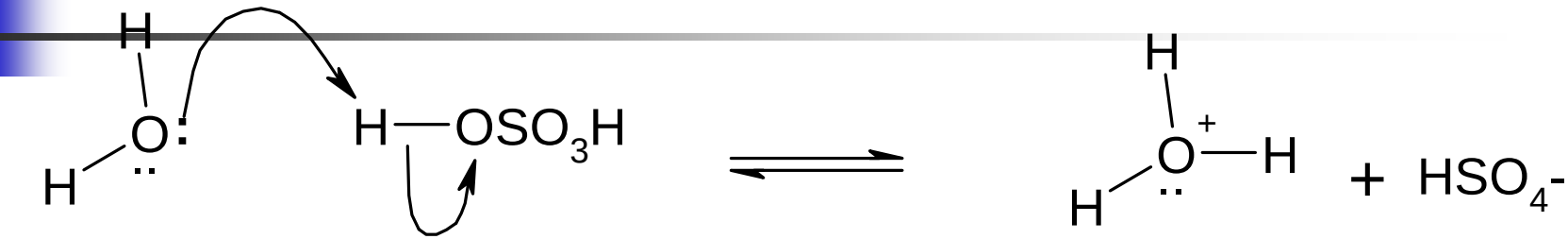


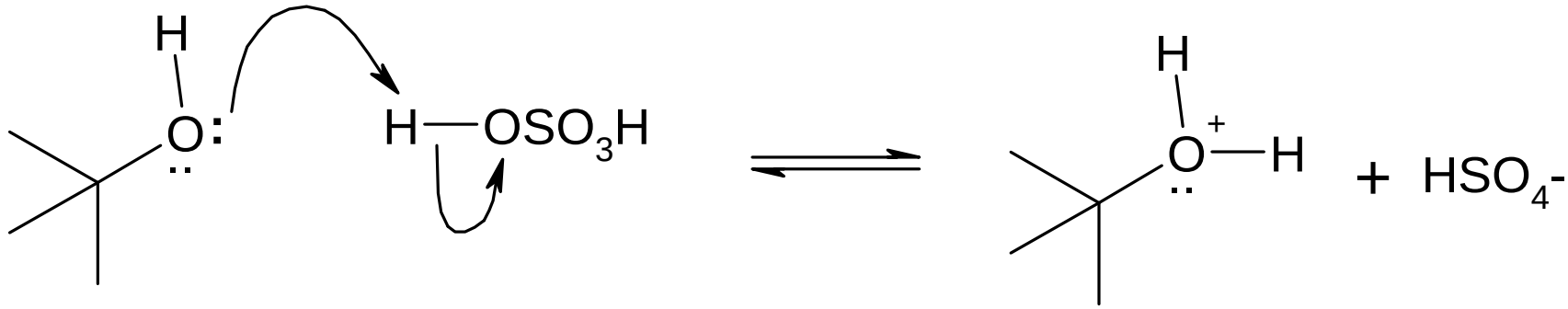
Substitution



Elimination

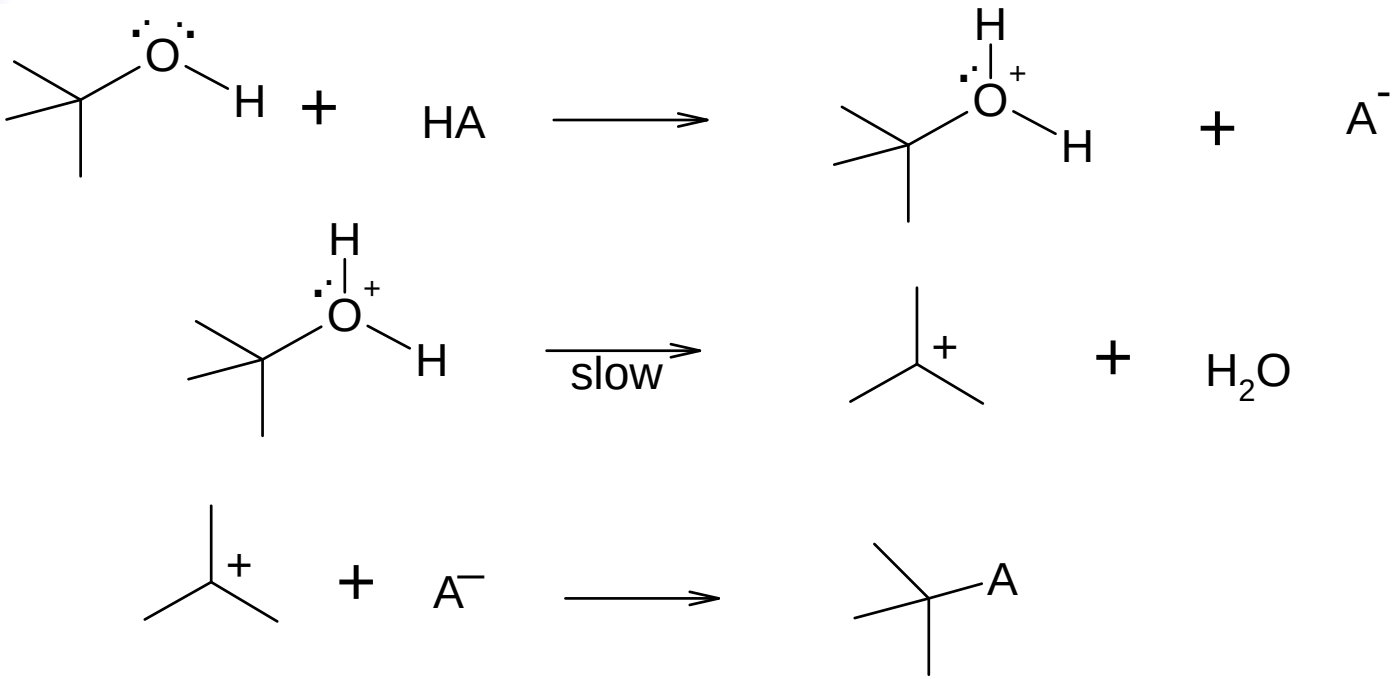
Kenapa ikatan C-O putus pada kondisi asam?





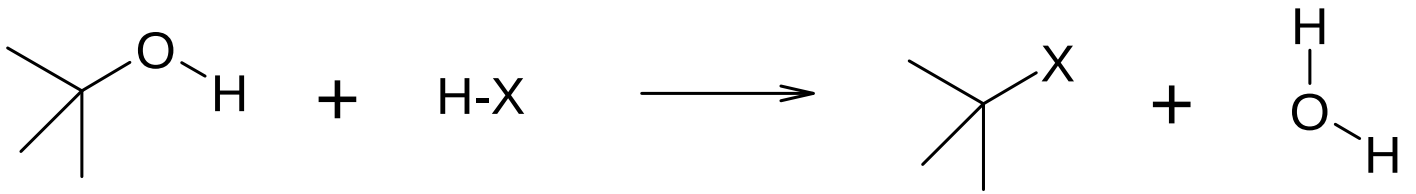
Alkohol adalah basa lemah, bereaksi dengan asam kuat (Bronsted or Lewis).

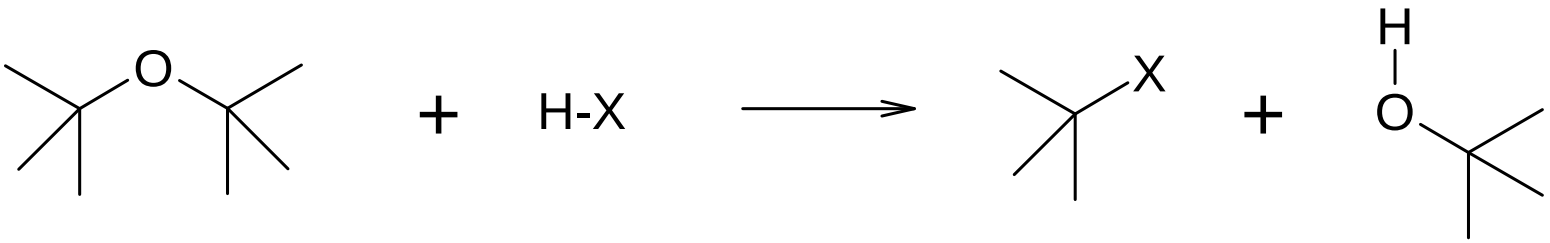
C-O dari alkohol terprotonasi bisa putus



- Suatu reaksi substitusi nukleofilik
- Air sebagai gugus lepas
- S_N2 jika primer uncrowded
- S_N1 (seperti terlihat)

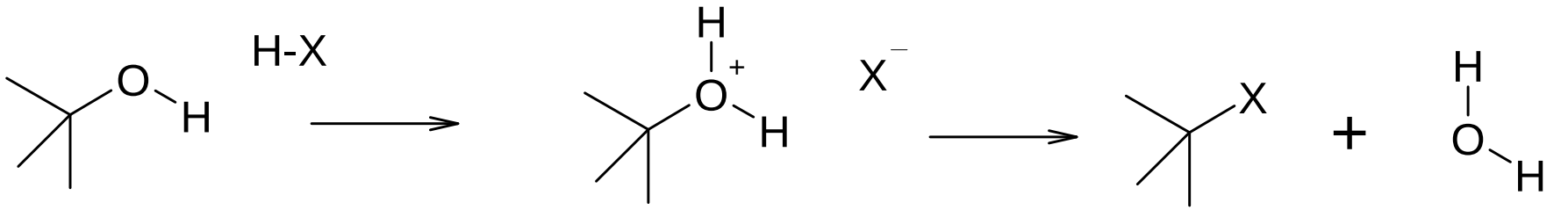
Ether Chemistry is C-O Chemistry --Just Like Alcohol C-O Chemistry

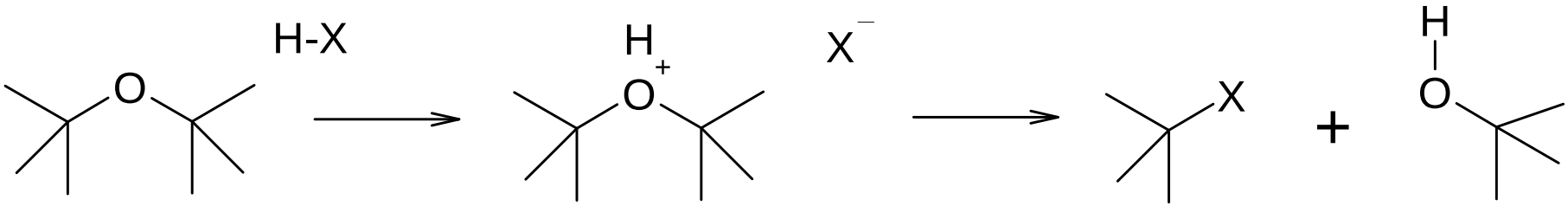




Identical Mechanisms, Too.

Protonation of the O, then Nucleophilic Substitution

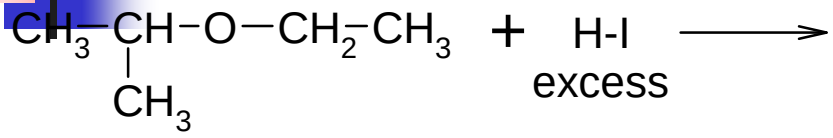


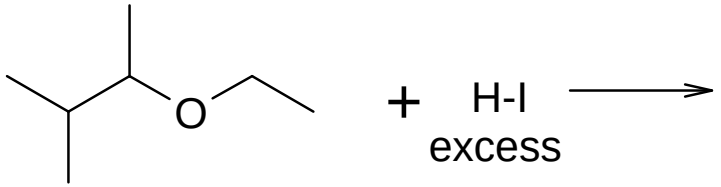


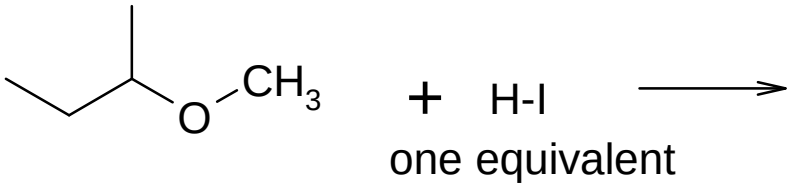
Predicting the Products

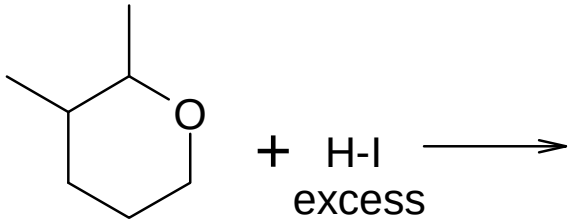
- Ether cleavage is not usually selective; both sets of cleavage products are to be expected. In methyl ethers, the X preferentially attacks the methyl group. In excess HX, both C-O are cleaved, producing water and two C-X bonds. In phenyl ethers, the benzene ring is not attacked, even in excess HX.

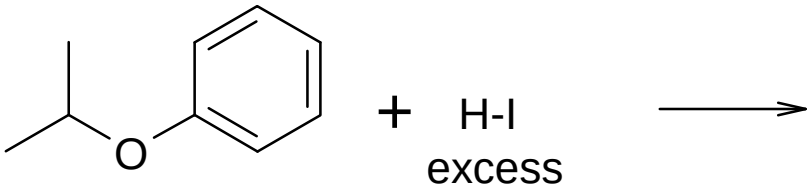
Ether Cleavage Reactions











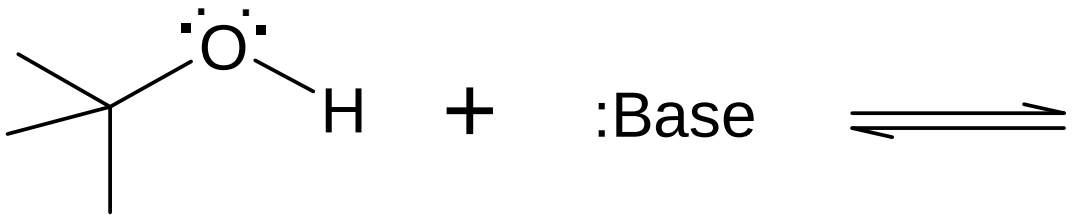
Alcohol Reactions Not Involving C-O Cleavage

Electron-rich oxygen

The O-H

Reactions of the O-H

Water has the same functional group



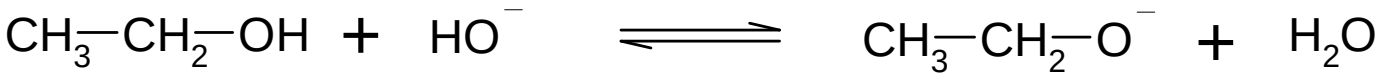
The H is electron-poor.

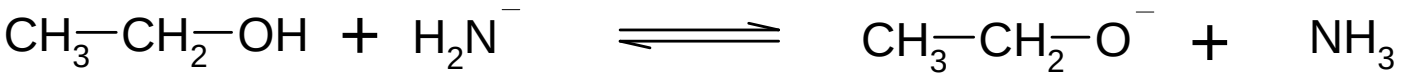
Are alcohols acids?

Learn from water's chemistry

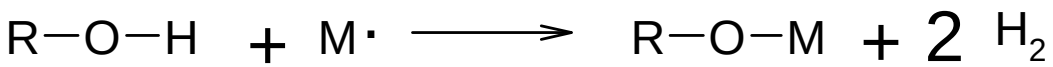
The Acidity of Alcohols

- H-O-H $pK_a = 15.7$
- R-O-H $pK_a = 15$ to 16
- $R\text{-}NH_2$ $pK_a = 34$

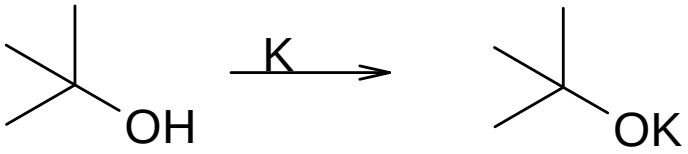


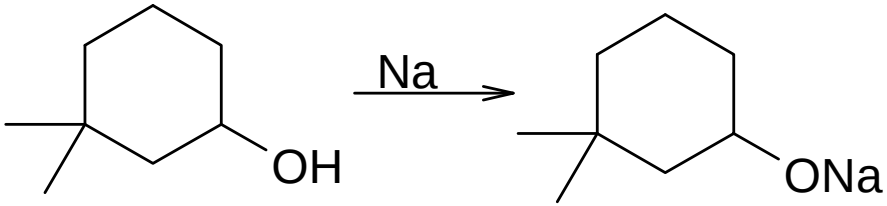


Reaction with active metals

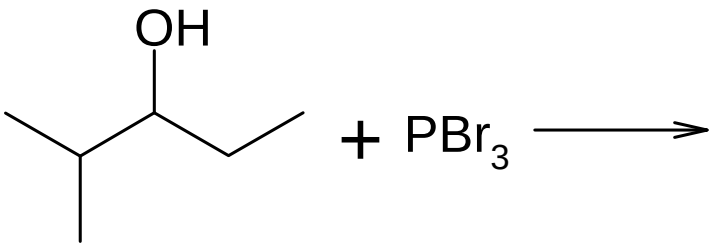


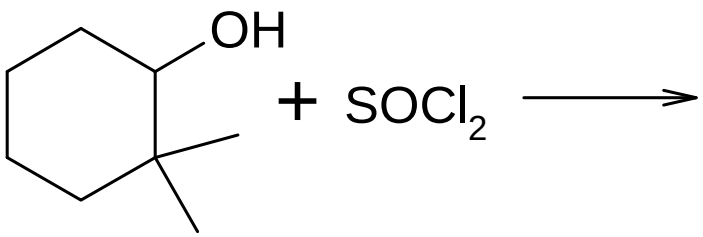
M can be Na or K





Other Ways to Convert the OH to a Good Leaving Group: Halides





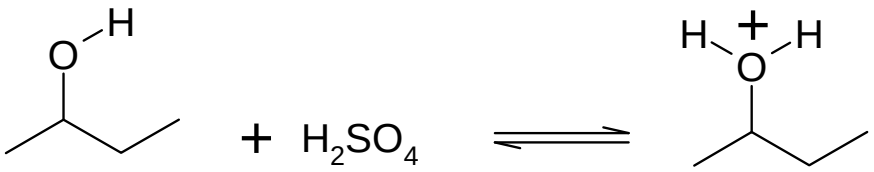
Reactions Using the Lone Electron Pairs of Oxygen

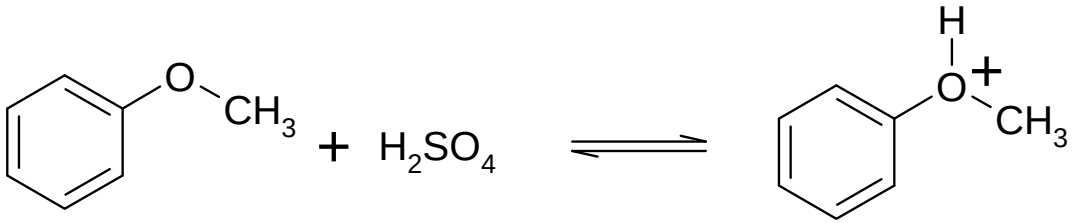
Base?

Nucleophile?

Alcohols and Ethers are Weakly Basic

- They are protonated in strong acids.

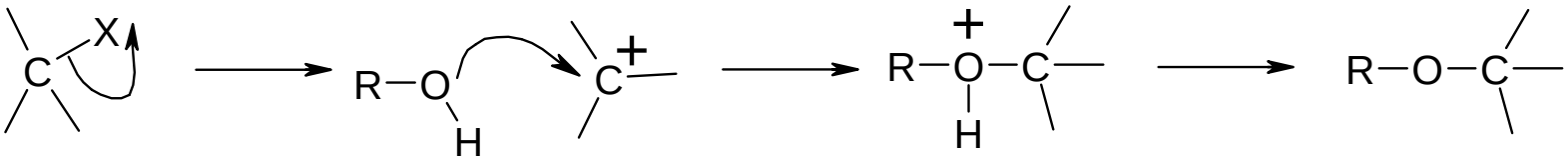




All oxygenated organic compounds are protonated by strong acids

Alcohols are Nucleophiles

...but not very strong ones.



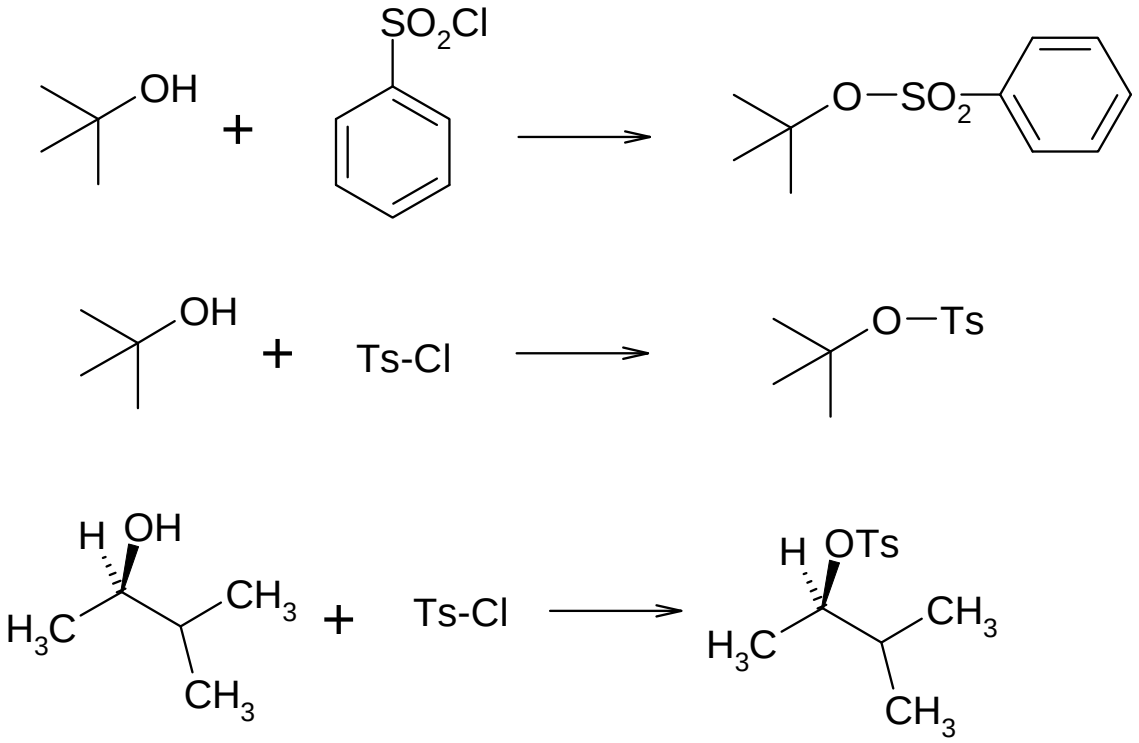
With methyl and primart halides, this probably happens by an S_N2 mechanism

Note that the nucleophile is NOT alkoxide! Like water, alcohols are not strong acids, so there is no R-O^- present. The nucleophile is the whole alcohol molecule.,

There is no alkoxide (RO^-) in alcohol!!

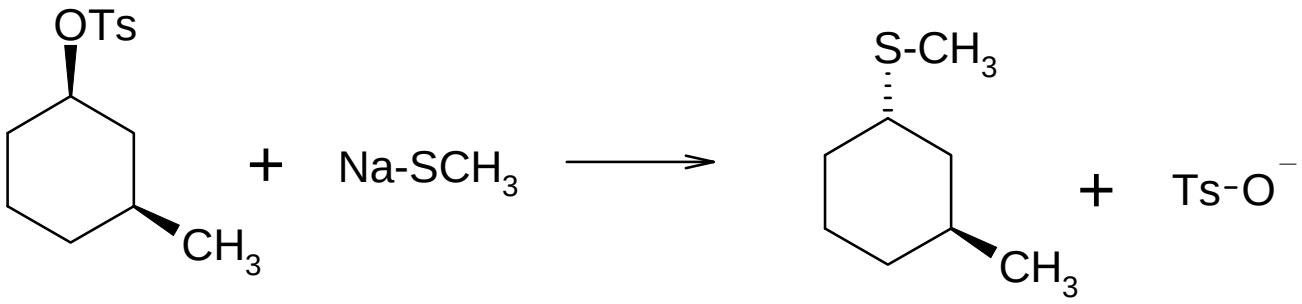
Conversion to Sulfonates

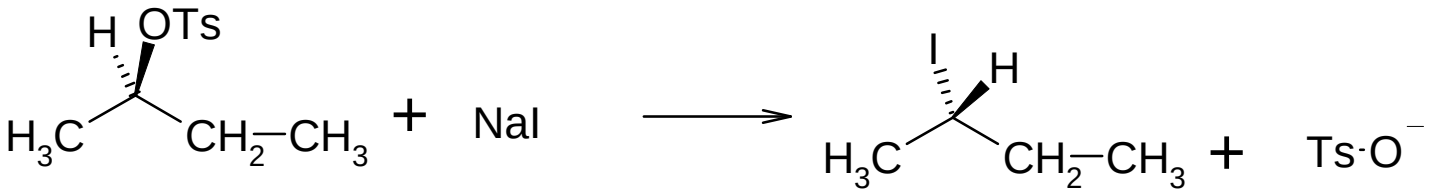
Nucleophilic Substitution by Alcohol at Sulfur!!



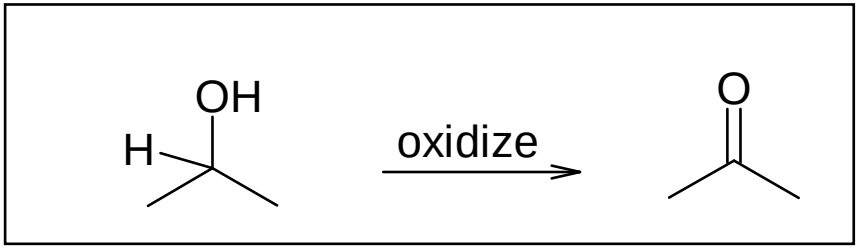
Sulfonate is a Good Leaving Group

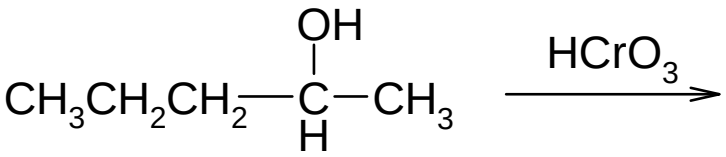
As good as or better than bromide

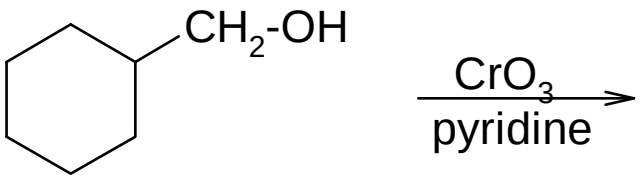


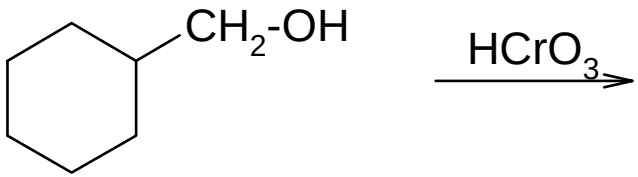


Oxidation of Alcohols: Preparation of C=O bonds



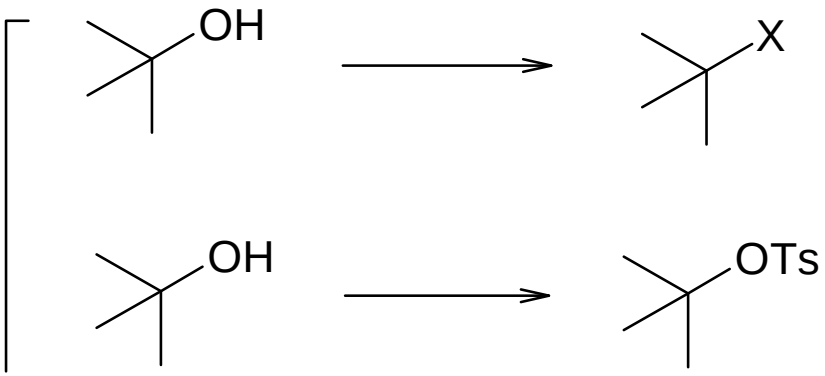




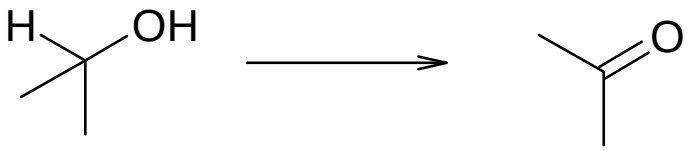


Three Ways to Make the Alcohol Carbon More Electrophilic

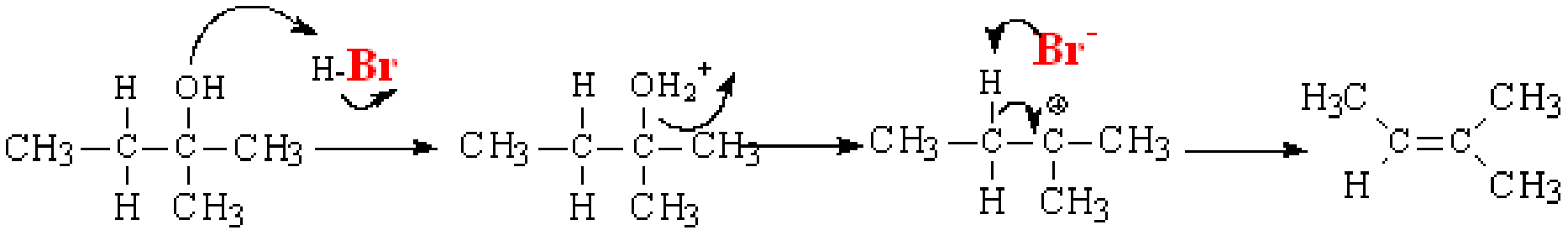
Convert to a
better leaving group



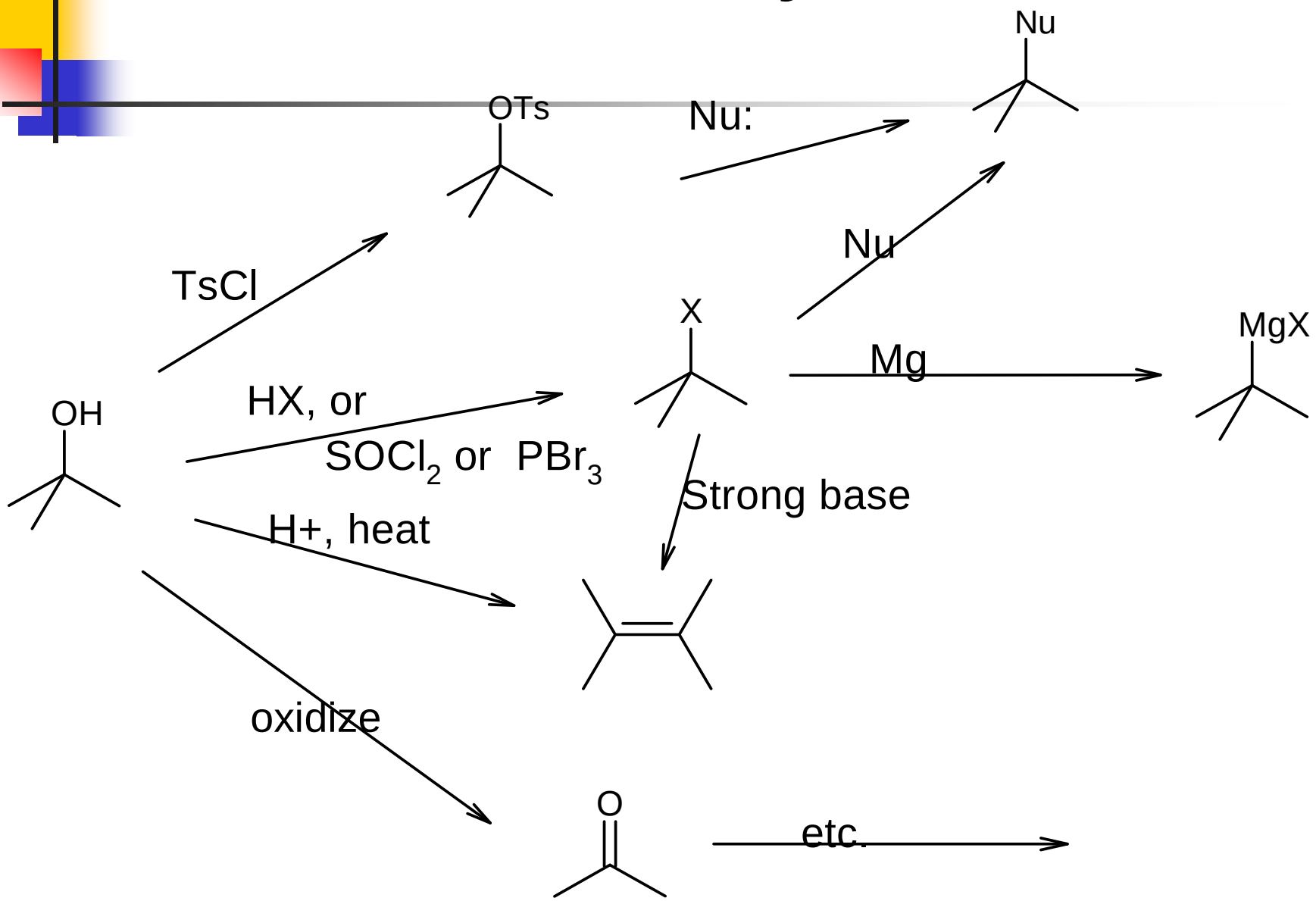
Oxidize



DEHIDRASI ALKOHOL

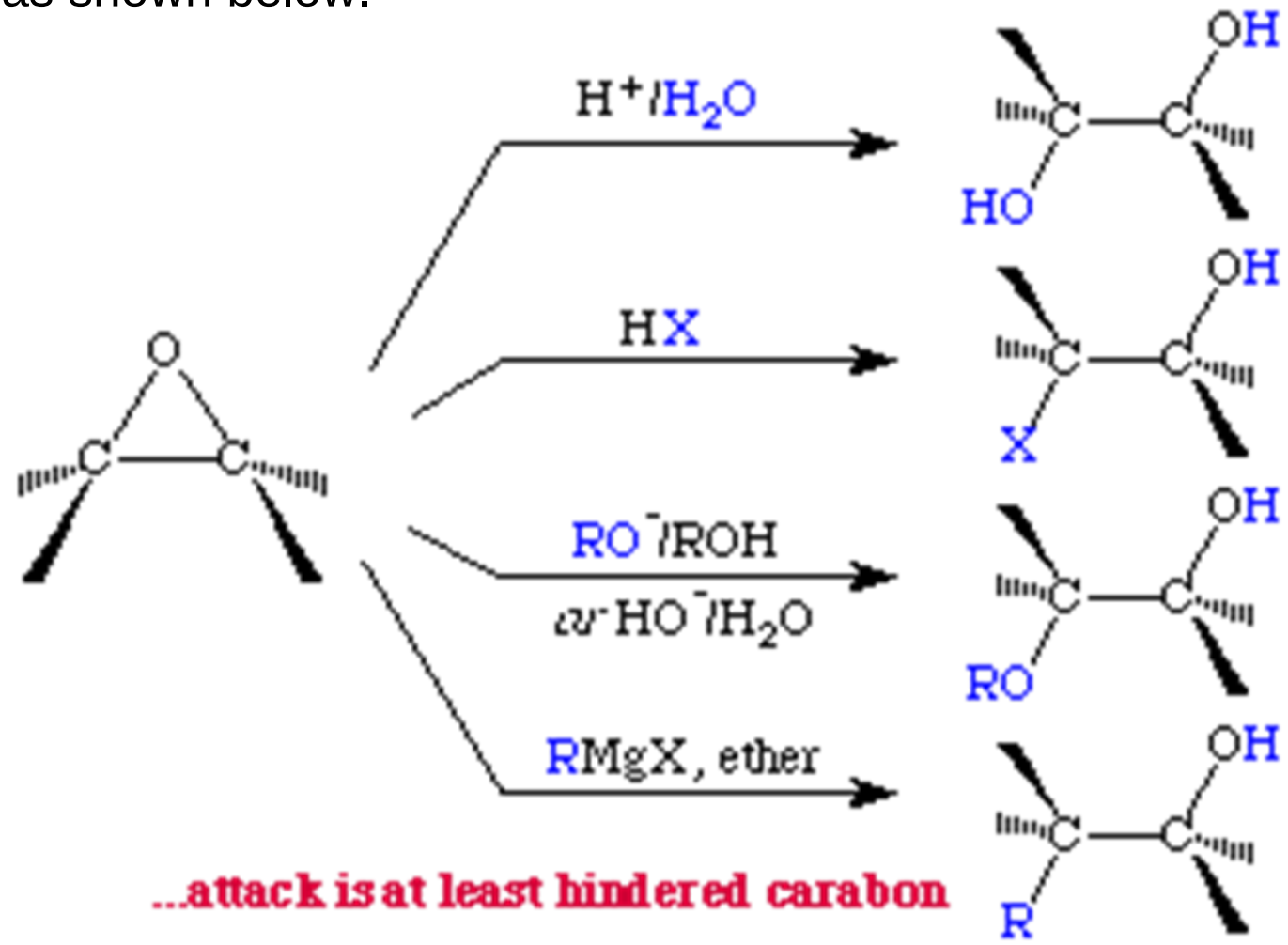


Alcohols in Synthesis



Reaksi Pembukaan cincin Epoksida

- The three-membered ring of epoxides is highly strained and undergoes ring-opening reactions with a variety of nucleophiles, as shown below.



Reaksi berkatalisis asam