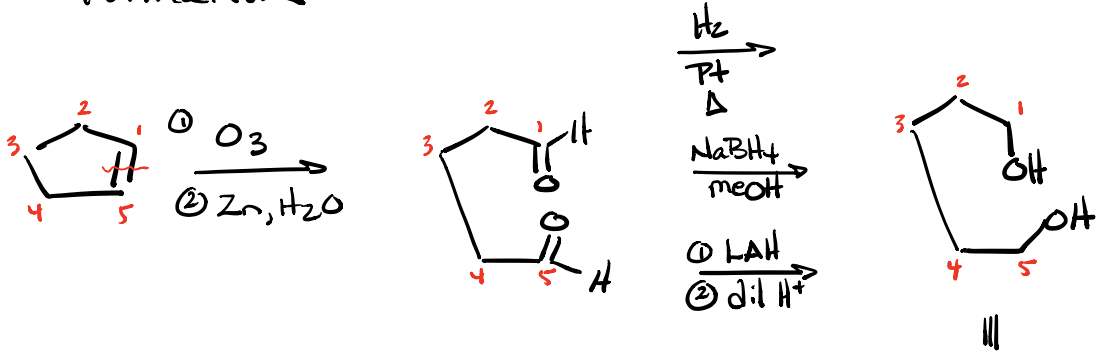
Coop #5 ⇒ Problem reversed

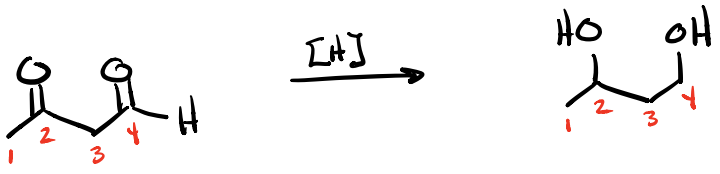
Reversed 

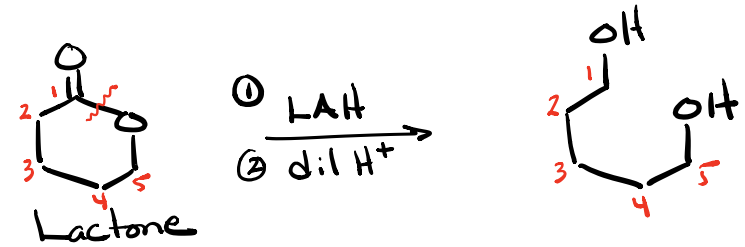
Correction 

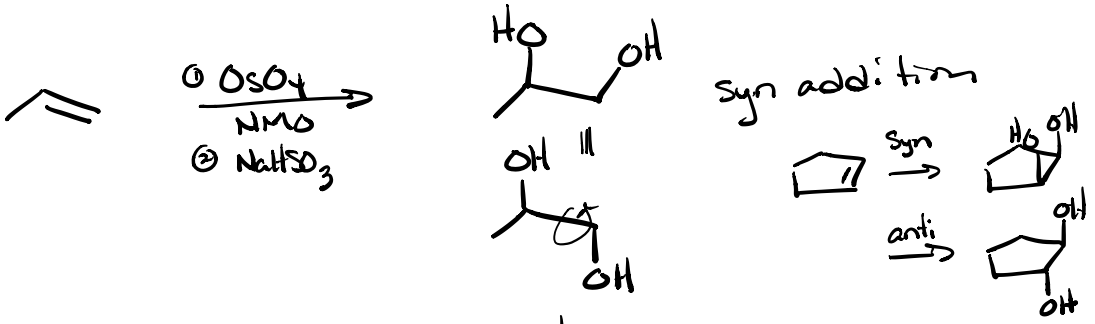
Diols

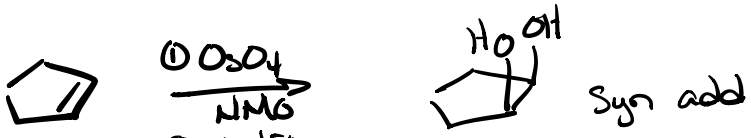
Formation

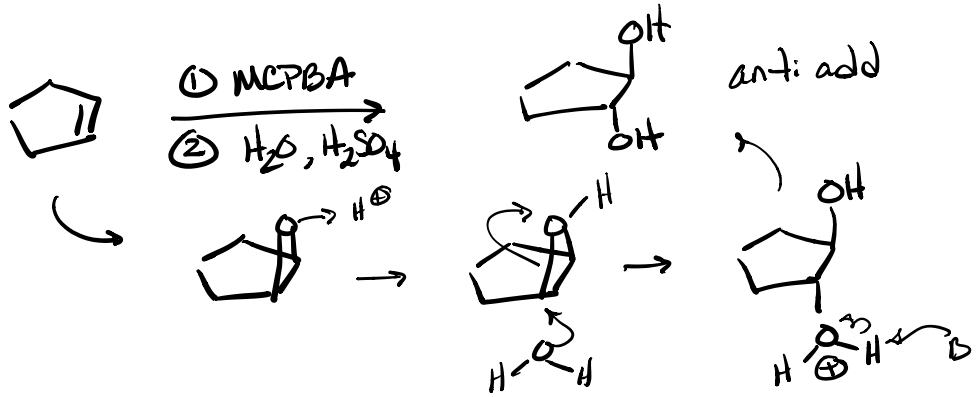



[H]
HO
OH

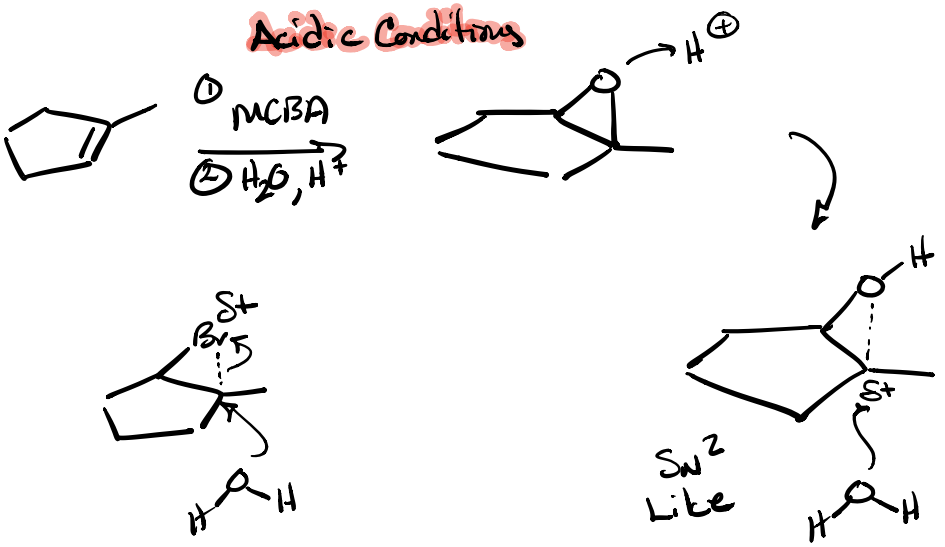

① LAH
② dil H+
Lactone
(Cyclic ester)


① OsO4
NMO
② NaHSO3
syn addition
syn
anti

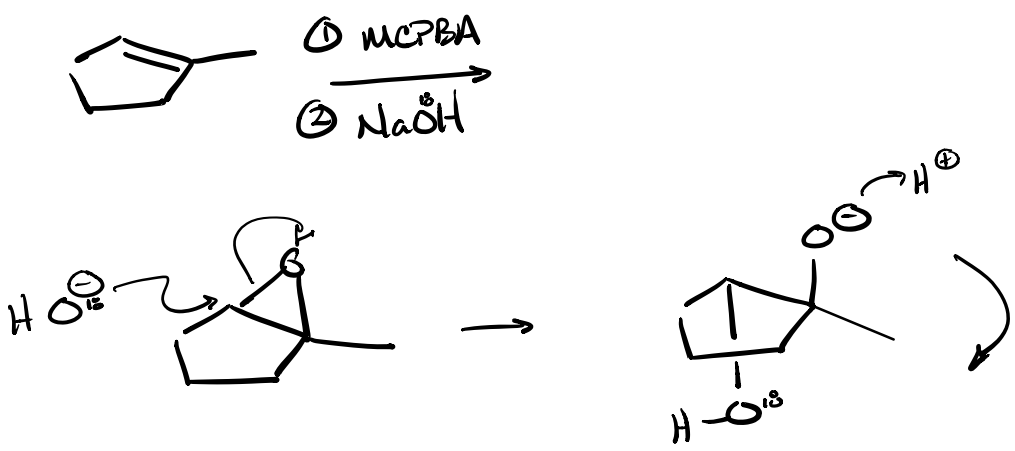

① OsO4
NMO
② NaHSO3
Syn add

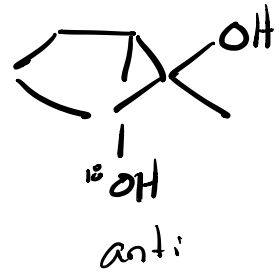

① MCPBA
② H2O, H2SO4
anti add

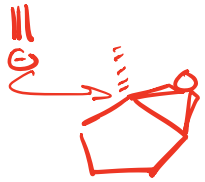
Acidic Conditions



Basic Conditions







Ahh... I need to attack the more substituted side

⇒ Acidic Conditions

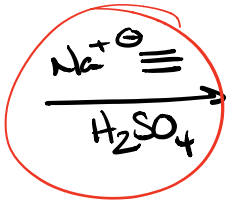
Epoxide

Acid ⇒ nuc attacks more Sub Side

Basic ⇒ nuc attacks Less Sub Side

for Oxygen & Nitrogen nucleophiles only

⇒ no Carbon nucleophiles in acidic Conditions

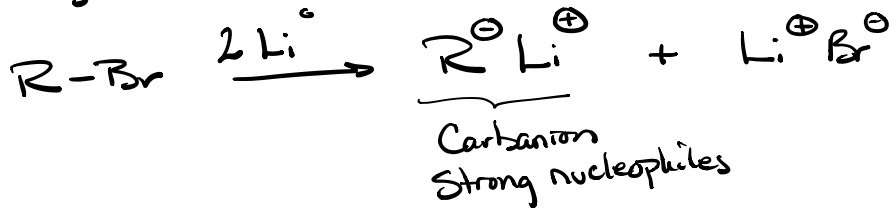


No Rxn 

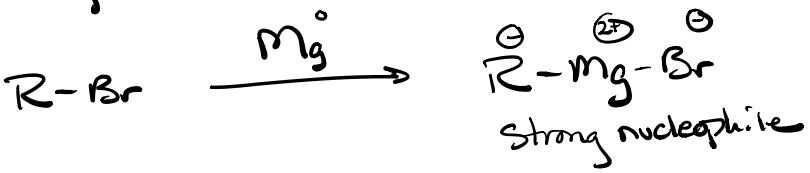
Formation of Alcohols by organometallics

Alkyl lithiums & Grignards

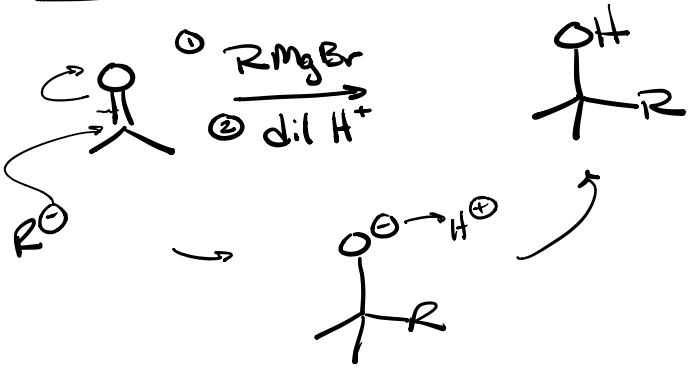
Alkyl lithium

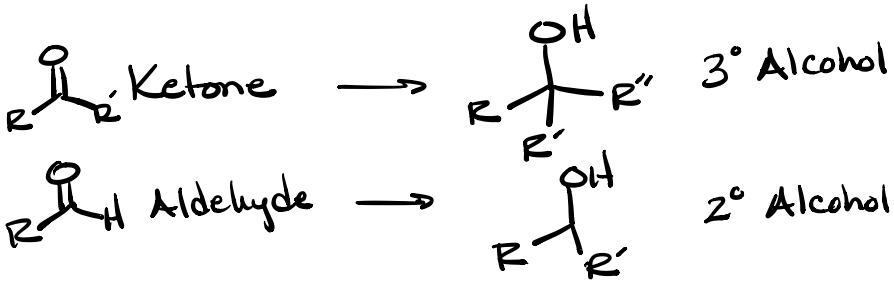


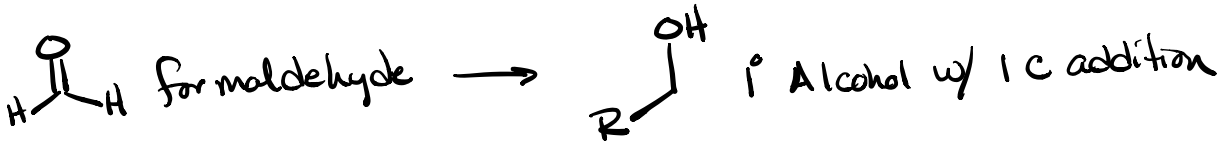
Grignard

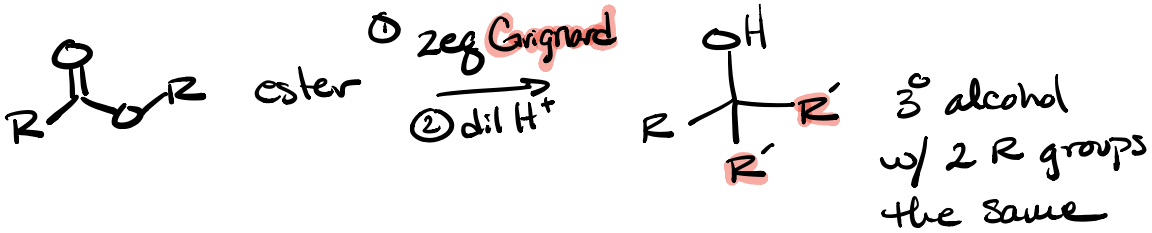


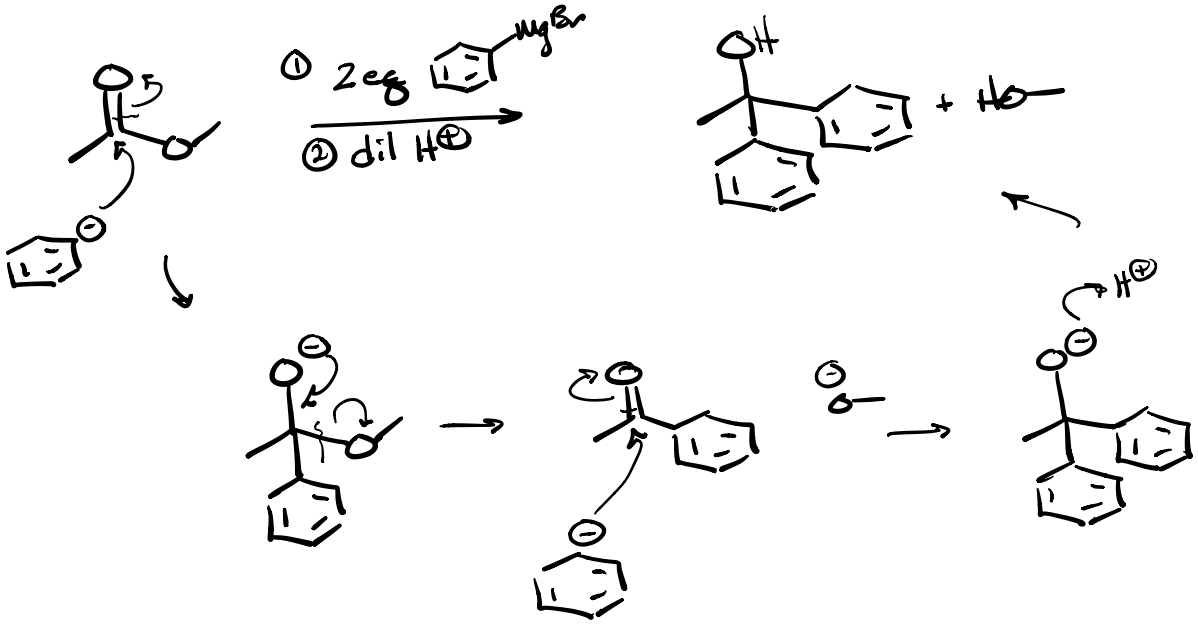
General Rxn

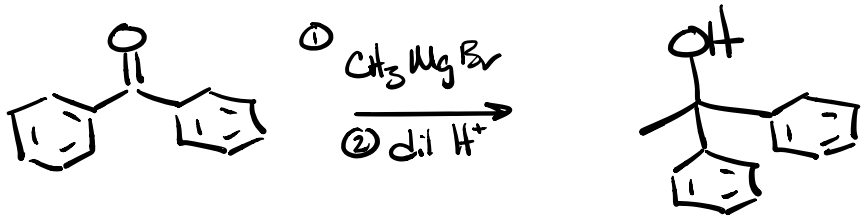


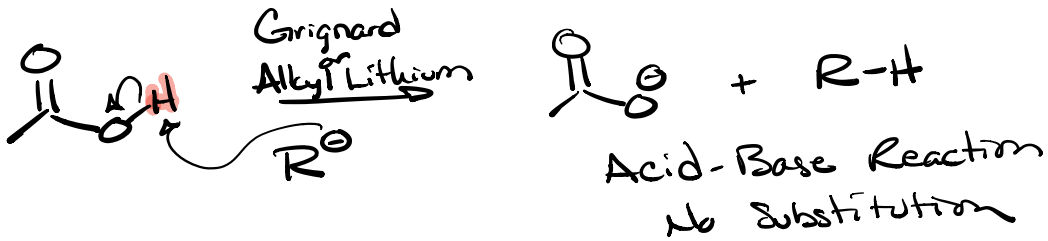


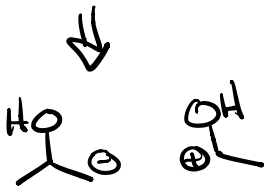

formaldehyde
1° Alcohol w/ 1 C addition


ester
① 2eq Grignard
② dil H+
3° alcohol
w/ 2 R groups
the same

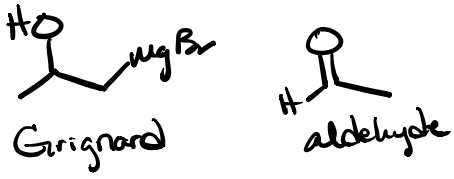

① 2eq
② dil H⊕


① CH3MgBr
② dil H+

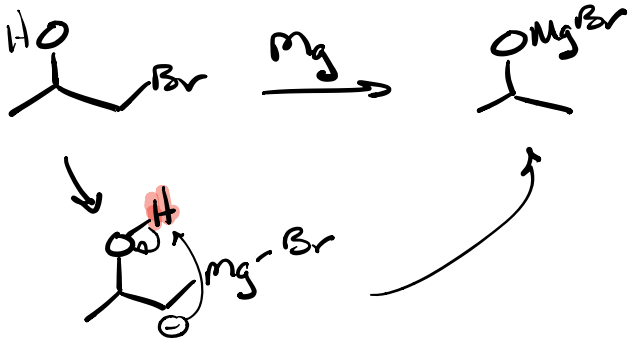




Synthons

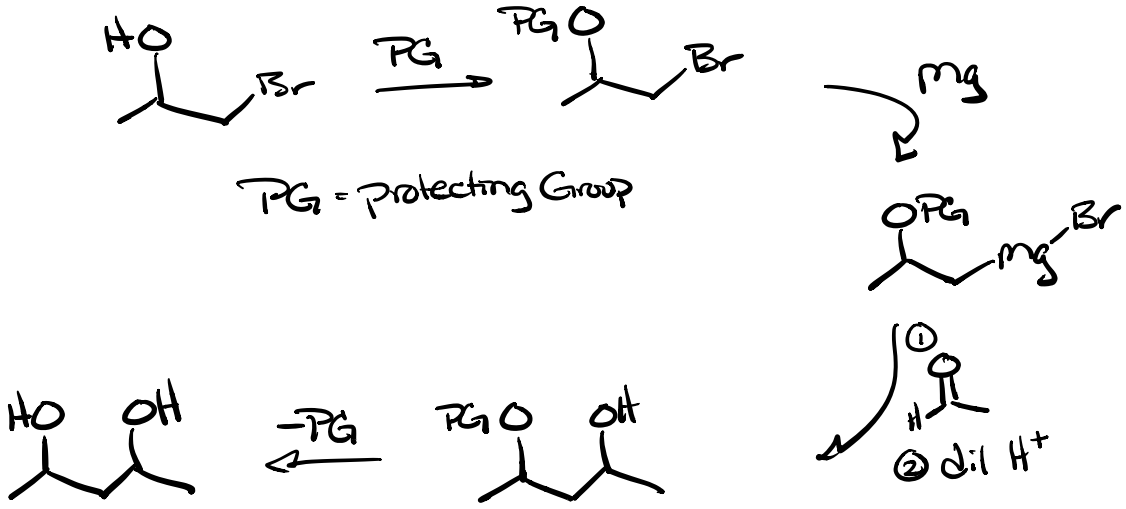


Grignard aldehyde



Can't use Grignard (or alkyl lithium) with any acidic proton !

What if we could Protect the proton?

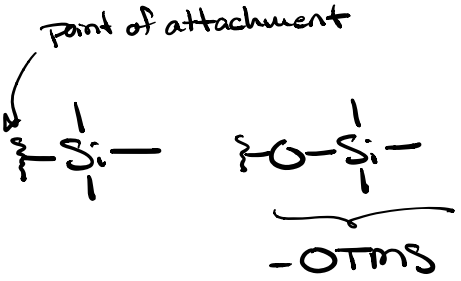


Protecting groups are chemically inert to the desired reaction conditions. They are easy to put on & take off.

Protecting Groups for Alcohols

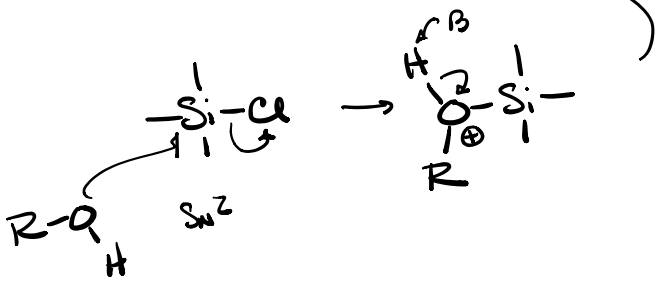
Silyl ethers

TMS Trimethyl Silyl



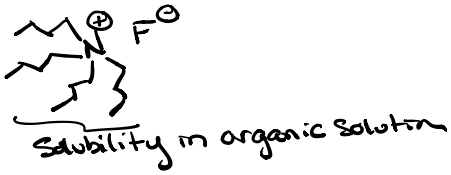
Put on

$$R\text{-}OH \xrightarrow[Et_3N]{TMSCl} R\text{-}OTMS$$

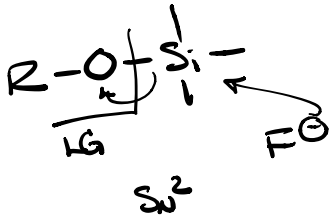


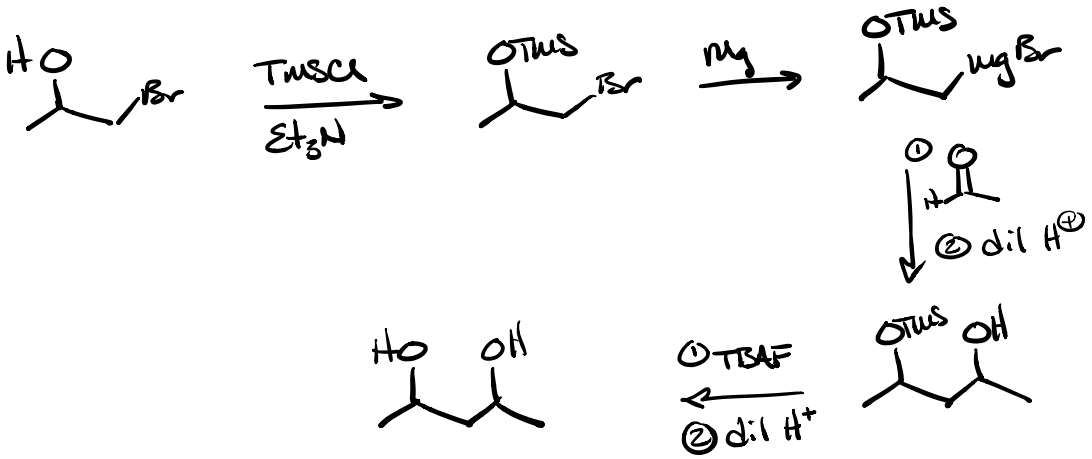
Take off

TBAF = Tetrabutyl ammonium fluoride



$$R\text{-}OTMS \xrightarrow[\text{② dil } H^{\oplus}]{\text{① TBAF}} R\text{-}OH + F\text{-}Si\text{-}$$

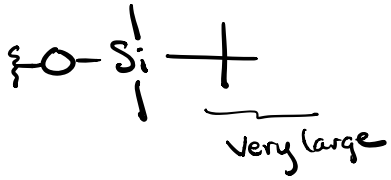




Silyl ethers Cont.

TBDMS tert-butyl-dimethyl-Silyl

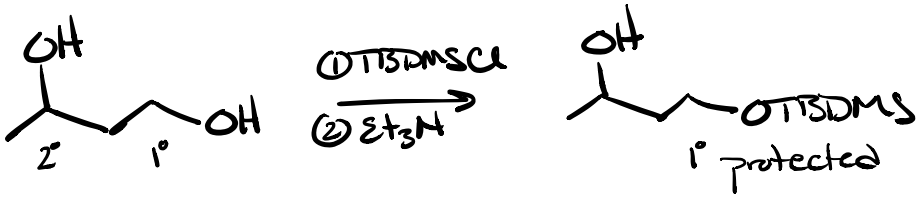
Selective for 1° alcohols over 2° & 3° alcohols



put on & take off just like TMS

$$R\text{-}OH \xrightarrow[Et_3N]{TBDMSCl} R\text{-}OTBDMS$$

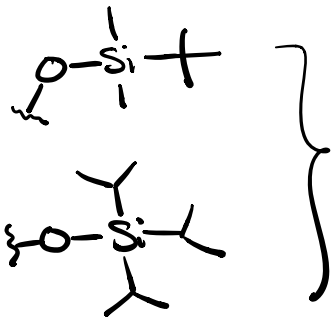
$$R\text{-}OTBDMS \xrightarrow[②\ dil\ H^+]{①\ TBAF} R\text{-}OH$$



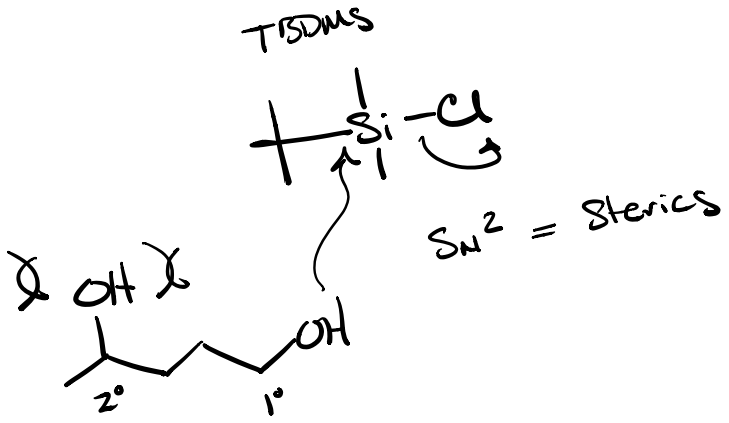
Two large Silyl ethers

TBDMS

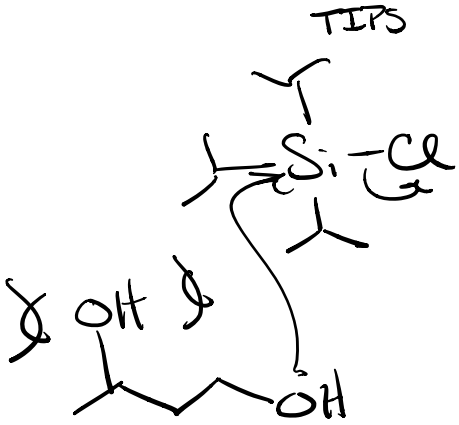
TIPS

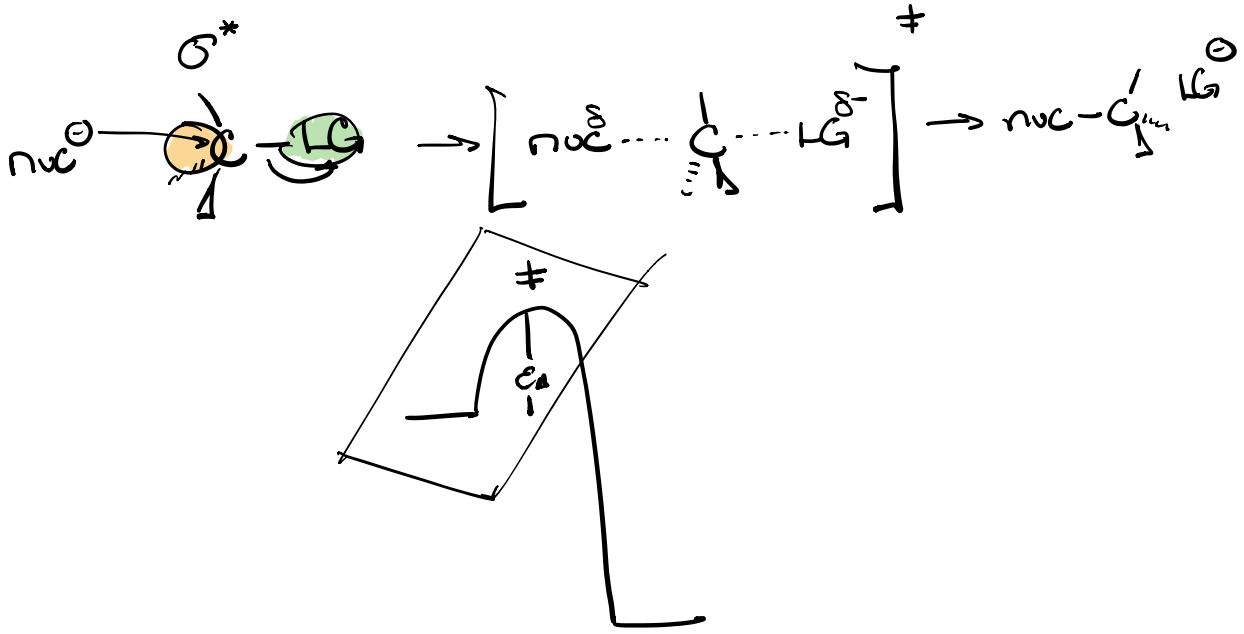


Both selective for 1° over 2° or 3°

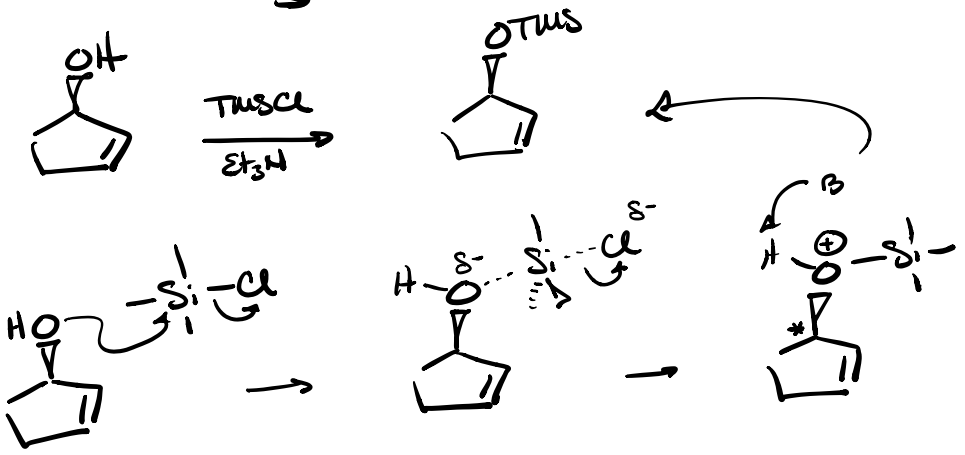


S_N2 = Sterics





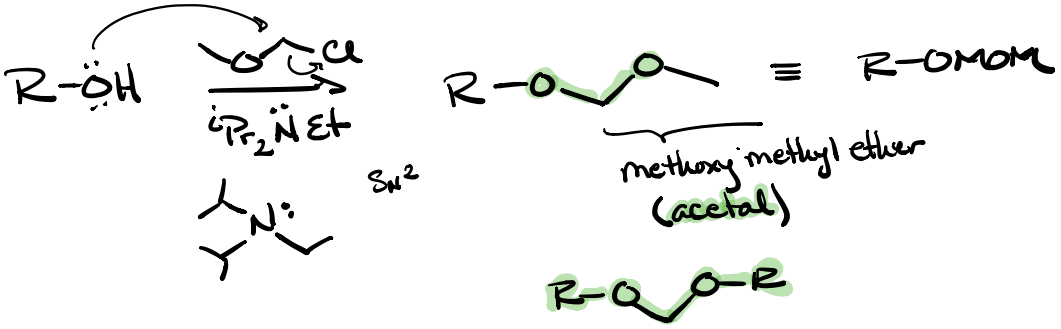
Stereochemistry



Acetal Type

MOM Methoxy methyl ether

Put on



Take off