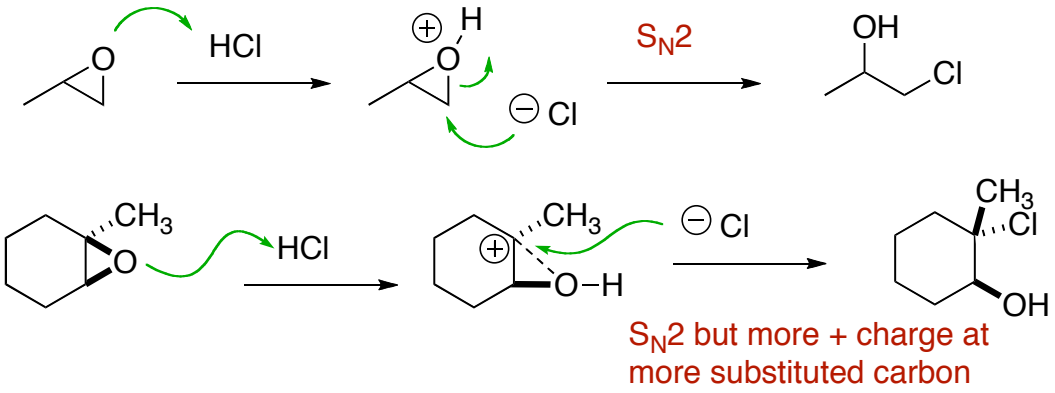
Chem 342 • Organic Chemistry II

Lecture Summary 18 - 02 Mar 2009

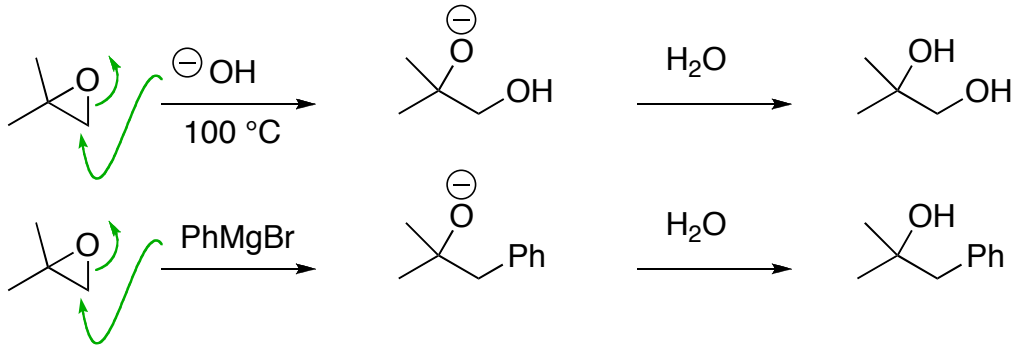
Chapter 18 - Ethers and Epoxides; Thiols and Sulfides

Reactions of Epoxides

Epoxides are more reactive than typical ethers due to ring strain. Under acidic conditions, primary and secondary protonated epoxides will be attached by nucleophiles via a S_N2 mechanism - thus the nucleophile will add to the less hindered carbon. If there is a tertiary carbon in the epoxide, there will be more positive charge at that carbon so nucleophiles will add to the more hindered carbon. Note that this is still a stereospecific anti addition as there is not a full carbocation formed. It is somewhere in between a S_N2 and S_N1 mechanism.

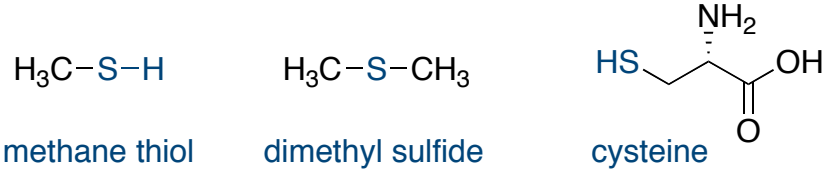


Base catalyzed or nucleophilic opening of epoxides can be done. It generally requires strong nucleophiles and heat. Epoxides are not as electrophilic as typical alkyl halides.



Thiols and Sulfides

The sulfur analogs of alcohols are called thiols and the sulfer analogs of ethers are called sulfides. The amino acid cysteine is an important amino acid in proteins and affect their folding structure and stability.



methane thiol dimethyl sulfide cysteine

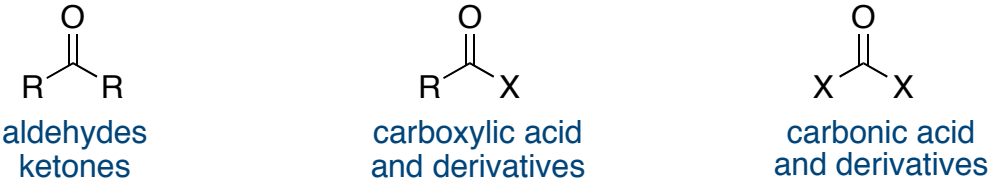
Be An Electron

All chemical reactions are simply a rearrangement of electrons (bonds). Many generalities can be found if you can identify what functionality is the electron rich group (nucleophile) and which is electron poor (electrophile). If you have some knowledge of the polarity of functional groups and keep in mind that if you make a bond, generally you need to break a bond to maintain proper valency (eg only 4 bonds to C) you should be able to predict many types of reactions. Some functional groups can react as either an electrophile or a nucleophile depending on what it is reacting with. Carbonyls are an example of this type of species.

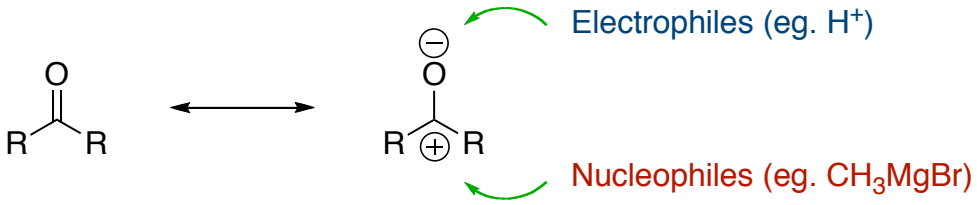
Chapter 19 - Aldehydes and Ketones: Nucleophilic Addition Reactions

Carbonyl Compounds

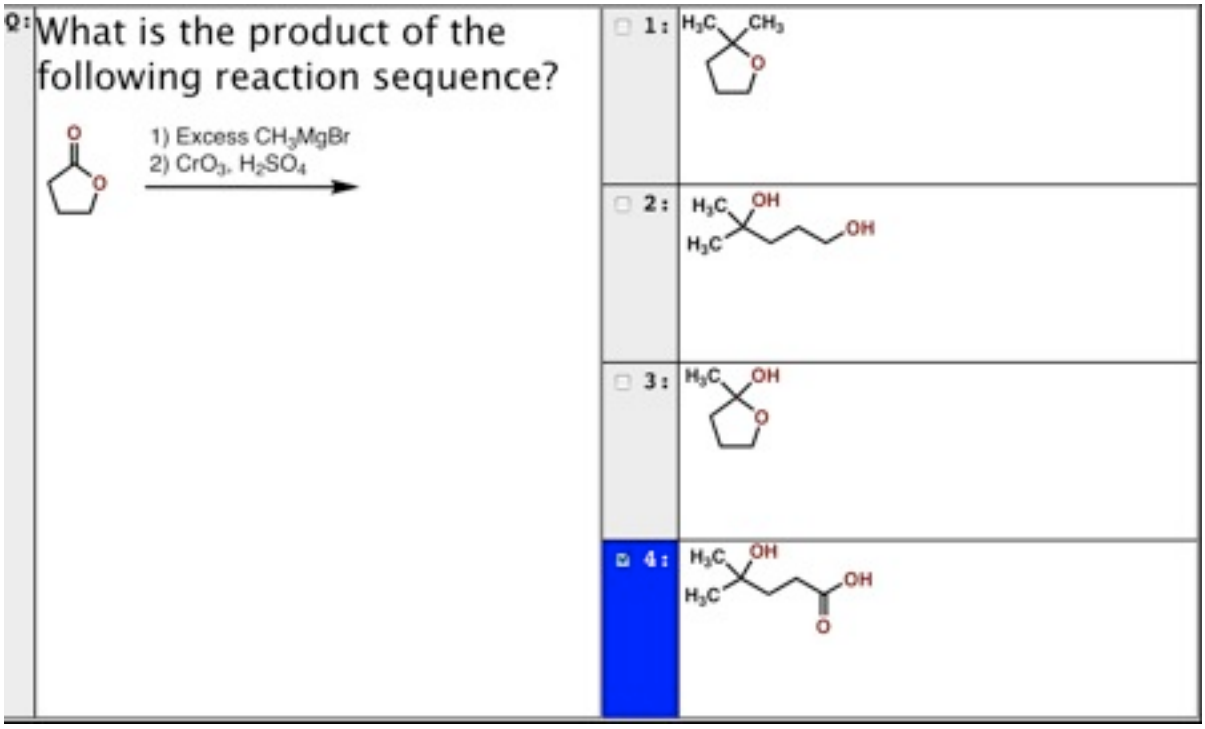
Carbonyl compounds exist in three different oxidation states.



Carbonyls are polarized toward the oxygen. Thus, nucleophiles will react at the carbon and electrophiles at the oxygen.



Daily Quiz


Q: What is the product of the following reaction sequence?
1) Excess CH_3MgBr
2) CrO_3, H_2SO_4
1:
2:
3:
4: