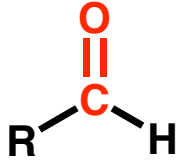
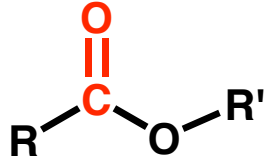
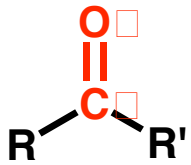
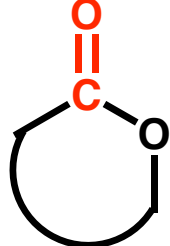
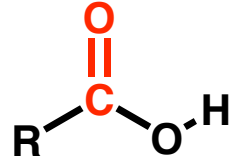
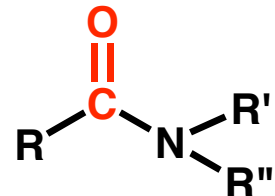
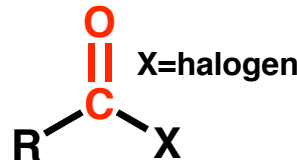
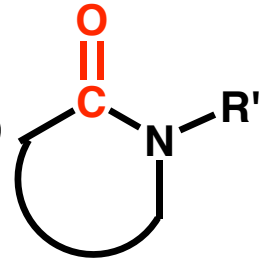
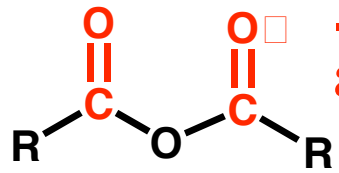
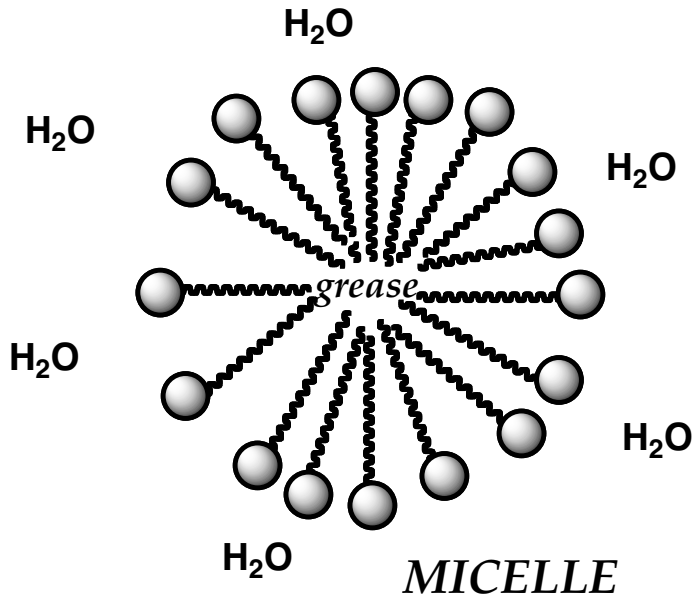
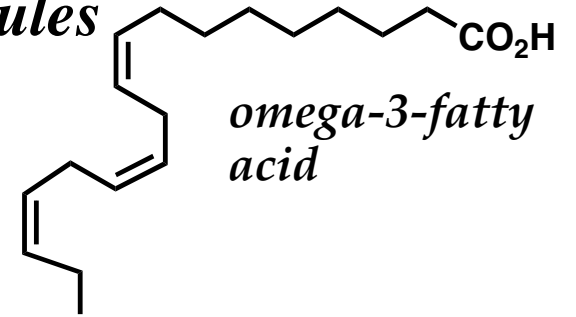
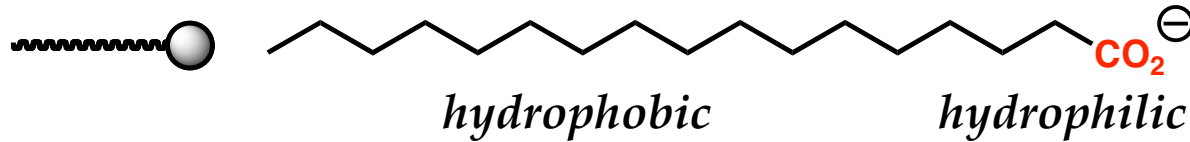


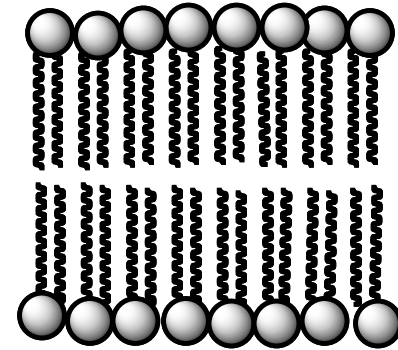
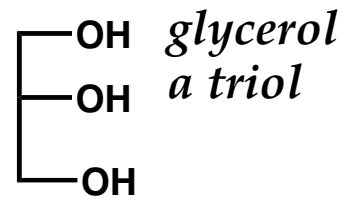
## TYPES OF CARBONYL COMPOUNDS

Name	General formula	Name suffix	Name	General formula	Name suffix
Aldehyde		<b>-al</b>	Ester		<b>-oate</b>
Ketone		<b>-one</b>	Lactone (cyclic ester)		
Carboxylic acid <input type="checkbox"/>		<b>-oic acid</b>	Amide		<b>-amide</b>
Acid halide		<b>-oyl halide</b>	Lactam <input type="checkbox"/> (cyclic amide)		
Acid anhydride		<b>-oic anhydride</b>			

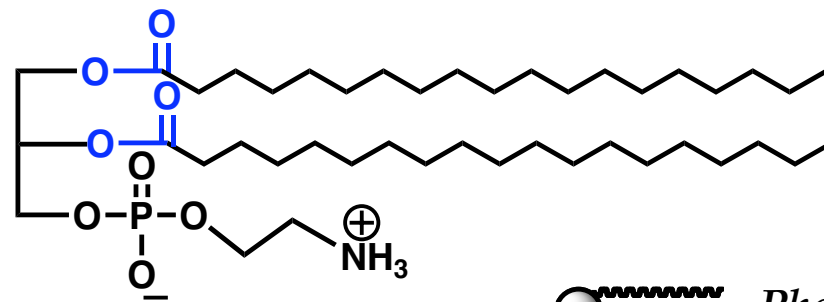
# Detergents and "fatty acids" - amphiphilic molecules



## Phospholipids - Fatty acid esters of glycerol

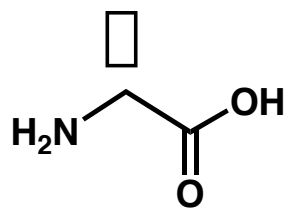


**LIPID BILAYER**

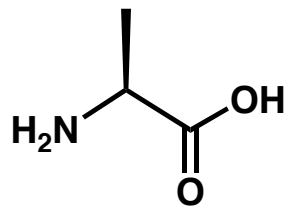


**Phosphatidylcholine**

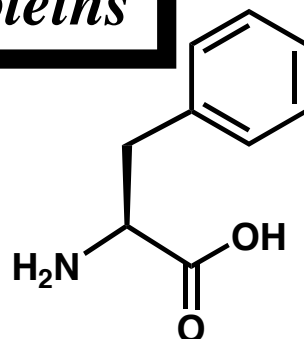
## *Amides in Peptides and Proteins*



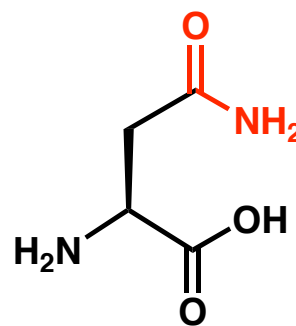
*glycine*



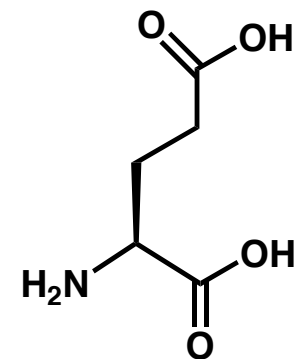
*alanine*



*phenylalanine*



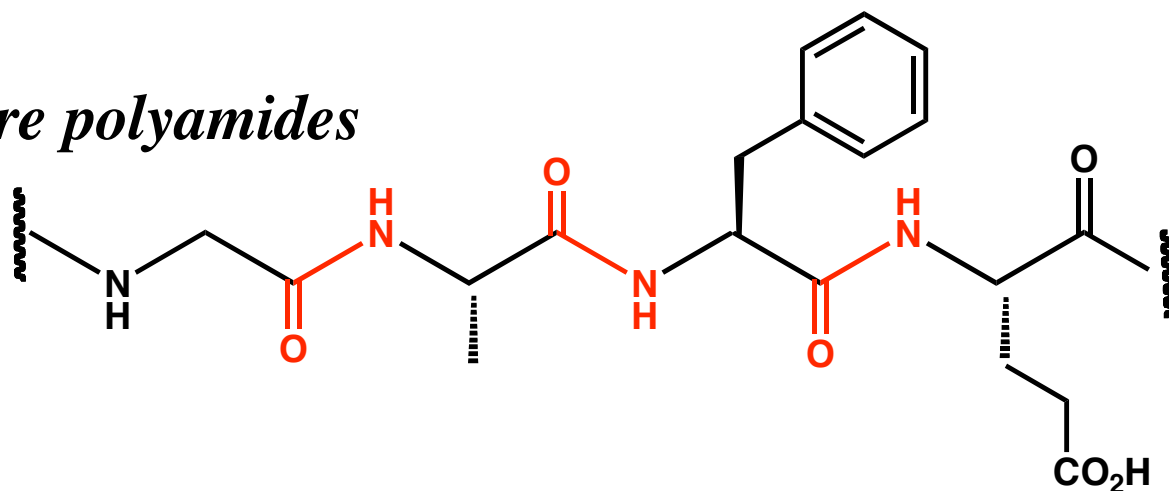
*asparagine*



*glutamic acid*

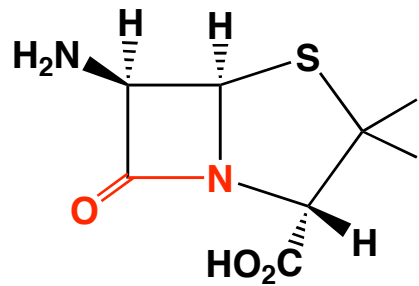
*Five of the 20 amino acid building blocks that go into all proteins*  
*All  $\alpha$ -amino acids*

*Proteins are polyamides*

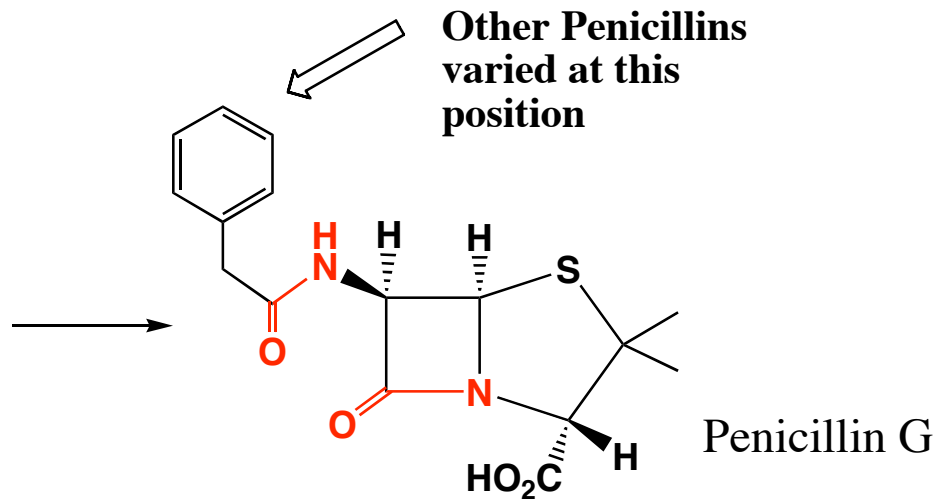


*Each protein is defined by a specific primary sequence of amino acids*

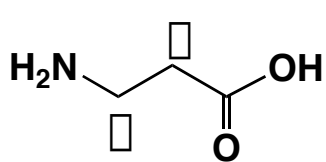
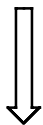
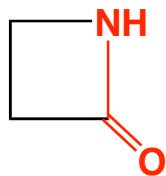
# $\beta$ -Lactam Antibiotics



6-aminopenicillanic acid

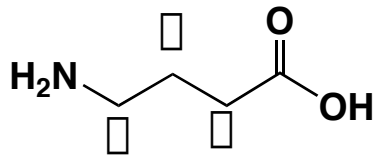
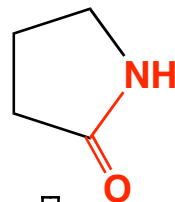


$\beta$ -lactam



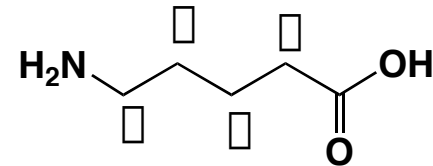
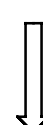
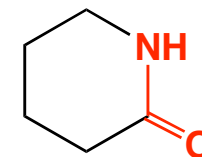
$\alpha$ -amino acid

$\beta$ -lactam



$\beta$ -amino acid

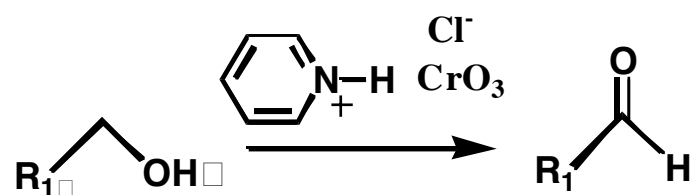
$\gamma$ -lactam



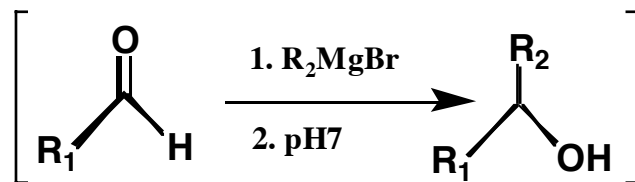
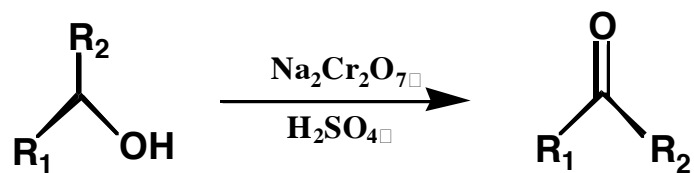
$\gamma$ -amino acid

# SUMMARY - SYNTHESIS OF ALDEHYDES AND KETONES

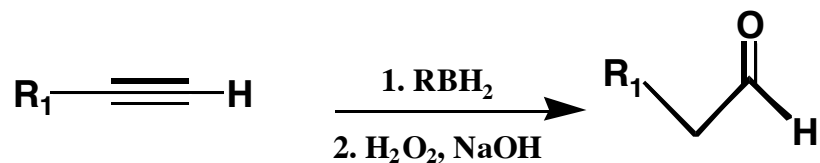
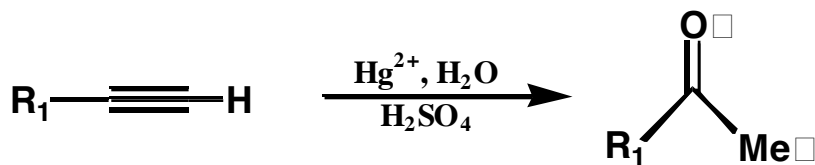
## 1. Oxidation of alcohols



$\text{Na}_2\text{Cr}_2\text{O}_7$  will over-oxidize to carboxylic acid

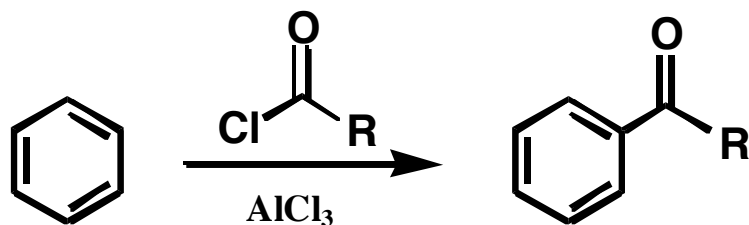


## 2. From alkynes

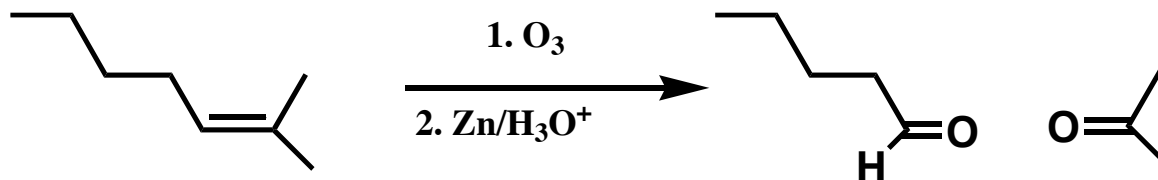


# SUMMARY - SYNTHESIS OF ALDEHYDES AND KETONES □

## 3. Friedel-Crafts Acylation



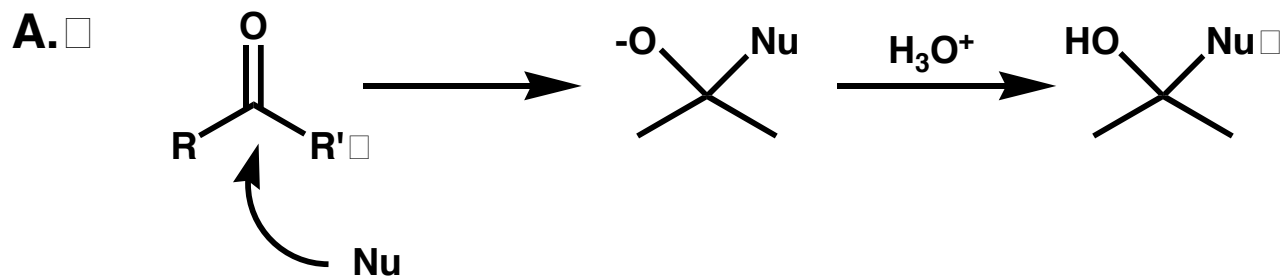
## 4. Ozonolysis



# Overview of Reactions 4/27-5/9 - Reactions with carbonyls □

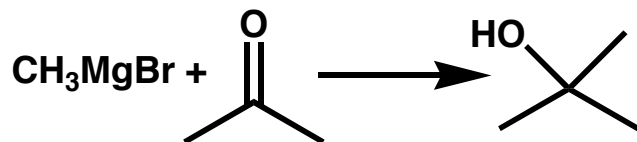
## 1. Nucleophilic Addition:

### Reactions with Aldehydes and Ketones (Chapter 19)



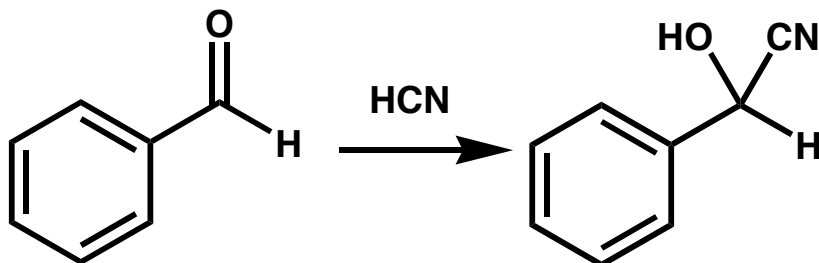
Example: Grignard Reaction □

Section 19.8



Example: Cyanohydrin Formation

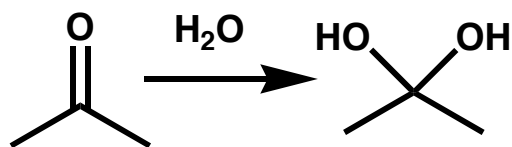
Section 19.7



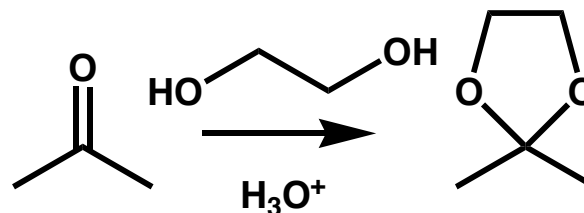
# Overview of Reactions 4/27-5/9 - Reactions with carbonyls □

## 1. Nucleophilic Addition

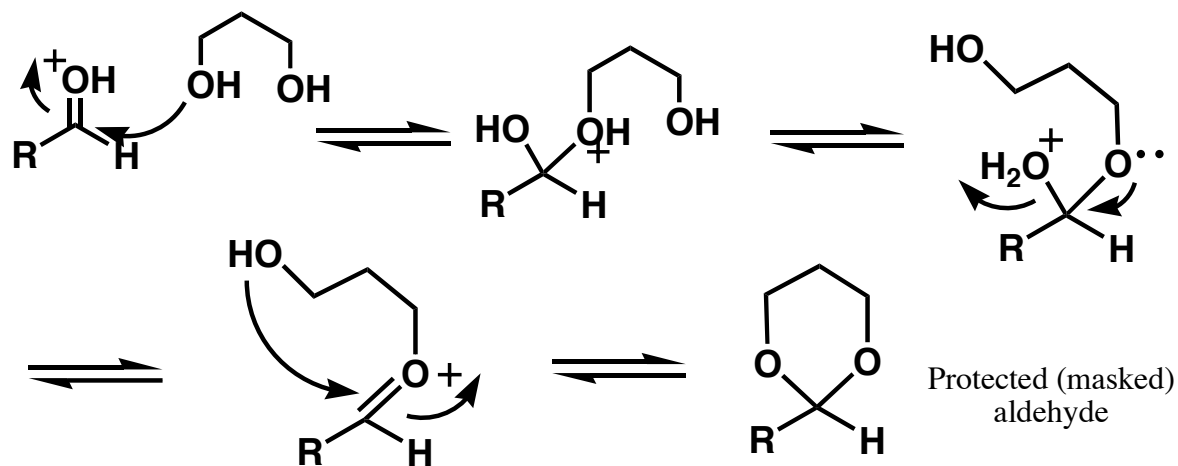
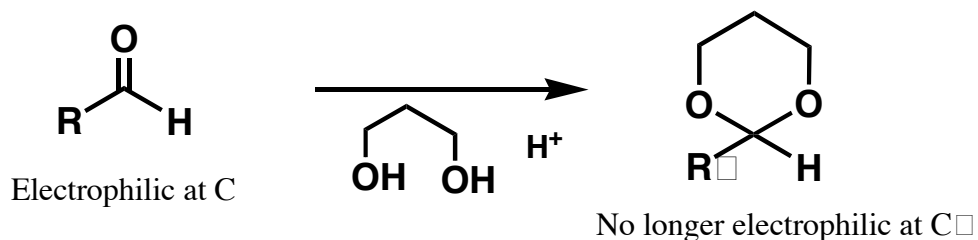
### A. Hydration and Acetal Formation



Section 19.6

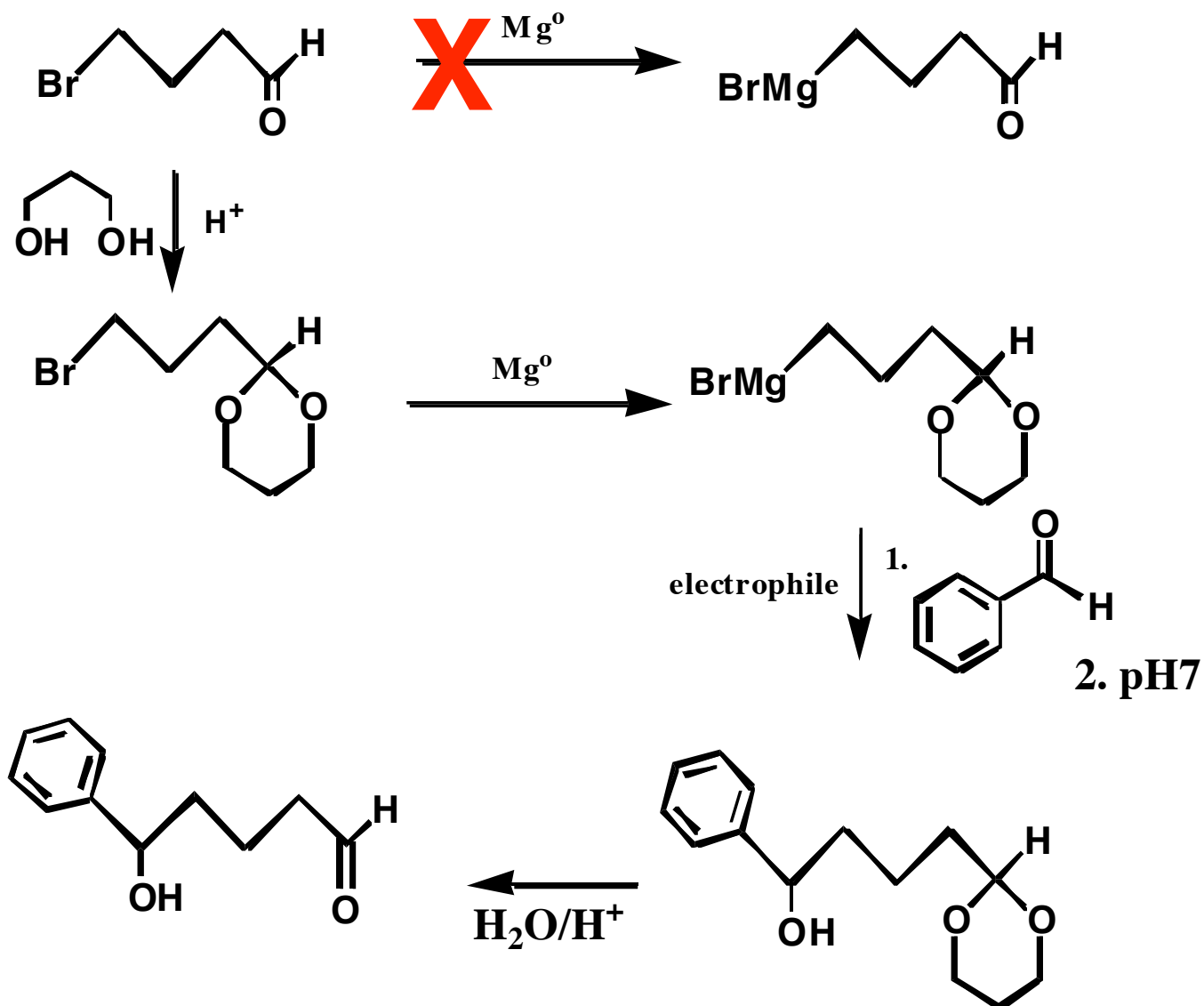


Section 19.11





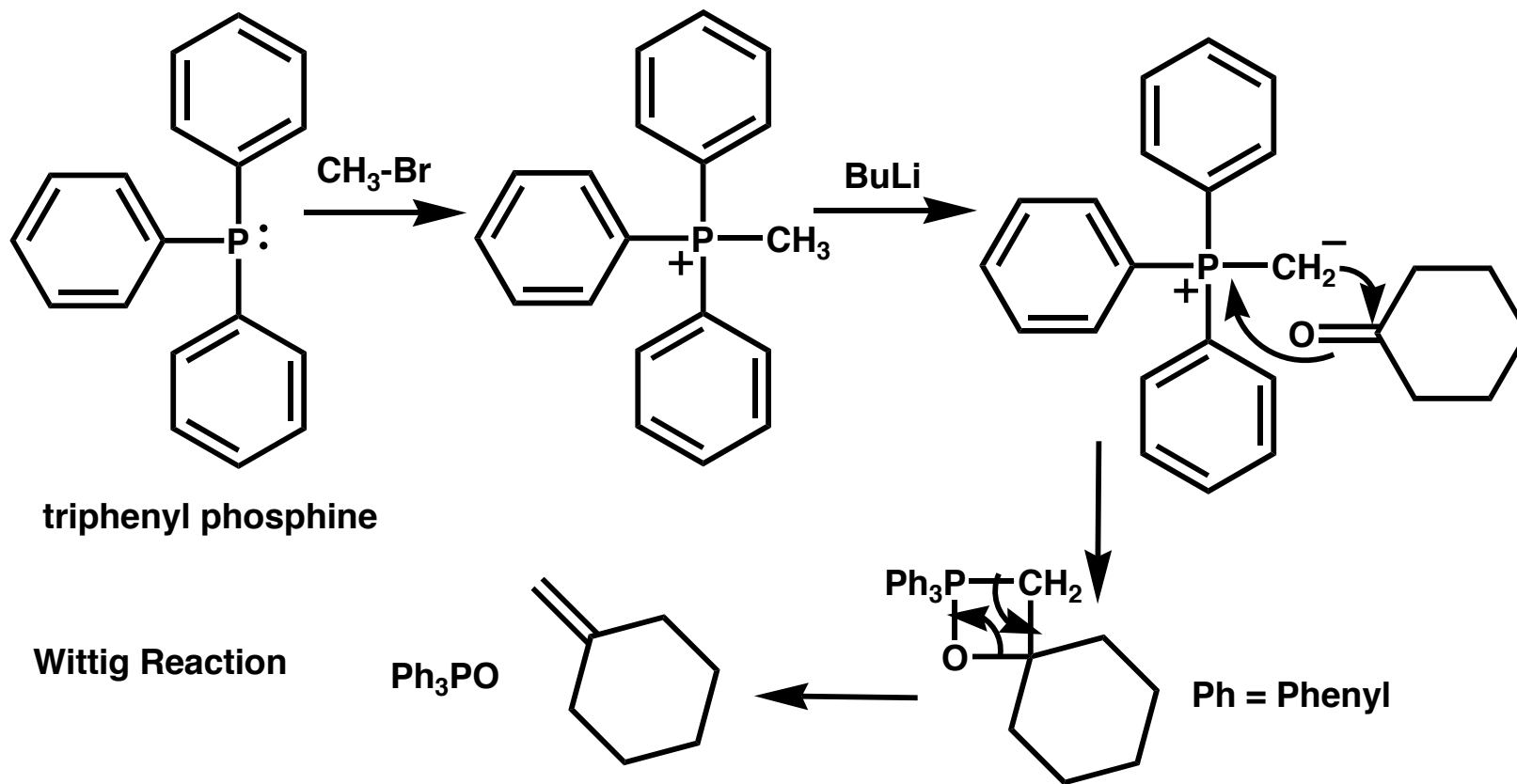
## Acetals as Protecting Groups for Aldehydes $\square$



# Overview of Reactions 4/27-5/9 - Reactions with carbonyls

## 1. Nucleophilic Addition

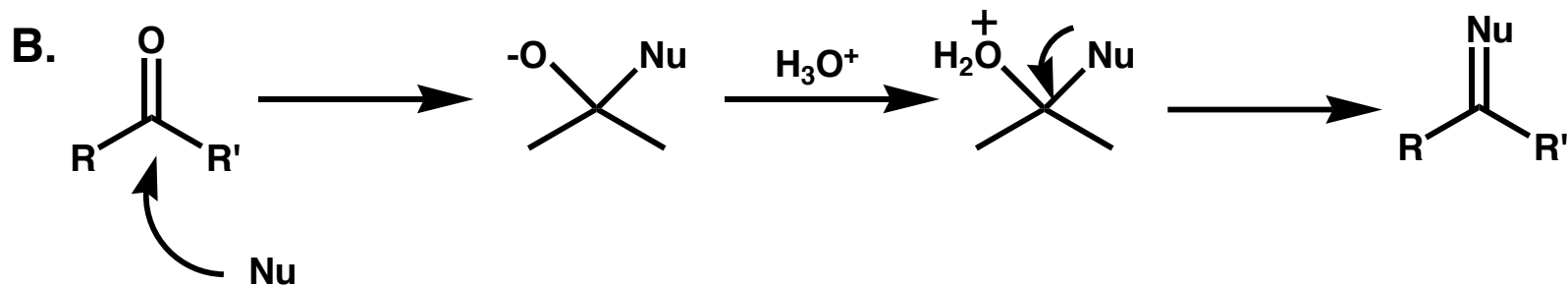
A.



Section 19.12

# Overview of Reactions 4/27-5/9 - Reactions with carbonyls □

## 1. Nucleophilic Addition

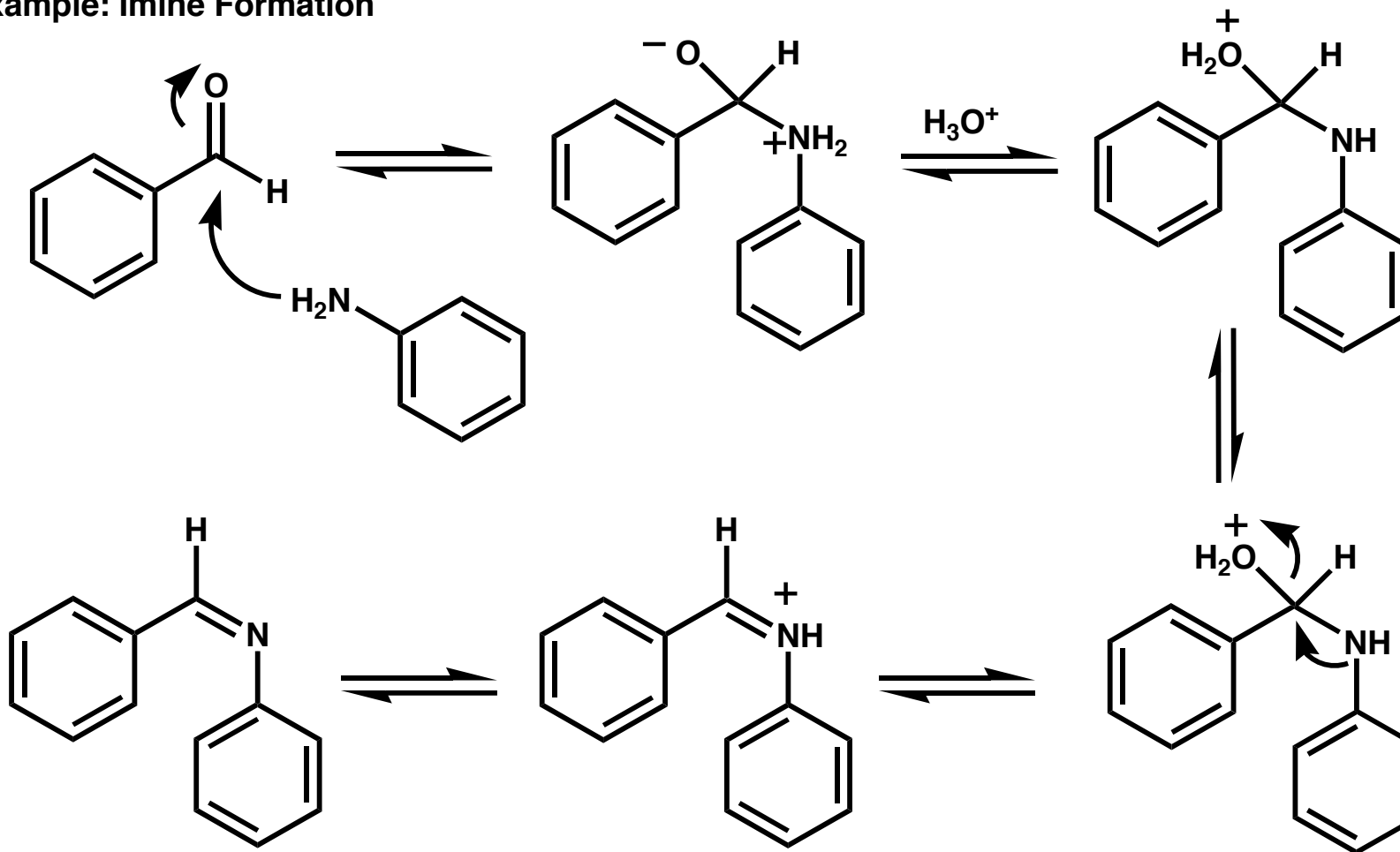


# Overview of Reactions 4/27-5/9 - Reactions with carbonyls

## 1. Nucleophilic Addition

### B. continued

Example: Imine Formation

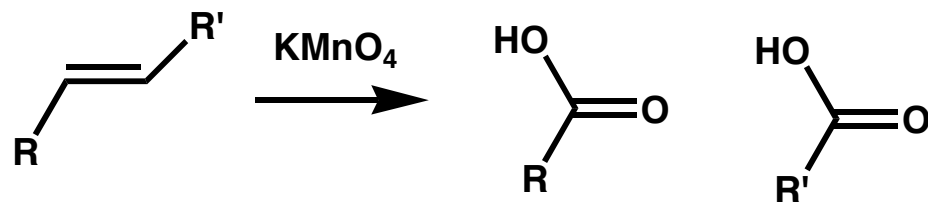


Sometimes called a Schiff base in biochemistry

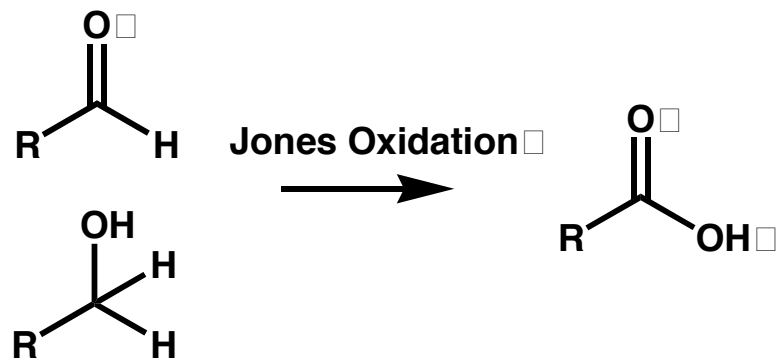
Section 19.9

# ***SUMMARY - Synthesis of Carboxylic Acids*** □

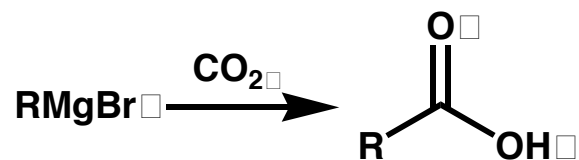
## **1. Oxidative cleavage of alkene**



## **2. Oxidation of 1° alcohols and aldehydes**



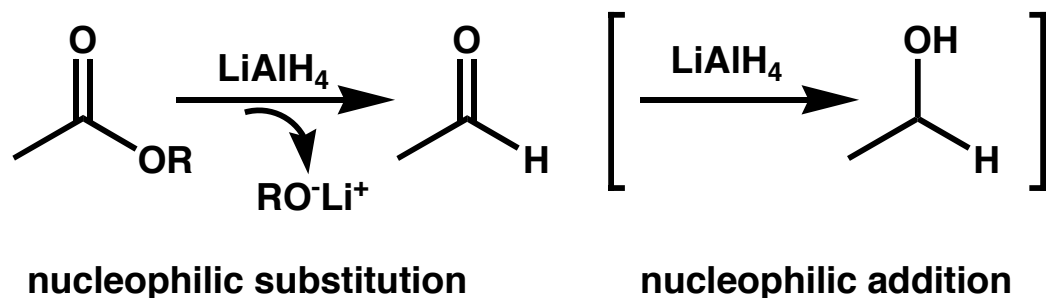
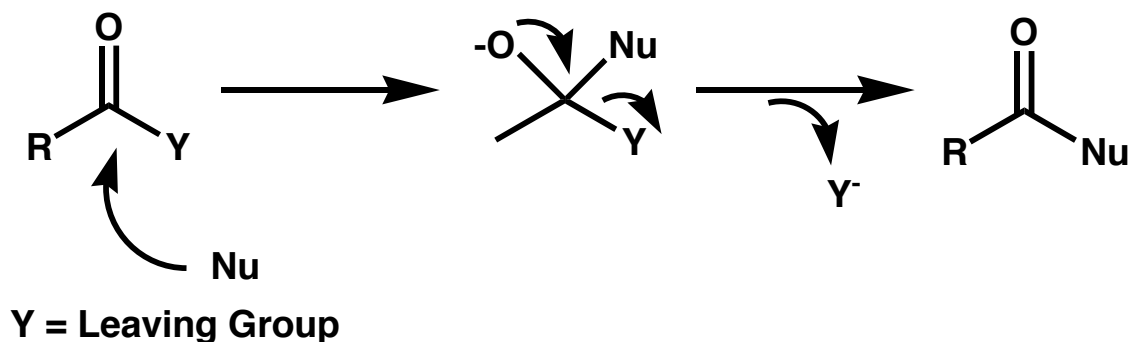
## **3. Carboxylation of Grignard Reagents**



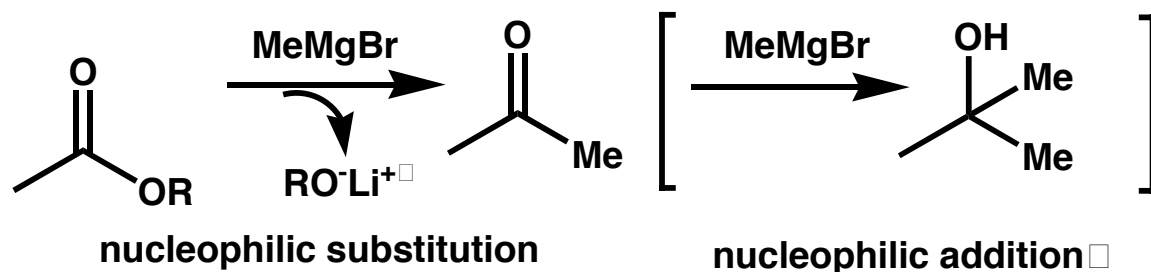
# Overview of Reactions 4/27-5/9 - Reactions with carbonyls □

## 2. Nucleophilic Acyl Substitution:

Reactions with Carboxylic Acid derivatives (Chapter 21)



Ester hydride reduction  
Chapter 17.5



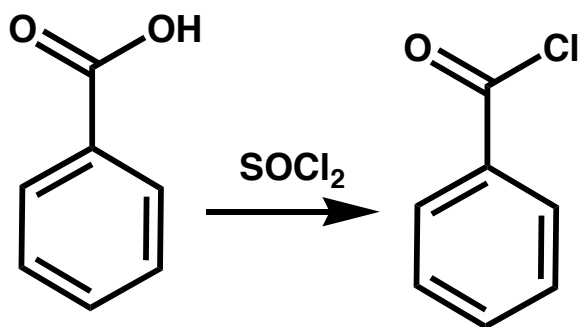
Ester grignard reaction  
Section 21.6

# Overview of Reactions 4/27-5/9 - Reactions with carbonyls □

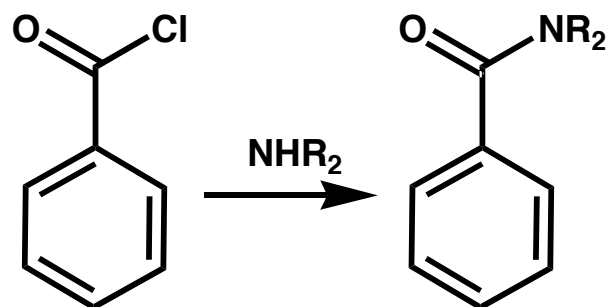
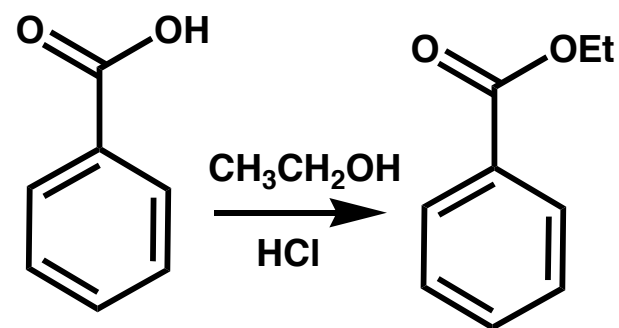
## 2. Nucleophilic Acyl Substitution

### Carboxylic Acid Derivatives

Example: Acyl Halide **Section 21.4**



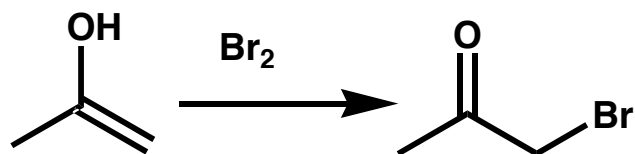
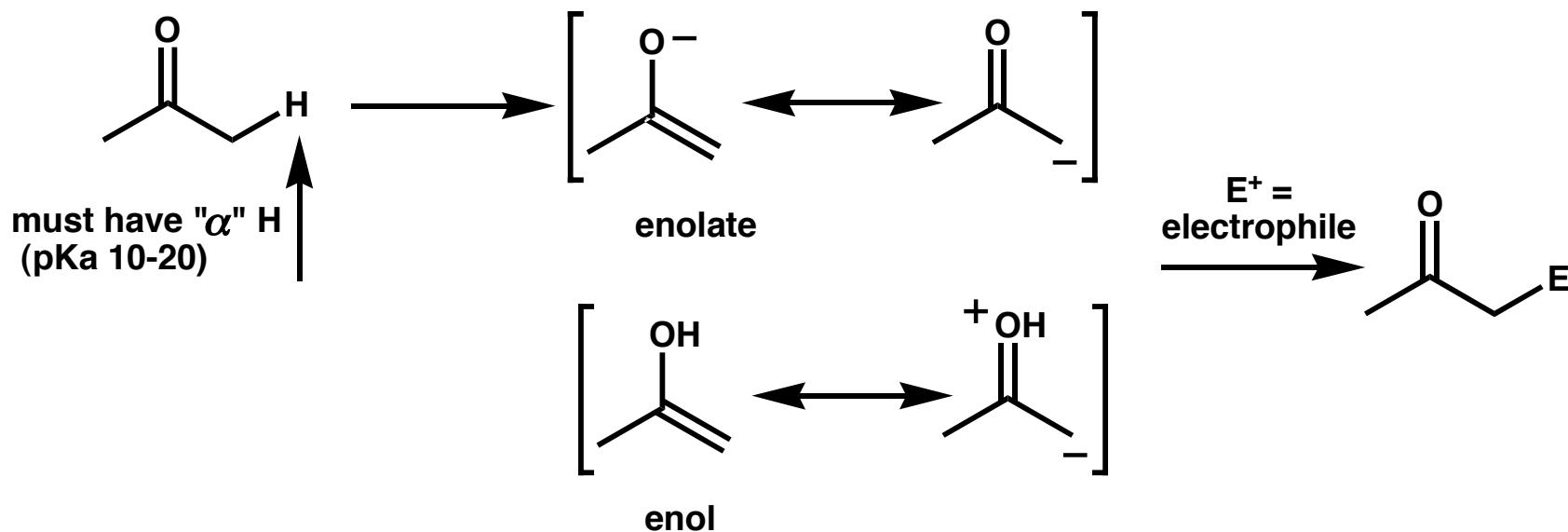
Example: Ester **Section 21.6**



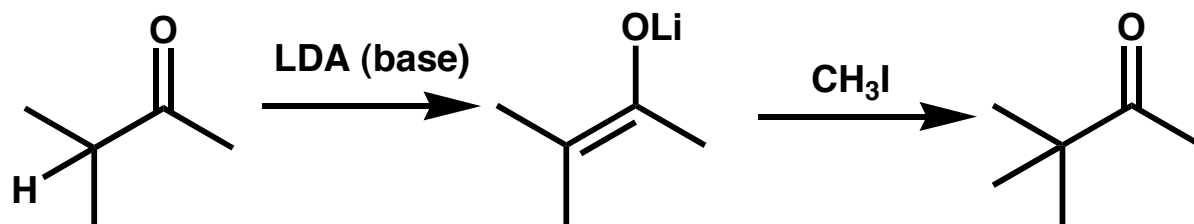
Example: Amide  
**Section 21.7**

# Overview of Reactions 4/27-5/9 - Reactions with carbonyls □

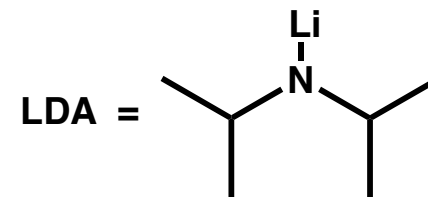
## 3. Alpha Substitution: Enolate/Enol Chemistry



Alpha Halogenation **Section 22.3**



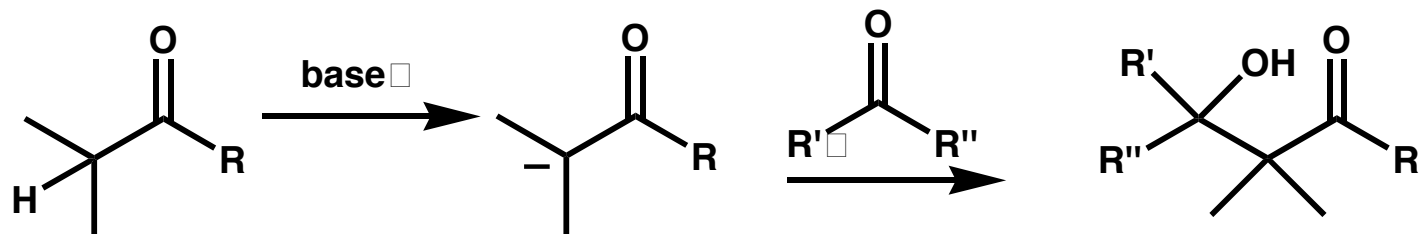
Alpha Alkylation  
**Section 22.8**



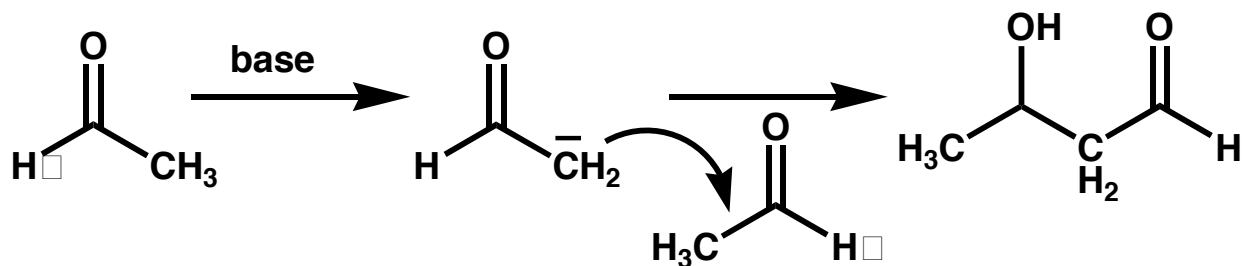


# Overview of Reactions 4/27-5/9 - Reactions with carbonyls □

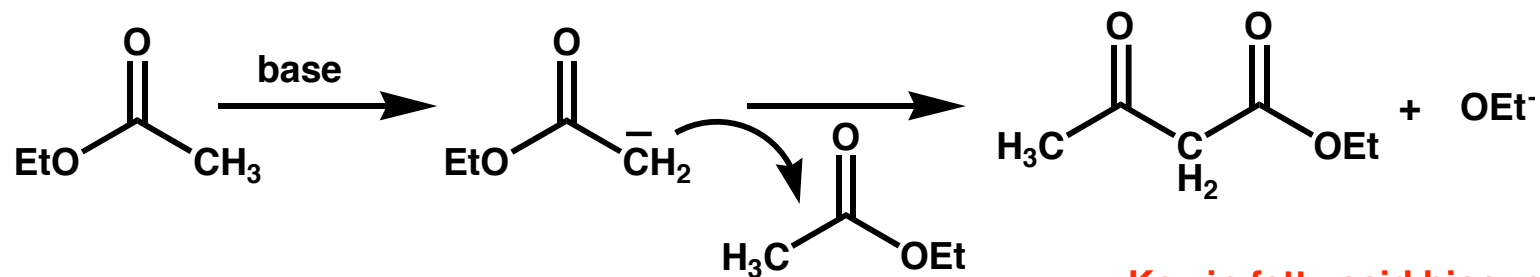
## 4. Condensation Reactions: Enolate/Enol Chemistry



### Aldol Reaction Section 23.2-23.7



### Claisen Condensation Section 23.8-23.9



Key in fatty acid biosynthesis

# Overview of Reactions 4/27-5/9 - Reactions with carbonyls □

## 4. Condensation Reactions: Enolate/Enol Chemistry continued □

Michael Reaction      Section 23.11 □

