

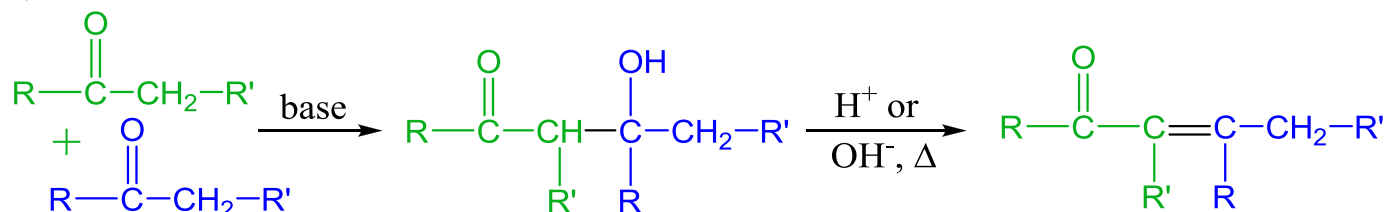
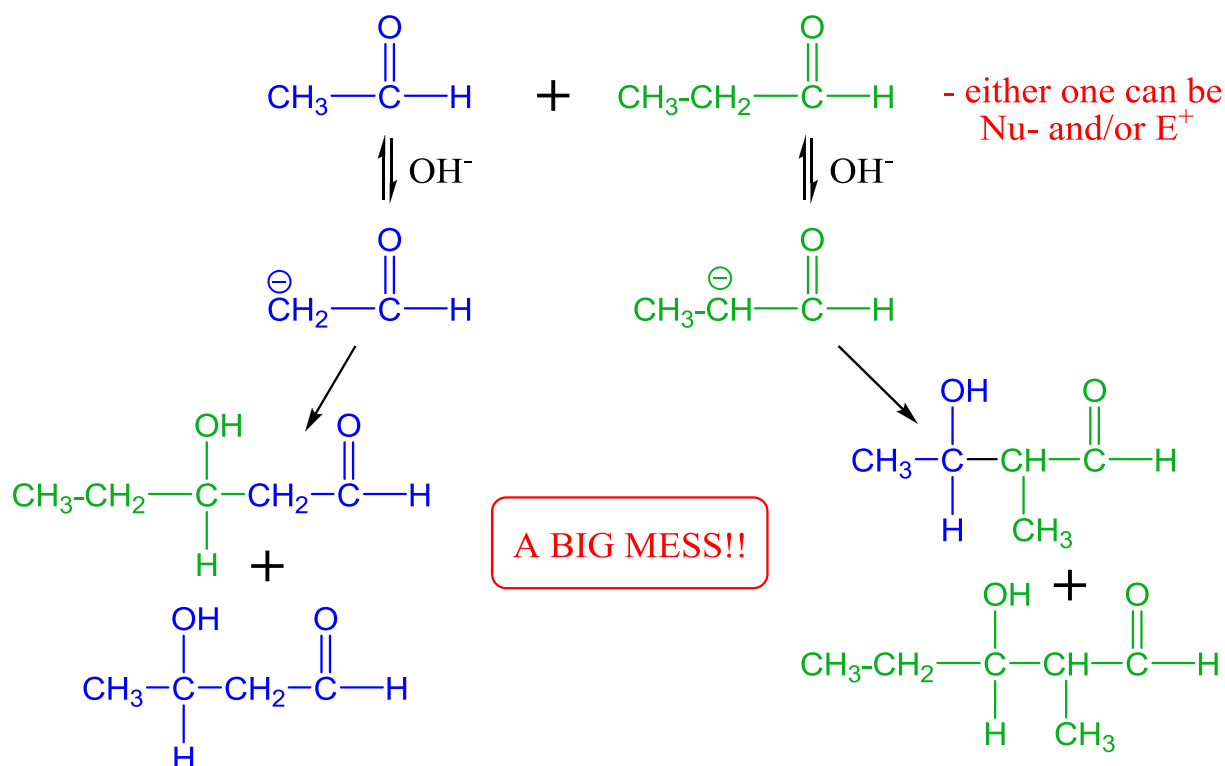
## Overheads: - Today's Outline

Recap I can't remember when:

Enolates:1) Addition to unsaturated carbonyls:

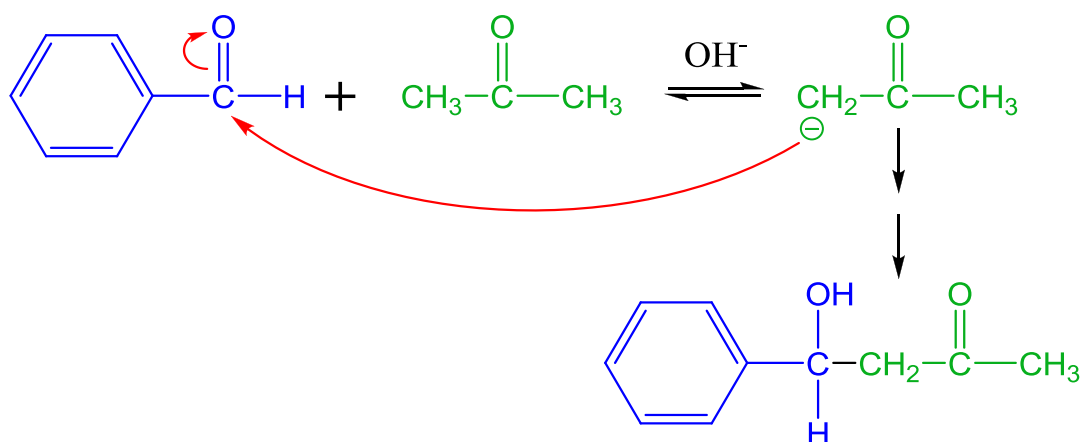
$\text{Nu}^-$	<u>Reaction favored</u>
R-Li	direct
$\text{R}_2\text{CuLi}$	conjugate
R-MgBr	conjugate favored (unless sterically hindered)
enolate	conjugate (Michael)

or other stabilized  $\text{C}^-$   
 $\ominus\text{CN}$ ;  $\ominus\text{CH}_2\text{CN}$ ;  $\ominus\text{CH}_2\text{NO}_2$  etc

2) Aldol:Mixed Aldol: using two different carbonyls

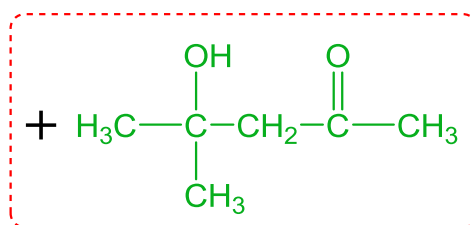
## How to Control?

i) Use one that can't enolize (no  $\alpha$ -H)

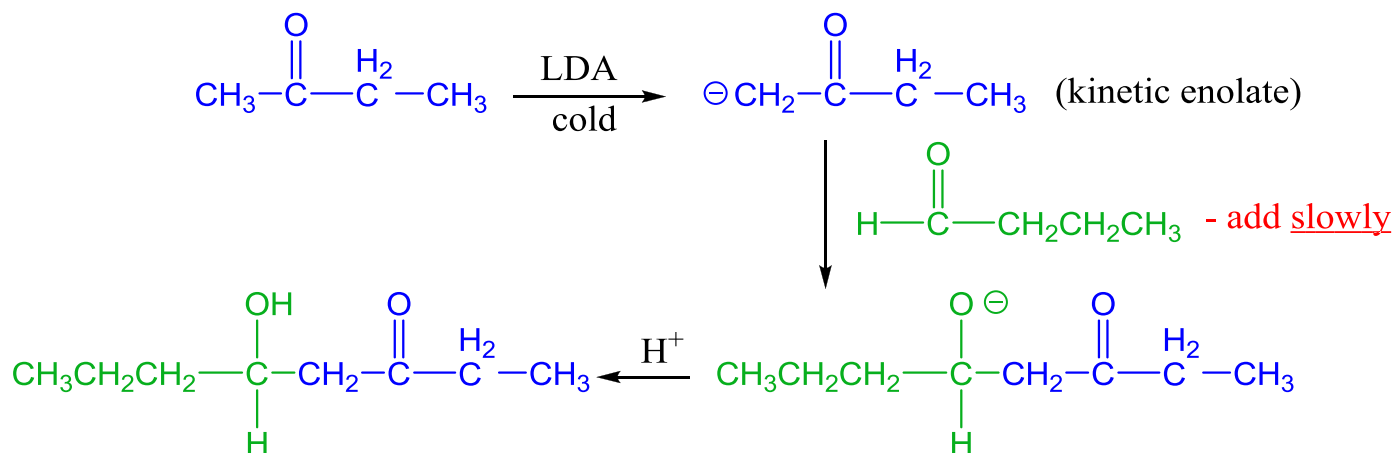


minimize:

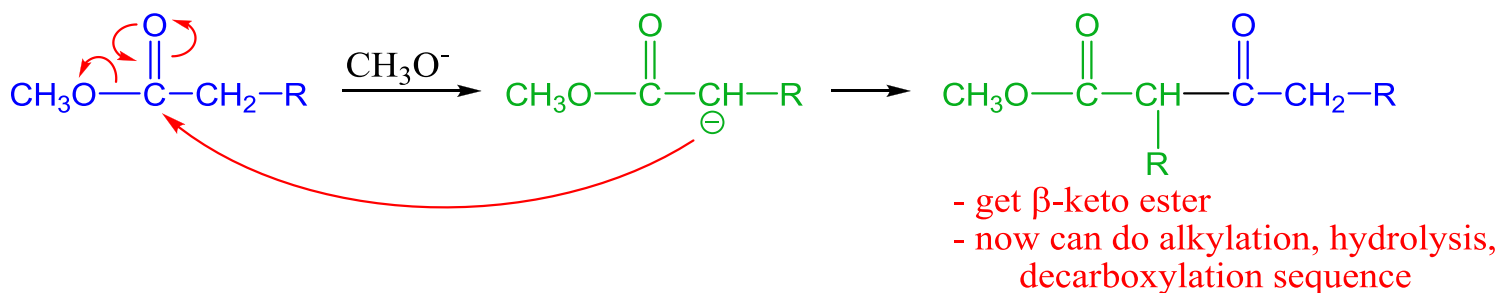
- 1) aldehyde reacts faster
- 2) use excess aldehyde
- 3) add ketone slowly so enolate adds to aldehyde before more acetone added



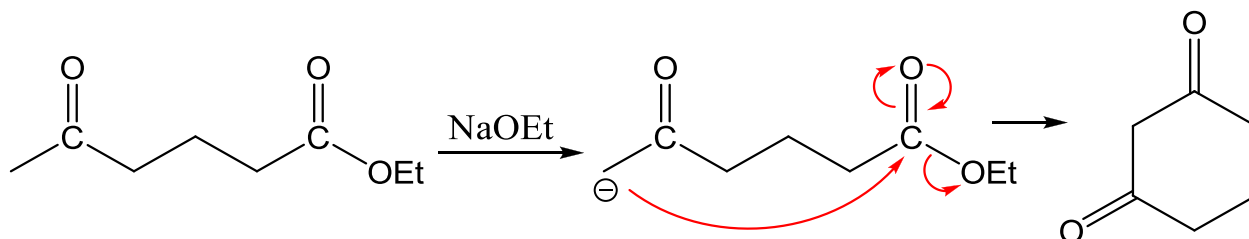
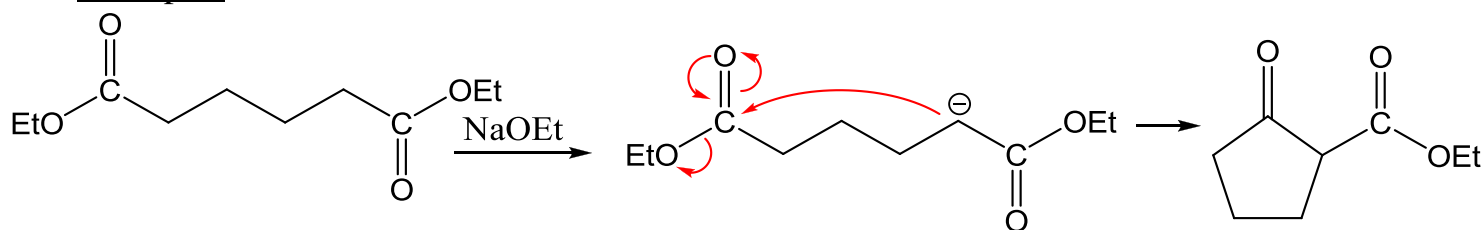
ii) Pre-make enolate of one compound using LDA



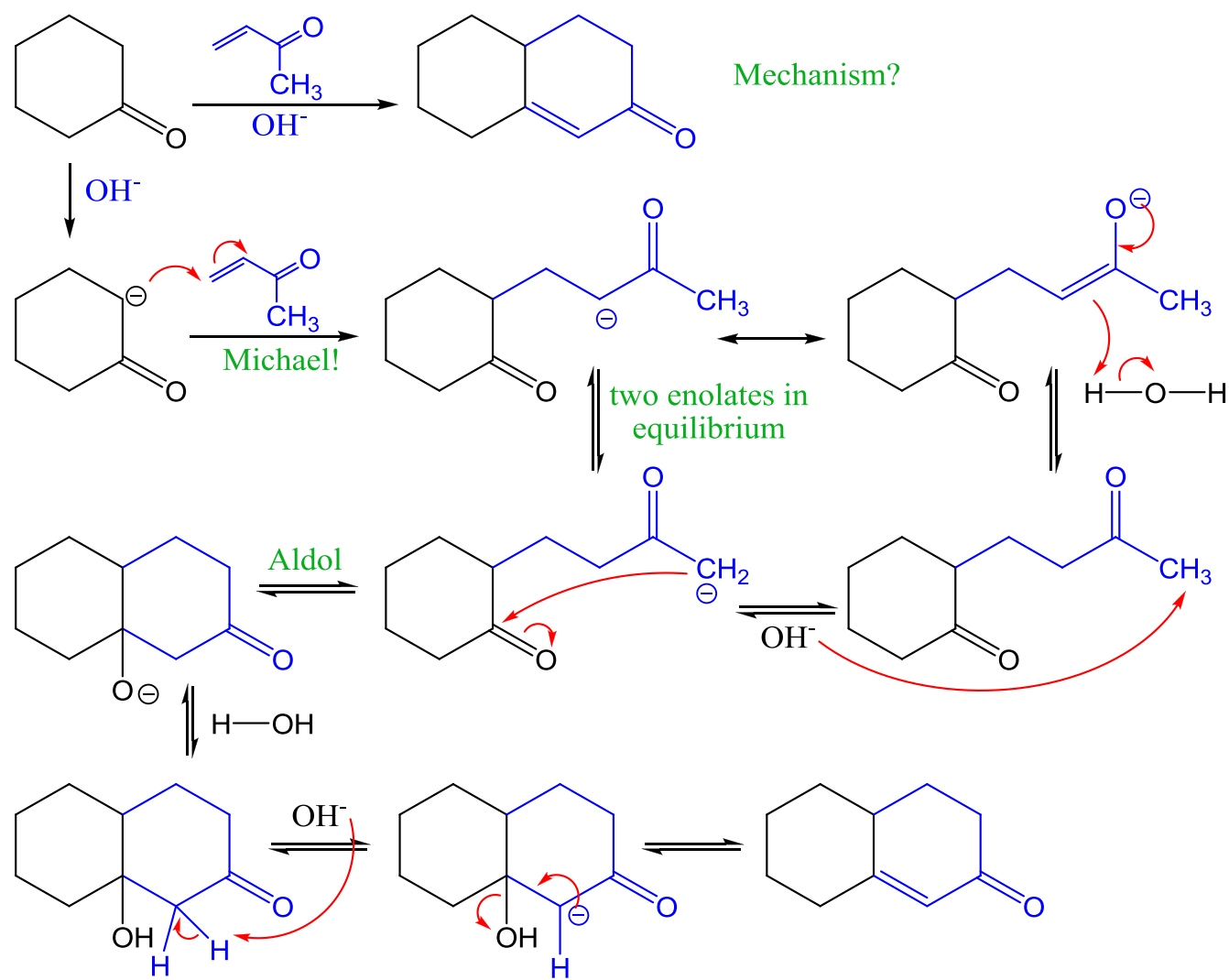
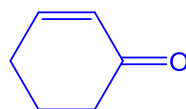
Claisen Condensation: Similar reaction with esters



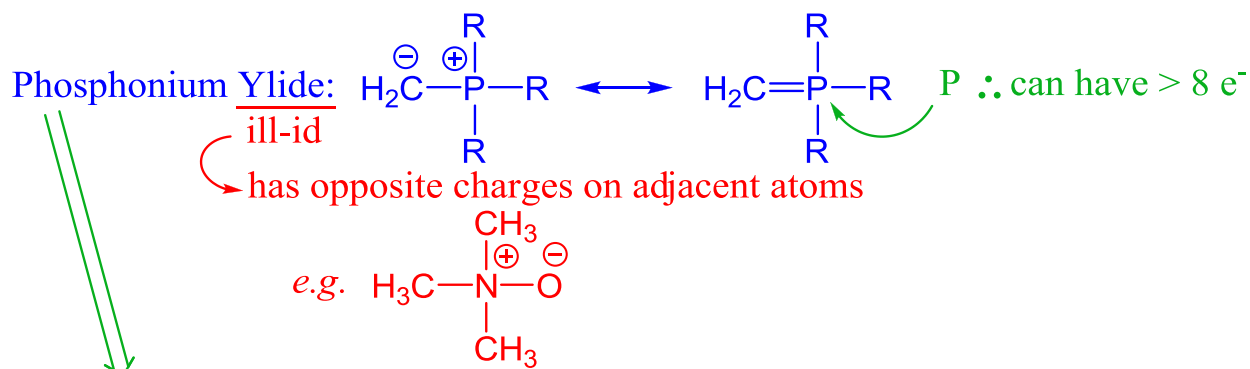
Examples: intramolecular reactions!



Robinson Annulation: important for making

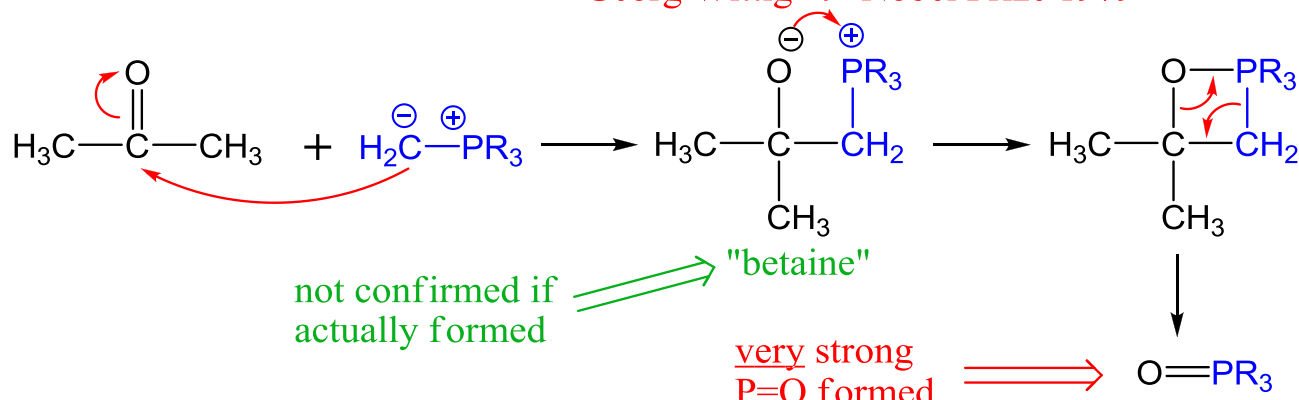


Another Nu<sup>-</sup> that adds to C=O:

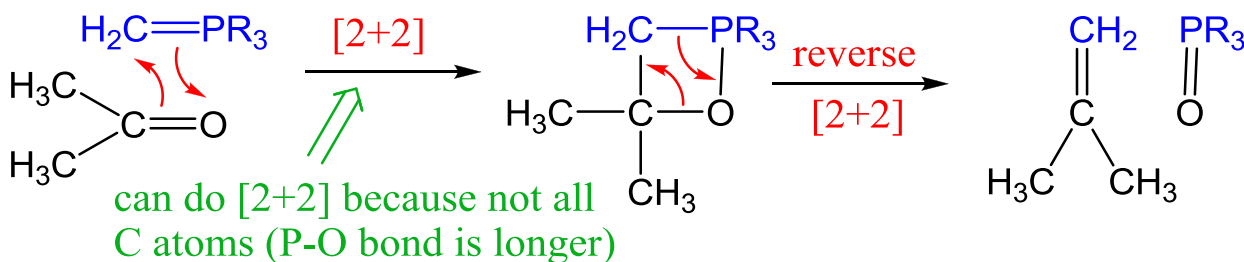


Addition to ketone/aldehyde = Wittig reaction

Georg Wittig → Nobel Prize 1979

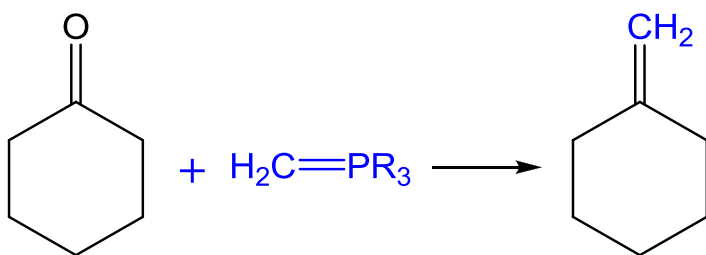


Can also show first 2 steps as concerted:  
(using other resonance form of ylide)



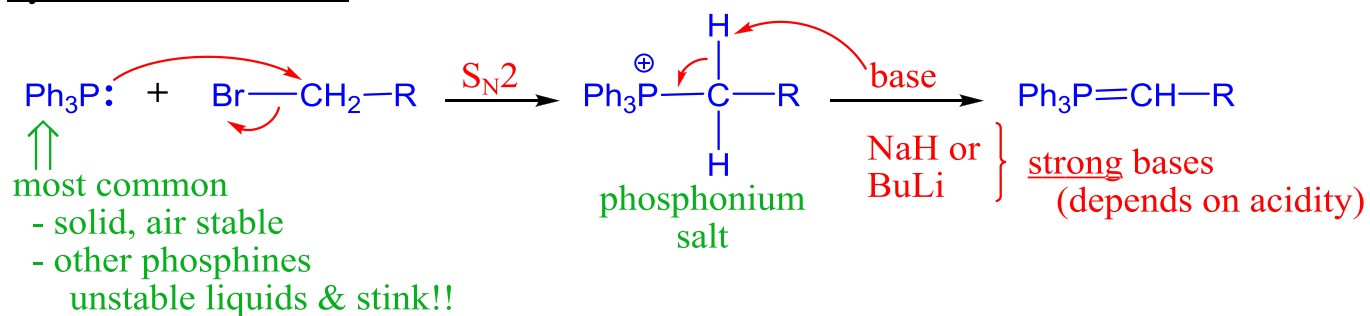
Advantage of Wittig:

- Unlike E1/E2, double bond location is fixed (between C of C=O and C of ylide)

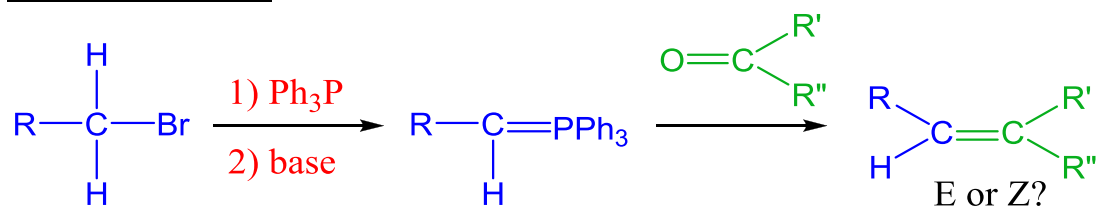


{ - hard to make by E1/E2 (Zaitsev)  
- also get competition from S<sub>N</sub>1/S<sub>N</sub>2

## Synthesis of the Ylide:

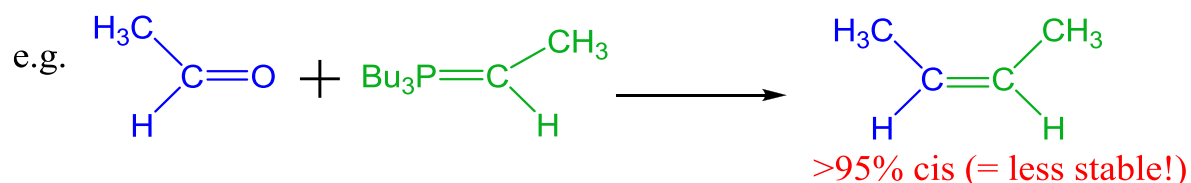


## Overall Reaction:



## Stereochemistry of alkene:

- Complicated!
- Depends on R's of ylide
- If R = alkyl, usually Z (or cis) major
- Bulky R's = more Z



## Why?

- Controlled by sterics of big R groups on P.
- $\text{CH}_3$  groups want to be far away from big groups in transition state

