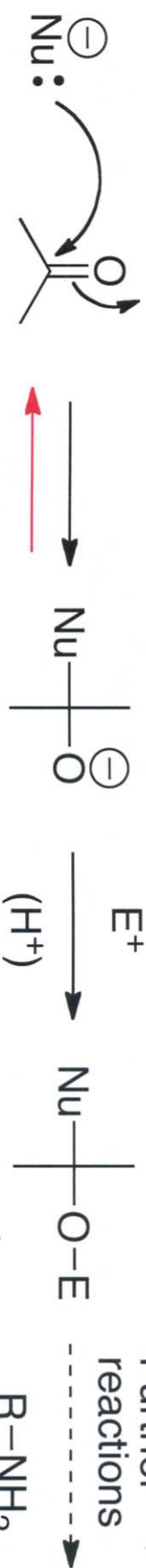


Weak Nucleophiles and Ketones & Aldehydes



Irreversible

If Nu: is H⁻ or R⁻

Reversible for weak Nu:



Hydrate Formation



Hemiacetal Formation

→ Acetal Formation

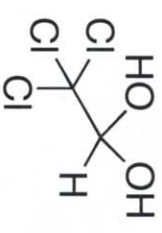
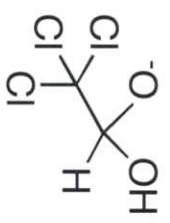
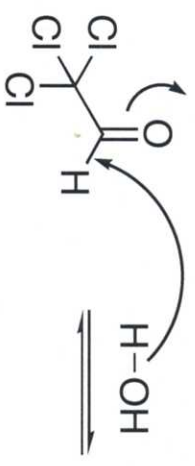


Cyanohydrin Formation



Aminal Formation

→ Imine Formation

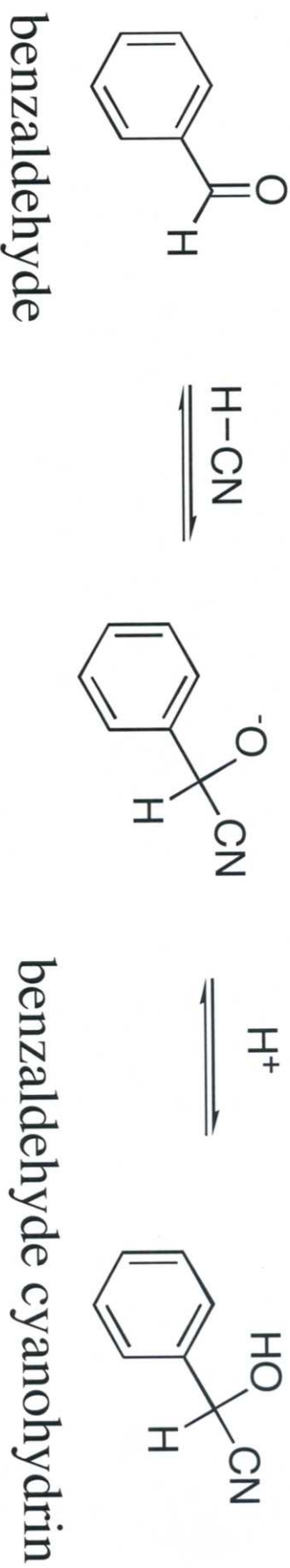


Chloral

Chloral Hydrate

Cyanohydrin Formation

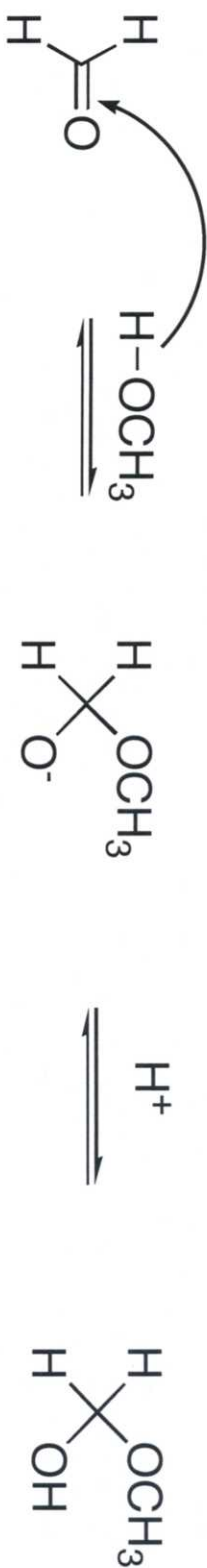
Example : cyanide is a good nucleophile



toxic gas hydrogen cyanide (HCN) is usually generated
by adding an acid (H_2SO_4) to a mixture of carbonyl compound
and excess sodium cyanide (NaCN)

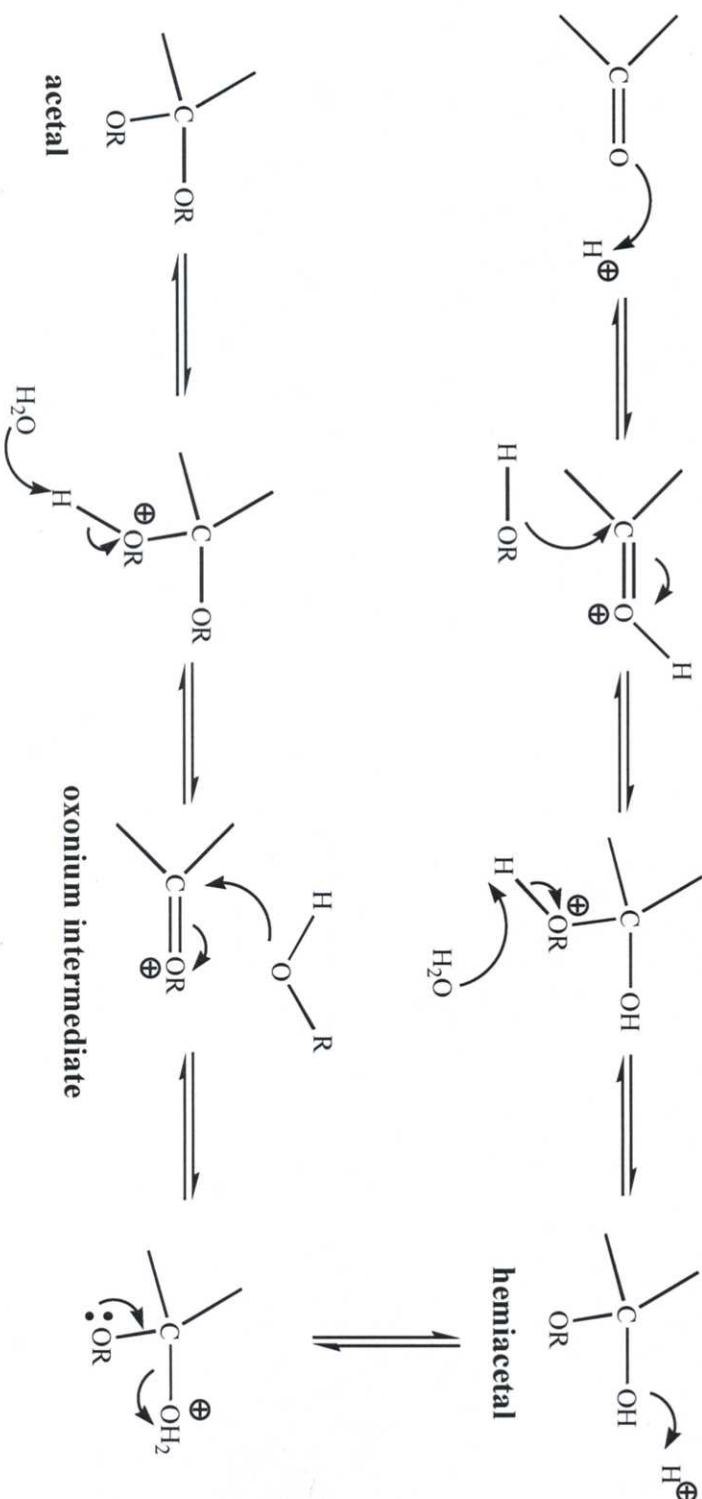
Hemi-Acetal Formation

Hemiacetal formation is similar to hydration but alcohols are used instead



Acetal Formation

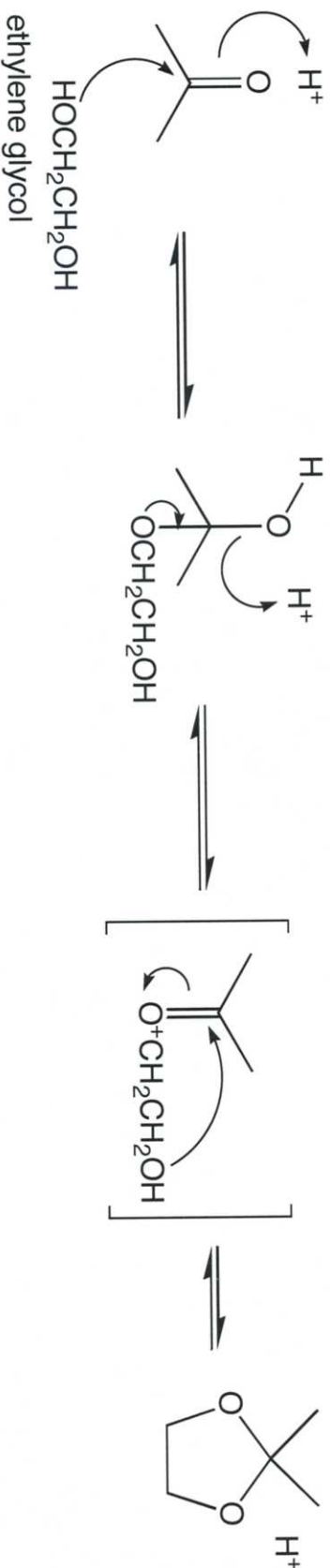
Hemiacetals can be converted to Acetals: two OR groups instead of one OR and OH
Addition then Elimination then 2nd Addition reaction



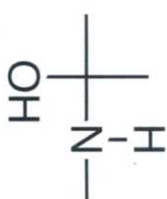
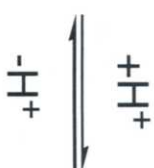
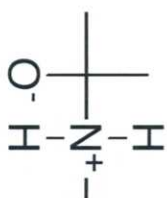
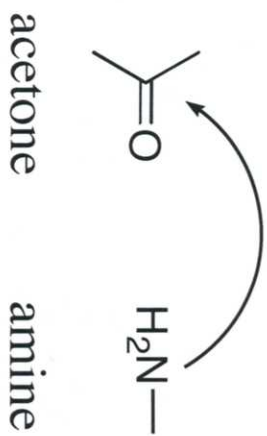
Acetal Formation - Examples (useful to protect ketone/aldehyde)



acetals very stable to base



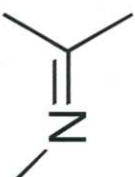
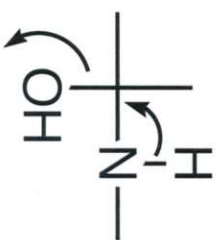
Aminal Formation



Aminal formation is similar to that of hydration except the nucleophile is an amine

Imine Formation

Addition then Elimination then 2nd Addition reaction



Aminal

Imine

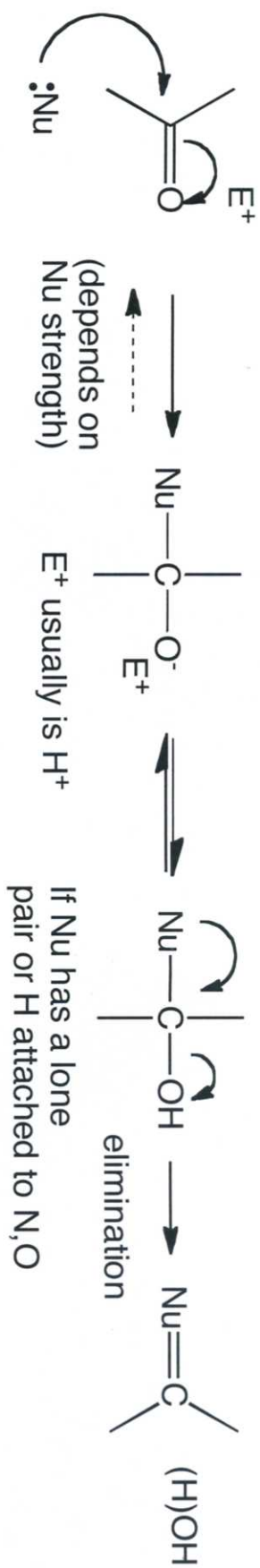
Imine Bond Formation - addition, elimination, addition



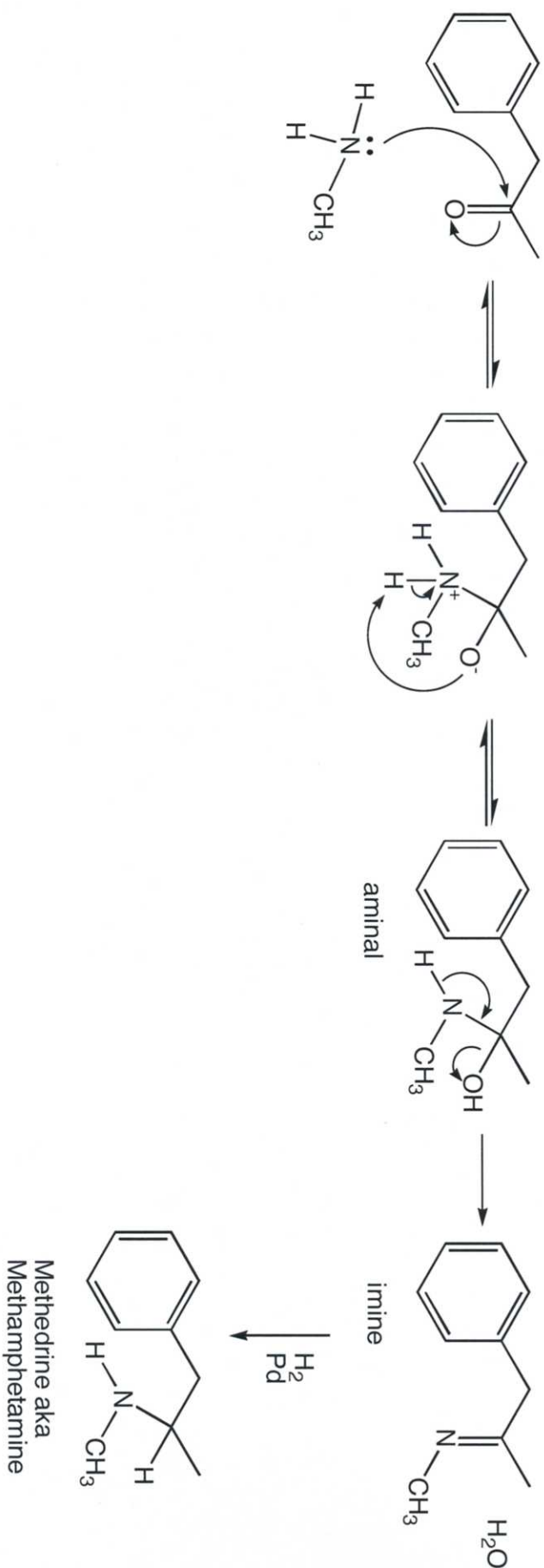
aka aldoximes or ketoximes
depending on whether they are derived
from an aldehyde or ketone



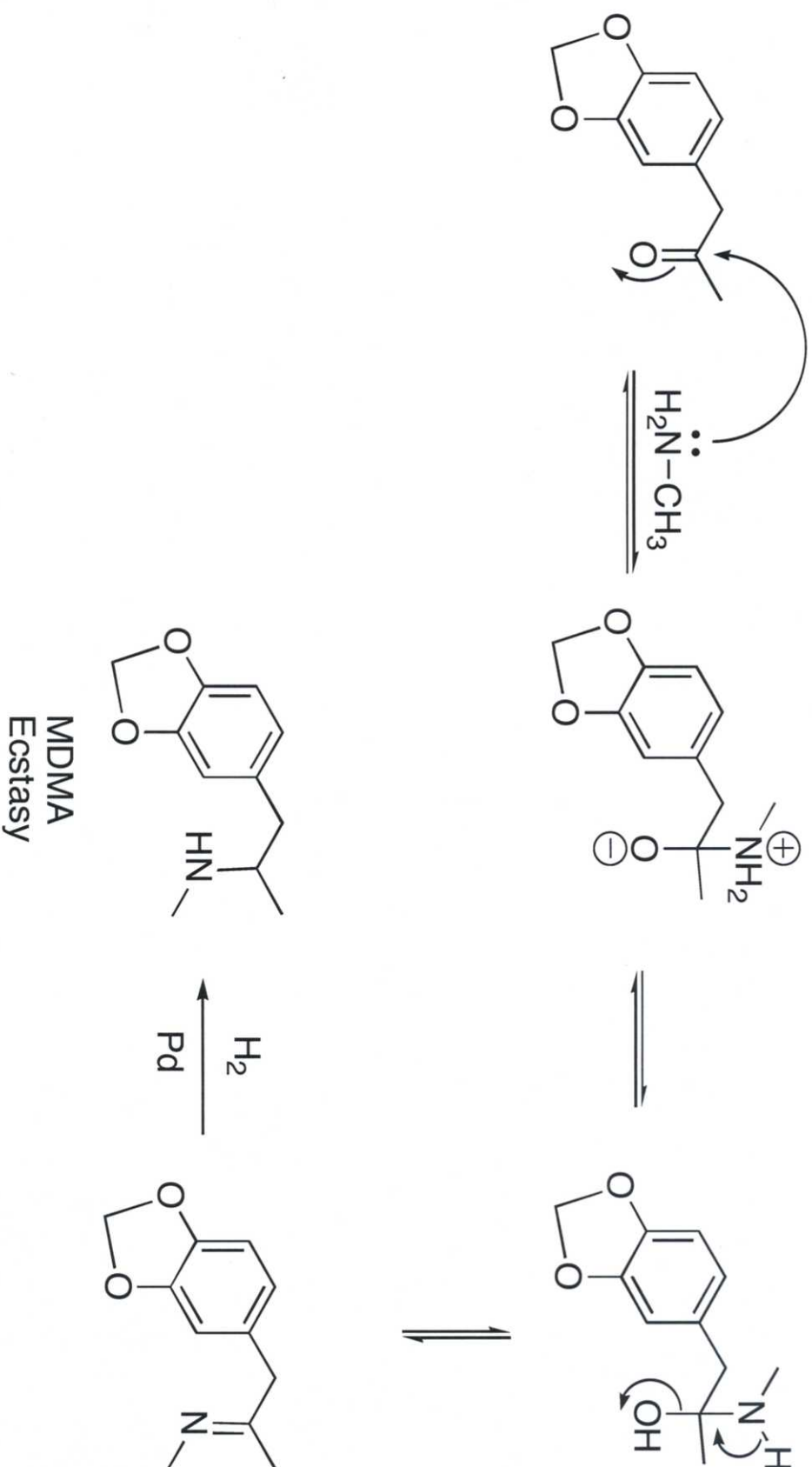
Imine Formation - addition, elimination, addition



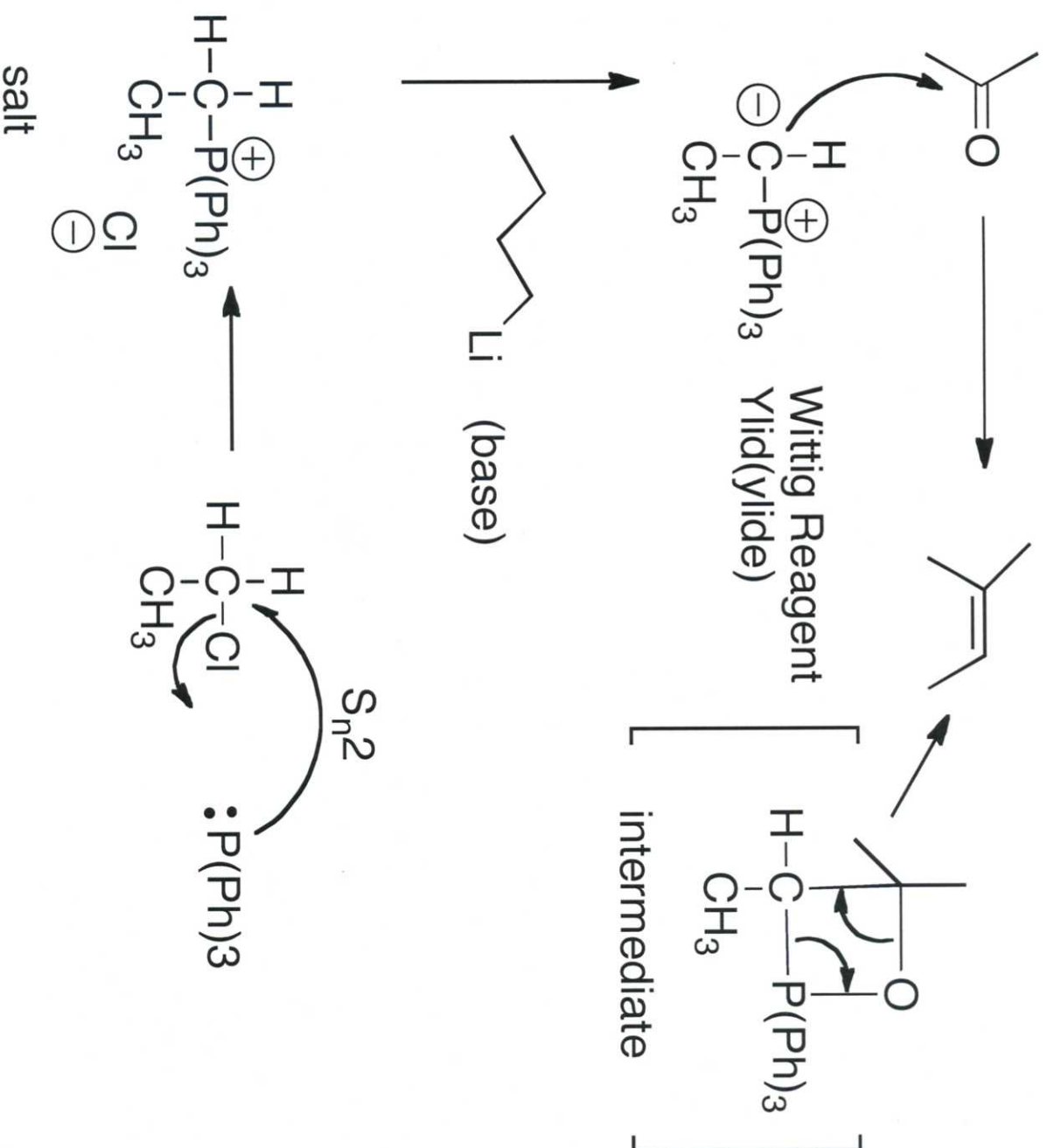
Example (Imines can be reduced to amines)



Imine Formation Example - addition, elimination, addition

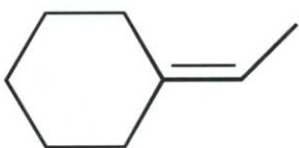


Wittig Reaction: an Addition-Elimination Reaction

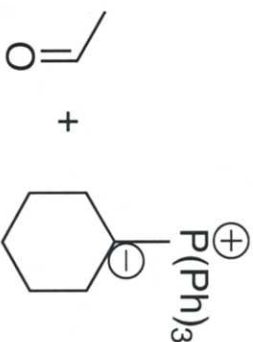


Wittig Reaction: an Addition-Elimination Reaction - Example

Consider how to make

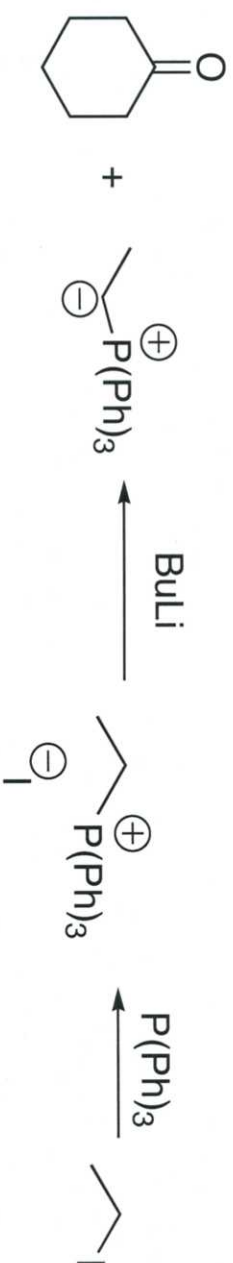


synthetic route A:



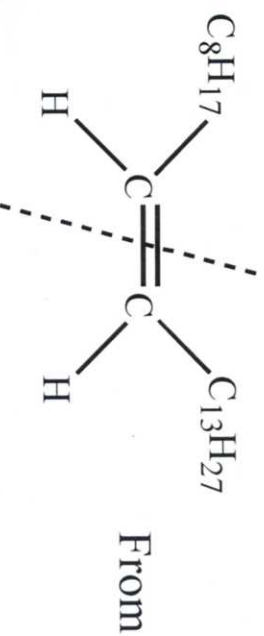
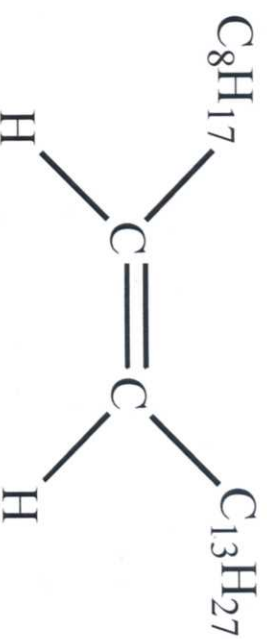
(but this wittig reagent is more hindered than the one in route B, so, route B is better)

synthetic route B:

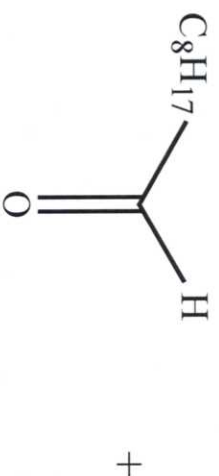
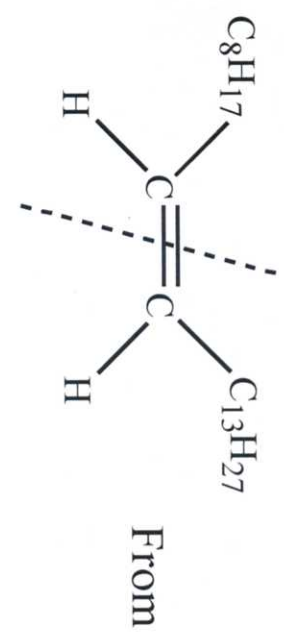


Wittig Reaction: an Addition-Elimination Reaction - Example

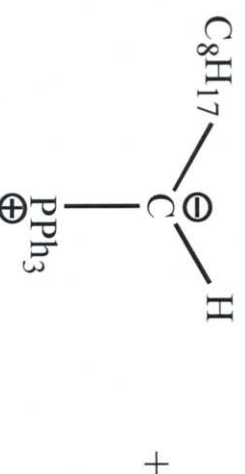
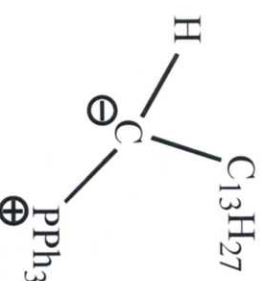
Consider how to make housefly pheromone



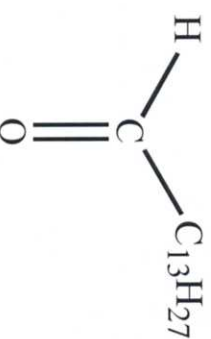
or (will also work) :



+

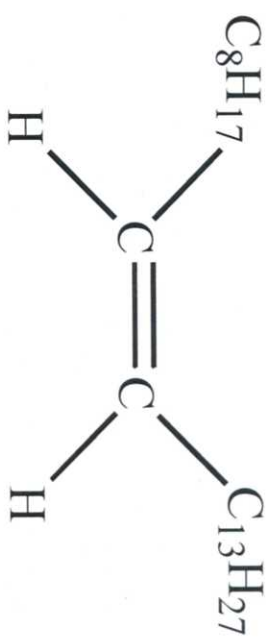


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Wittig Reaction: an Addition-Elimination Reaction - Example

To make housefly pheromone



add

