CHEM 109, Lecture 3

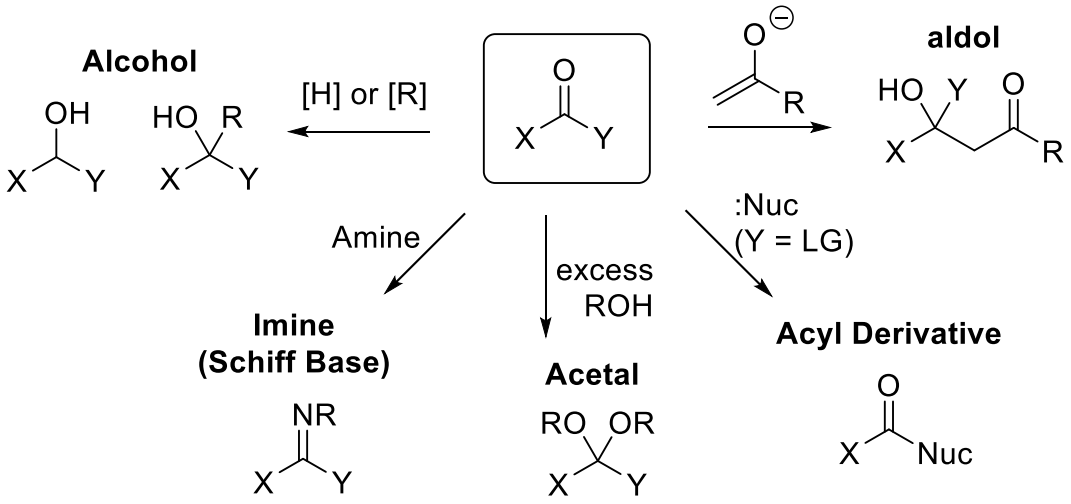
3. Nucleophilic Addition Reactions to Aldehydes & Ketones (**Nuc Add'n**)

A. Alcohol Formation **B.** Imine (Schiff Base) Formation

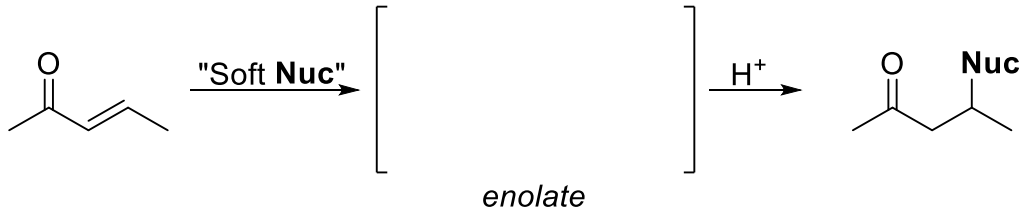
C. Acetal Formation **D.** Conjugate (Michael) Addition

* Given starting materials and either product(s) or name of mechanism, you should be able to complete the mechanism and/or draw the product(s).

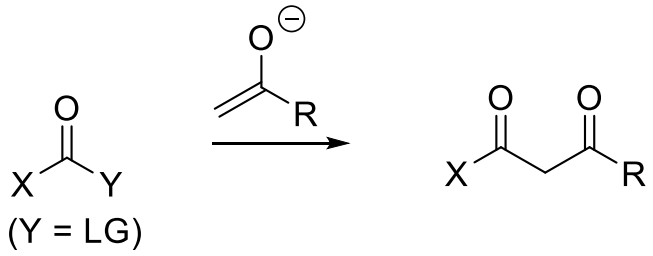
CARBONYL MECHANISM REVIEW



The New Guy: **Michael Addition** (AKA **conjugate addition**, AAKA **1,4-addition**)



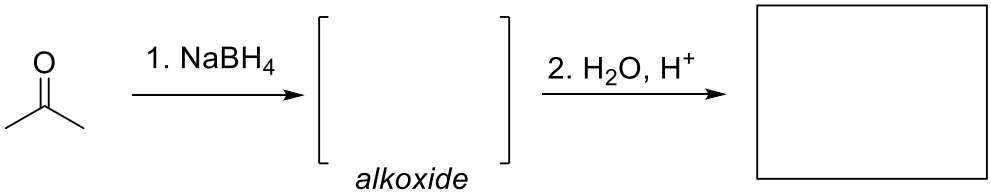
Another new guy: **Claisen** condensation (lecture 4)



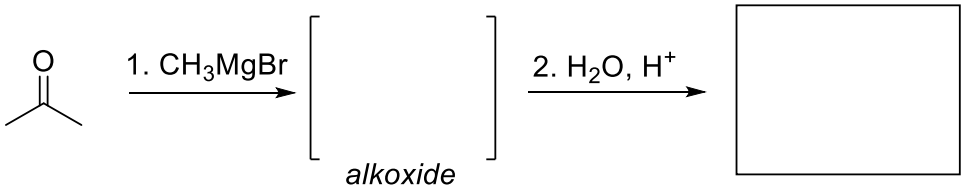
3. Nuc Add'n Rxns to Aldehydes & Ketones

3A. Alcohol Formation…

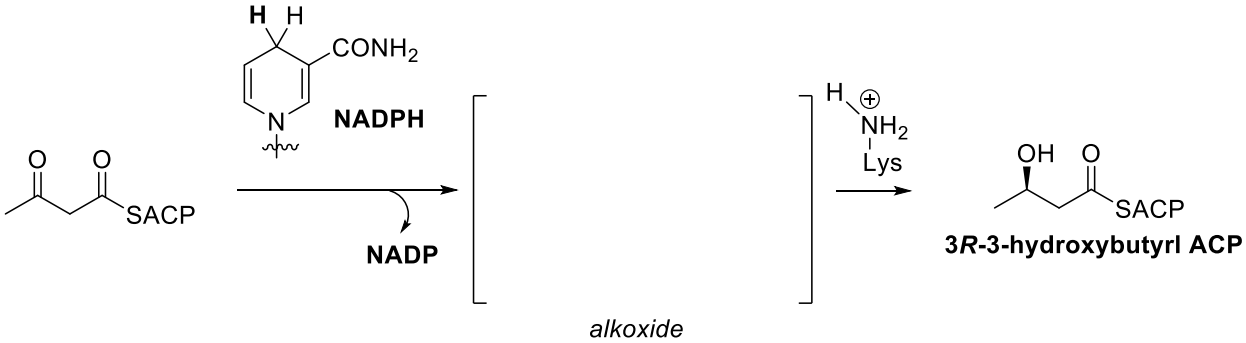
Synthesis: *Sodium borohydride reduction of acetone*



Synthesis: *Grignard addition to acetone*

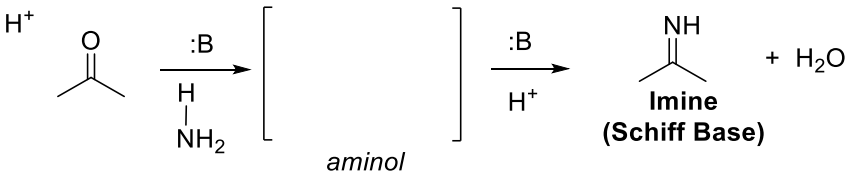


Nuc Add'n in Biology: *Fatty acid synthesis*



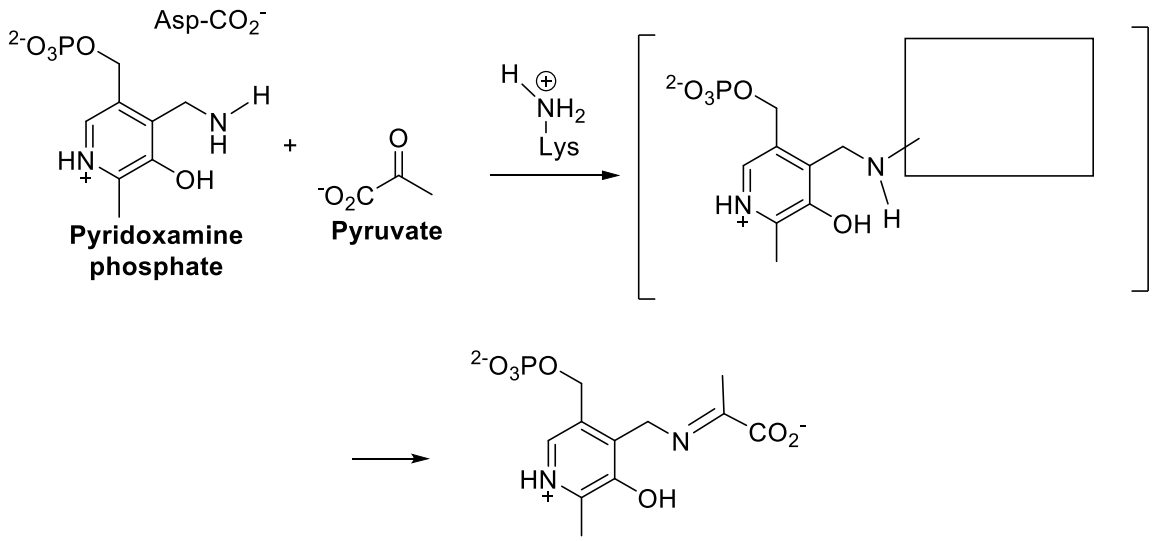
3B. Imine (Schiff Base) Formation

Synthesis: *Treatment of acetone with ammonia*



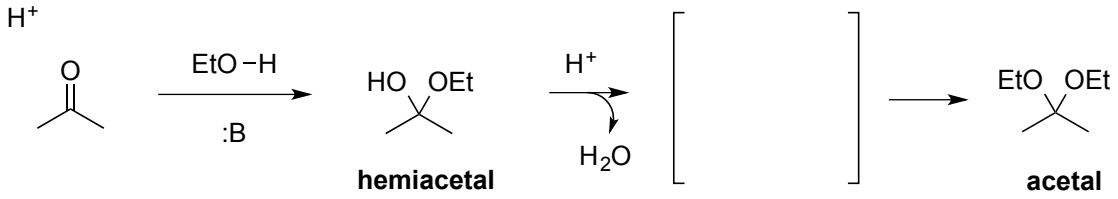
3B. Imine (Schiff Base) Formation (cont'd)

Biosynthesis of Amino Acids:

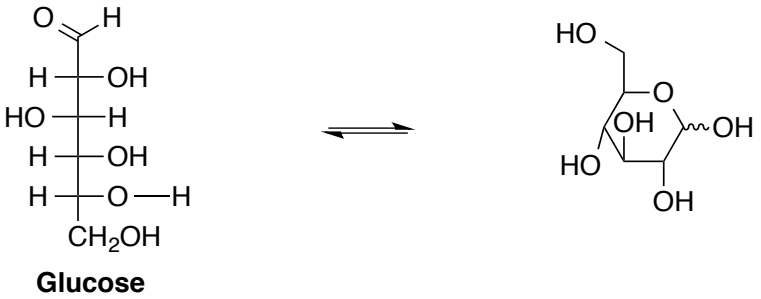


3C. (Hemi)Acetal Formation

Synthesis: *Treatment of acetone with ethanol*

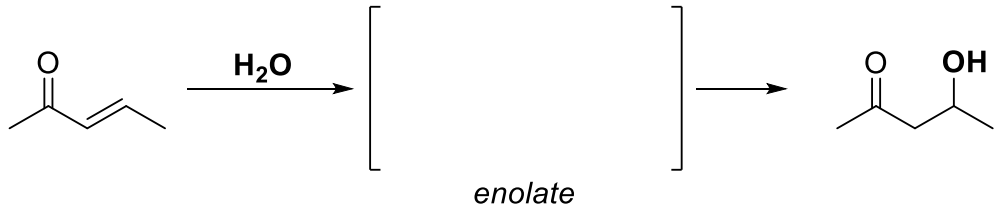


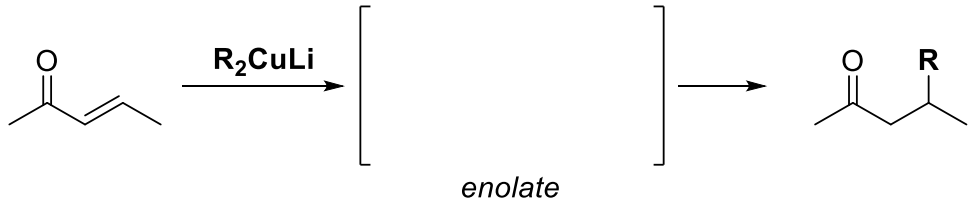
Hemiacetals in Nature: *Carbohydrates*



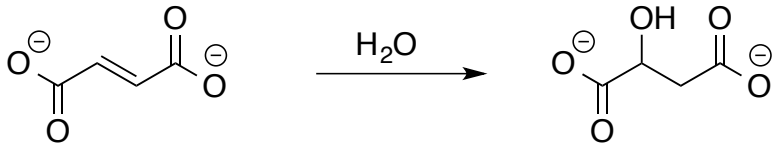
3D. Conjugate 1,4 (Michael) Addition

Synthesis





Biology: *Citric Acid Cycle*



Fumarate **Malate**

Apply the template mechanism from page 1 and keep track of those protons!

Next time…
Nucleophilic Acyl Substitution & Carbonyl Condensation Reactions (aldol & Claisen)

- **M&B Chapter 1.6-1.7**