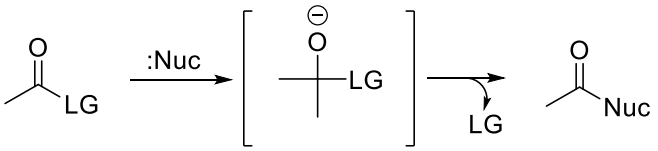
CHEM 109, Lecture 4

4. Nucleophilic Acyl Substitution (NAS)
5. Carbonyl Condensation
   A. Aldol Condensation B. Claisen Condensation

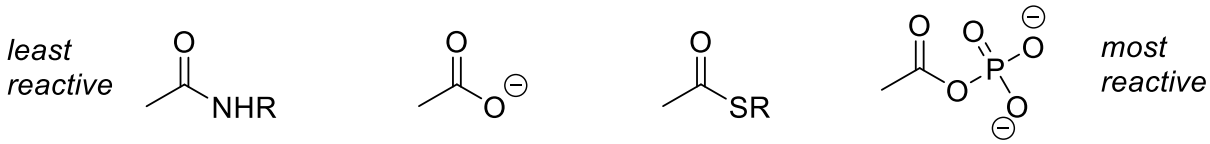
* Given starting materials and either product(s) or name of mechanism, you should be able to complete the mechanism and/or draw the product(s).

4. Nucleophilic Acyl Substitution (NAS)

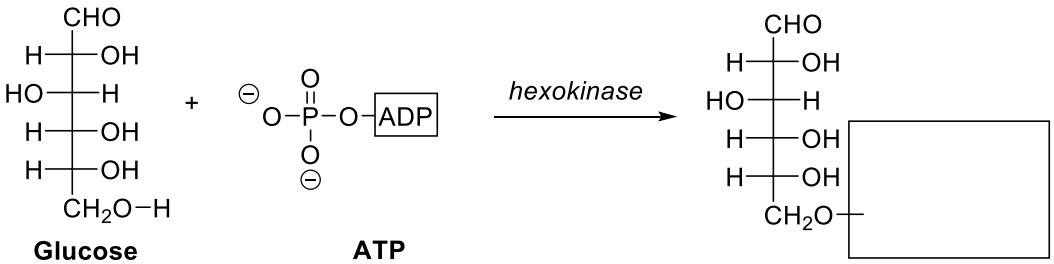


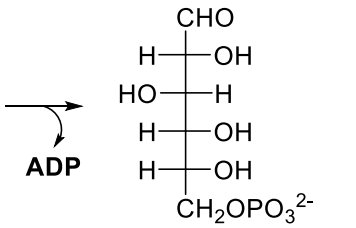
Synthesis: *Fischer Esterification – Fruity Fragrances*

BIOREACTIVITY SERIES toward **NAS**



NAS in Biology: *Glycolysis (first step)*



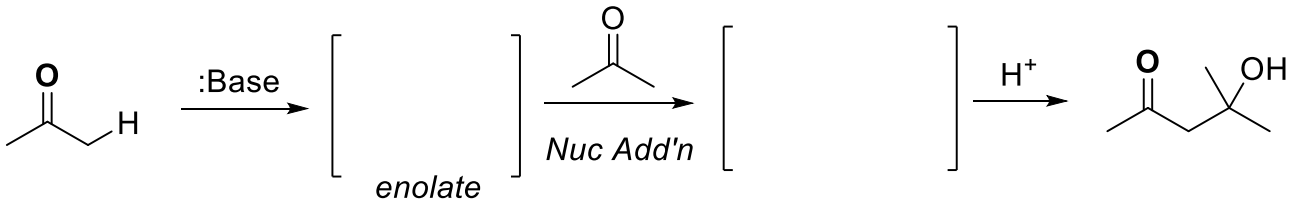


Glucose-6-phosphate

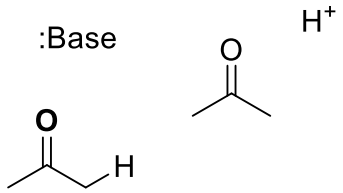
5. Carbonyl Condensation Reactions

Enolate Ions

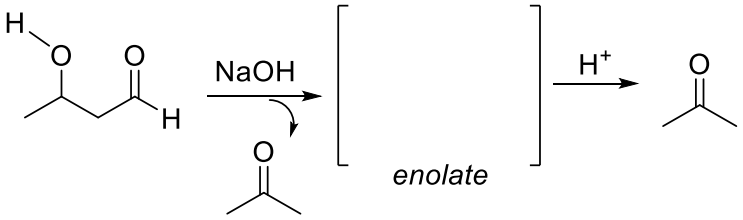
5A. Aldol Condensation



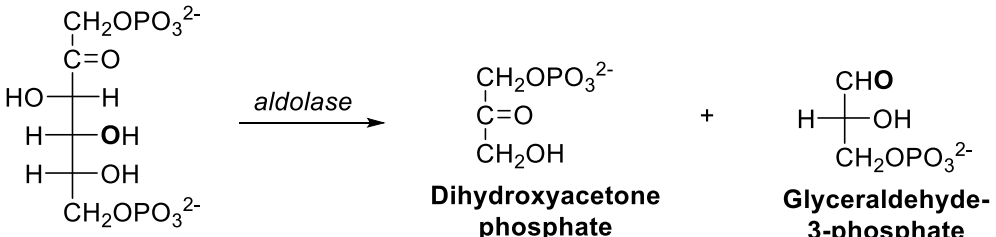
Draw that mechanism in one step:



Retro-aldol Reaction



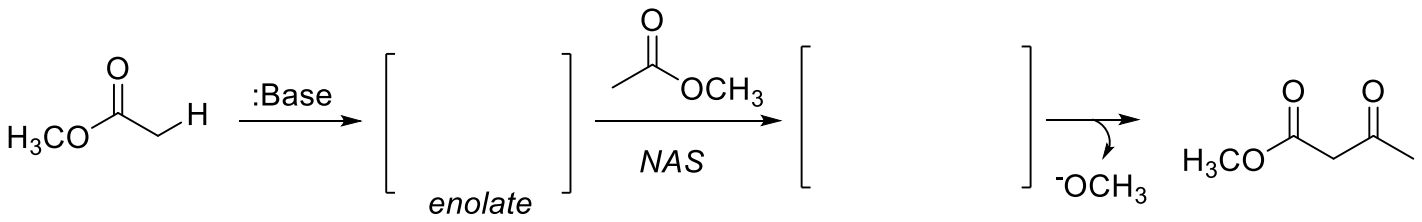
Retro-aldol: *Glycolysis*



Fructose-1,6-bisphosphate (F1,6P) **Dihydroxyacetone phosphate (DHAP)** **Glyceraldehyde-3-phosphate (GAP)**

Re-draw F1,6P below and propose a one-step mechanism…

5B. Claisen Condensation



Draw that mechanism in two steps!

Claisen Condensation in Biology: *Lipid Biosynthesis*

Retro-Claisen Reaction:

Carbonyl Reaction Overview

Nucleophilic Addition
to Aldehydes & Ketones

Nucleophilic Acyl Substitution (NAS)
with Esters, Thioesters, Carboxylic Acids, Amides

Aldol Condensation

Claisen Condensation

Next time…Elimination, Redox, pKa and Amino Acids