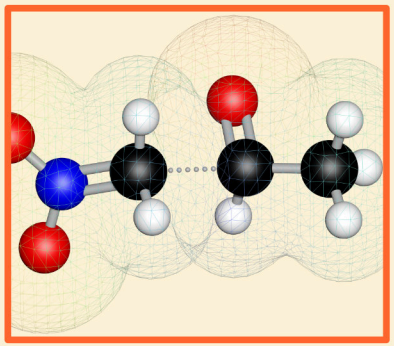
HIGHLIGHTS

- The general aldol reaction mechanism can be used to explain a variety of reactions.
- The general reaction mechanism is given for the following reactions:
  - The Claisen condensation
  - The Dieckmann cyclization
  - The Mannich reaction
  - The Henry reaction (or nitro-aldol)
- Note the similarities between the mechanisms.
- There are many more aldol-like 'named' reactions not covered in this introduction.
- But don't get obsessed with the names, all these reactions are effectively the same.



The general mechanism behind the aldol reaction can be applied to a range of useful transformations involving a variety of different functional groups. Generally speaking, one component can form a ***nucleophile*** by either tautomerization or deprotonation to a delocalized anion. The other coupling partner contains an ***electrophilic*** carbonyl group (or equivalent, as in the case of the Mannich reaction). The two reactants add to form a new C–C bond by ***nucleophilic addition***. In many examples, a subsequent ***dehydration*** step leads to a C=C double bond.

The idea that a single mechanism explains a variety of reactions (Claisen addition, Dieckmann reaction, Mannich reaction & the Henry reaction amongst others) shows the power of arrow pushing (& yes, I'm aware that these mechanism are far from 'true' but their predictive power is undeniable).

CHEMISTRY CLASSICS

ALDOL-LIKE REACTIONS

CLAISEN, DIECKMANN, MANNICH & HENRY REACTIONS

Aldol-like reactions

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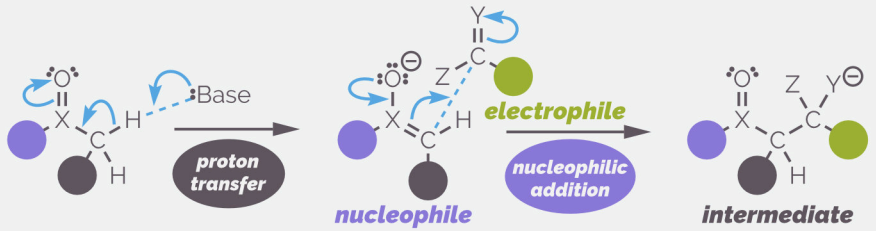
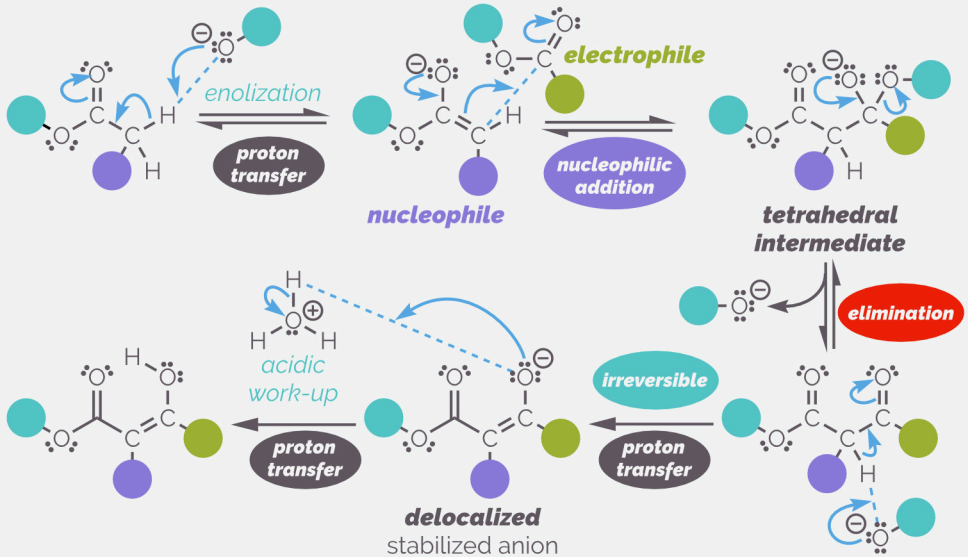
1. General reaction



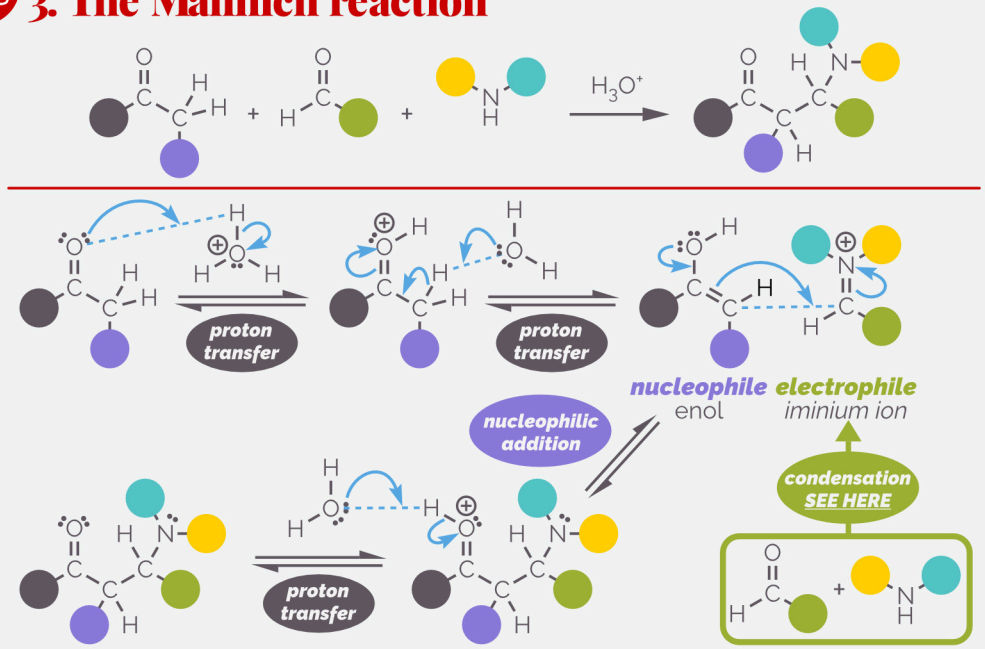
X = C → Claisen, Dieckmann, Mannich & others; **X = N** → Henry (nitro-aldol) reaction
Y = O → all except Mannich reaction where **Y = NR_2**; **Z = C or H** → Mannich & Henry (intermediated uncharged or protonated) or **Z = OR** → Claisen & Dieckmann (intermediate collapses, eliminating alkoxide).

2. Claisen & Dieckmann condensation reactions

Claisen condensation = no connection; Dieckmann condensation = intramolecular
Either strong base or second deprotonation (**H**) required to drive reaction forward.



3. The Mannich reaction



4. The Henry or nitro-aldol reaction