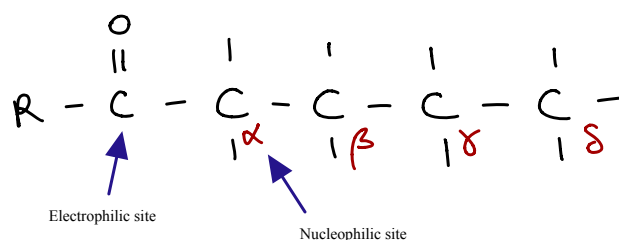


TOPIC 1: ORGANIC CHEMISTRY

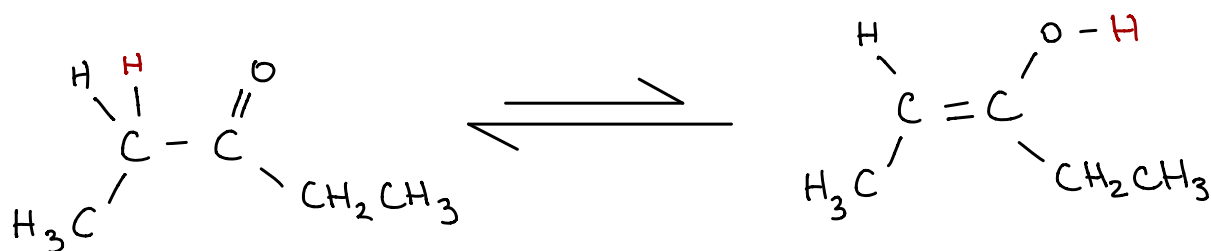
- Carbonyl carbons (C=O) are **electrophilic** and **prone to nucleophilic attack** creating a **tetrahedral intermediate**

- o Nucleophilic acyl substitution if R attached to carbonyl C is good leaving group (e.g. Cl)
- o Nucleophilic addition if R is a poor leaving group. Addition of H⁺ creates alcohols
- o If R is amino (NH₃ or RNH₂), R would substitute the O double bonded to the C

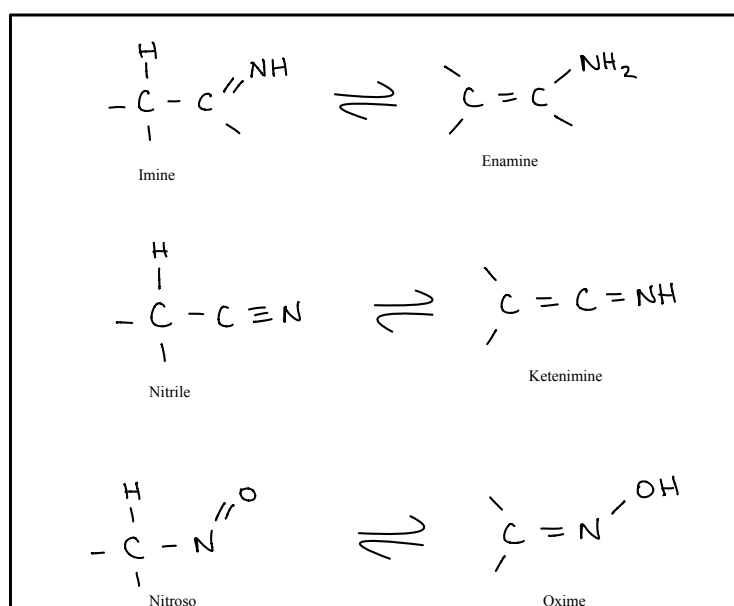


- **Tautomers:** structural isomers which exist in equilibrium with one another

- o Carbonyls can form enol tautomers, given that there is an **α-H** (H bonded to α-C) and that the α-C is **sp³ hybridised**

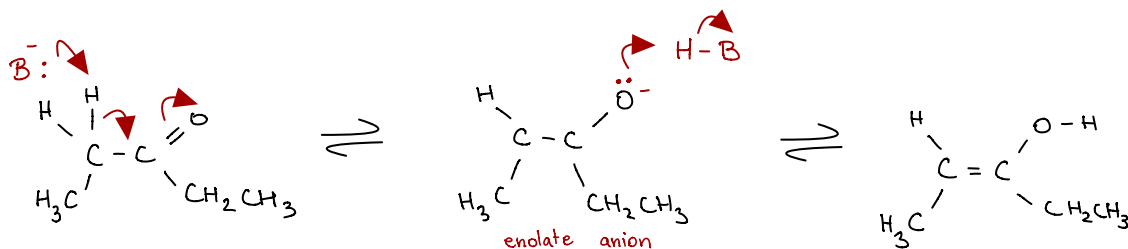


- o Non-carbonyl tautomers:

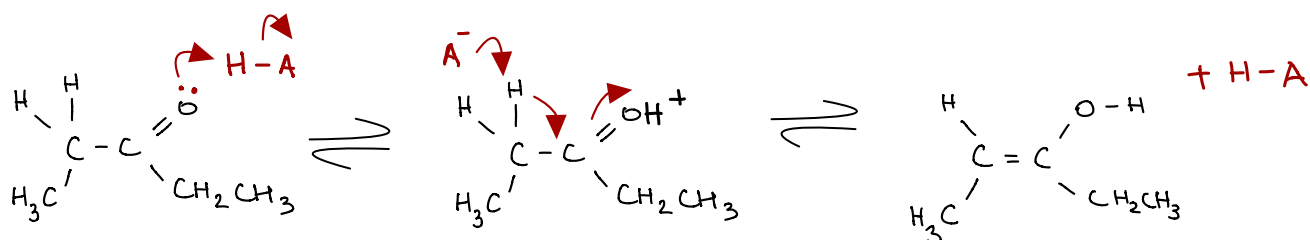


- Concentration of the enol tautomer in simply carbonyls is very small (~0.01%)

- **Tautomerisation can be catalysed by a base:**

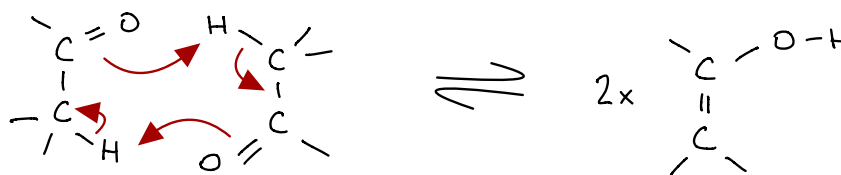


- **By an acid:**



- **By itself (self-tautomerisation):**

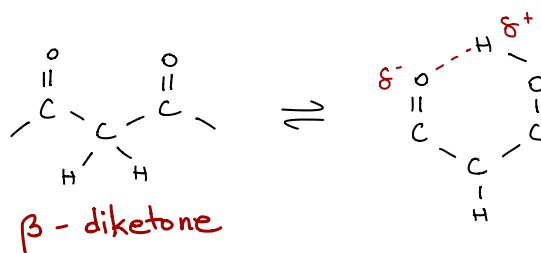
- Carbonyl compounds with α -H can act as both a weak acid and a weak base (reaction is slower than with a catalyst)



- Symmetrical ketones and carbonyls which only have α -H on one side (aldehydes, esters) only have 1 enol tautomer
- Unsymmetrical ketones can have 2 enol tautomers (each with E/Z geometry but are equivalent for this course)
- Carbonyl compounds with no α -H have no enol tautomers
 - Unless there are H's α to a C=C double bond which is conjugated to the C=O group (**conjugate enolization**)

- **β -dicarbonyls (1,3-dicarbonyls) have relatively stable enol tautomers** due to:

- Hydrogen bonding
- Conjugated double bonds (resonance)



- β -keto esters also form relatively stable enol tautomers, but less so than diketones