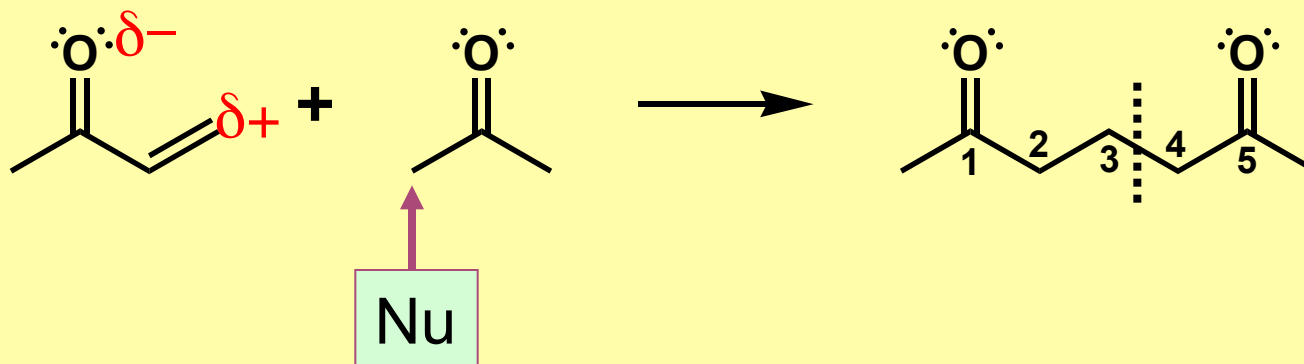
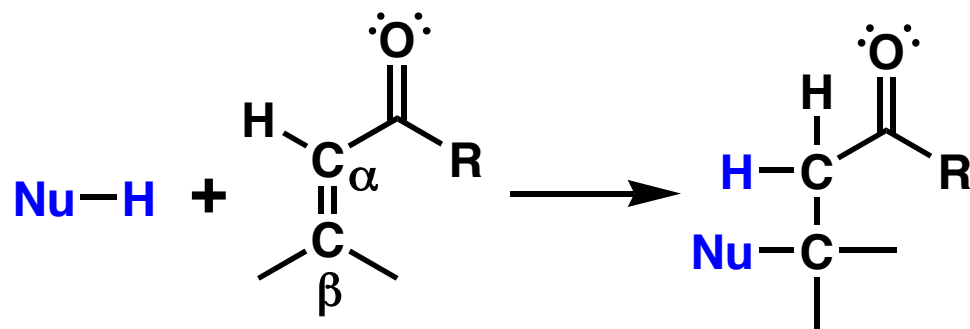


The Michael Reaction

(Conjugate addition with an α -Carbon Nu)

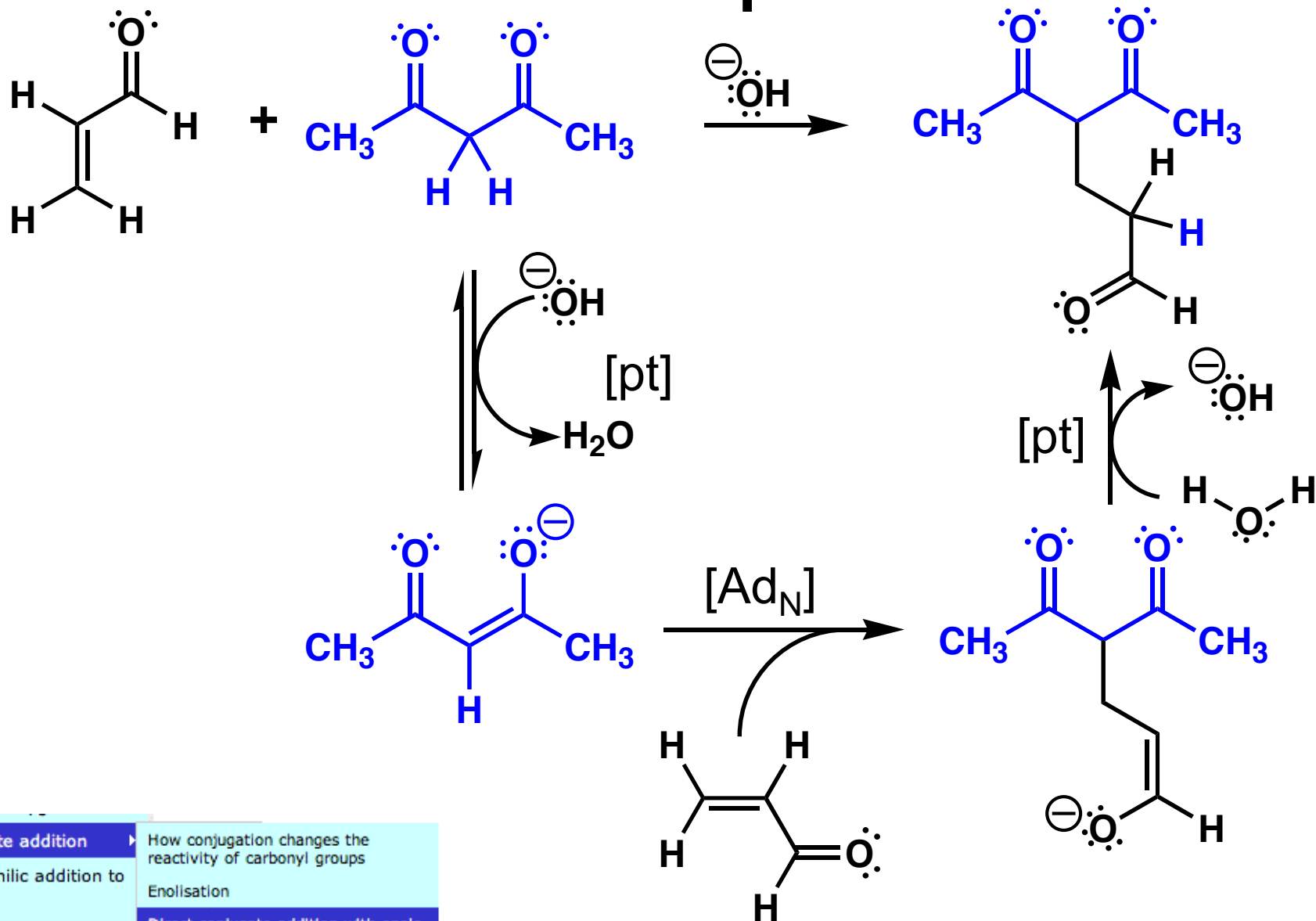
We have seen that nucleophiles can add across α,β -unsaturated double bonds, (conjugate addition). When the nucleophile is an α -carbon nucleophile, this reaction is called Michael addition.



- Draw a (----) line across the new C–C bond in the product
- Identify the nucleophilic carbon
- Assign partial charges to atoms of the electrophile to indicate their state of polarization in the reactant
- Number the carbonyl carbons in the product and use this to recognize “Michael adducts”



Michael Reaction: Example and Mechanism



| | |
|-----------------------------------|---|
| Conjugate addition | How conjugation changes the reactivity of carbonyl groups |
| Electrophilic addition to alkenes | Enolisation |
| Diels-Alder reactions | Direct conjugate addition with enols |
| Nucleophilic substitution | Conjugate addition of enolates |
| Elimination | Robinson annelation |
| Electrophilic aromatic | Dimedone synthesis |

For the acid-catalyzed version of this reaction see:
<http://www.chemtube3d.com/>

α,β -unsaturated compound

nucleophile

Reactants for
the Michael
Reaction

