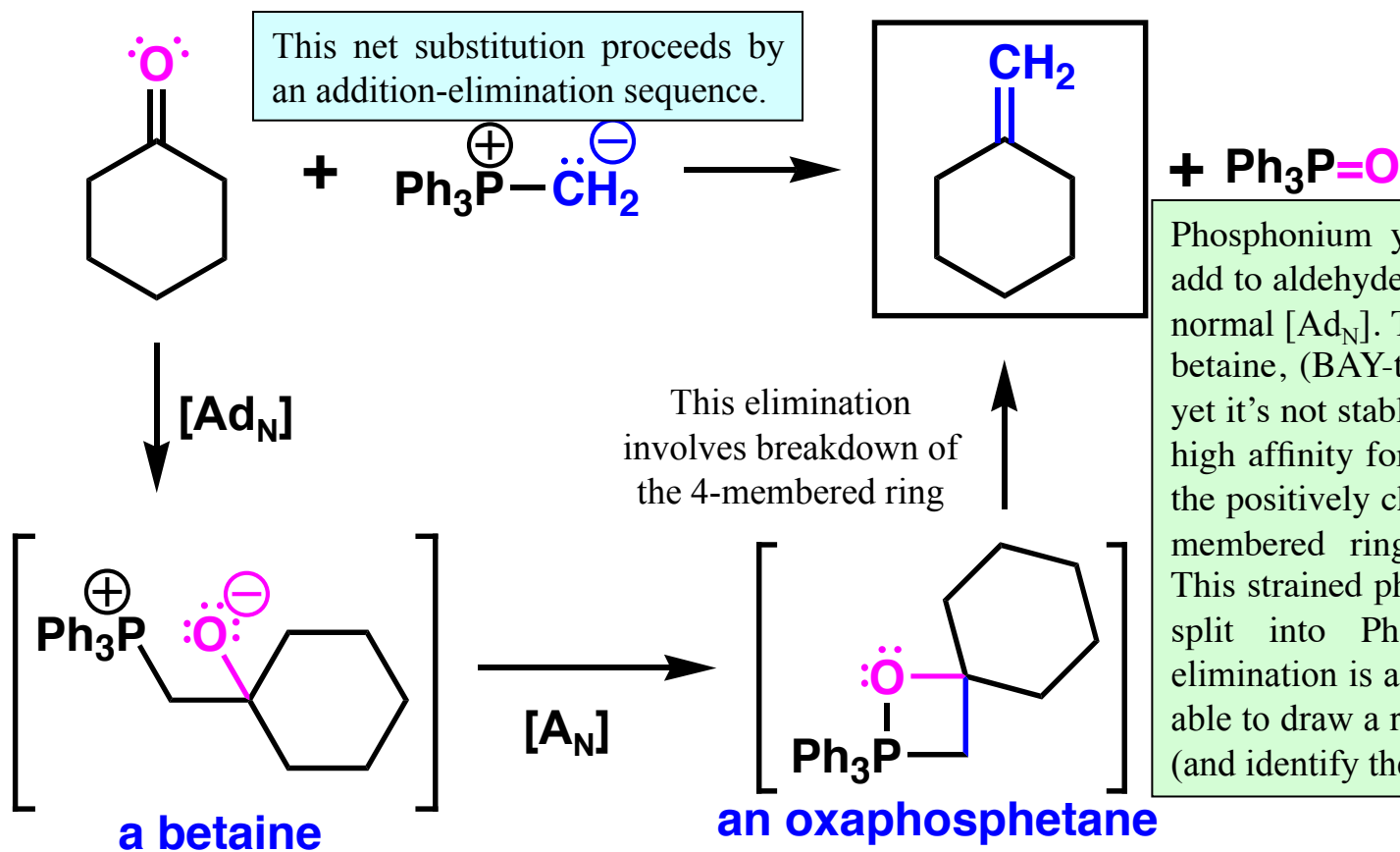
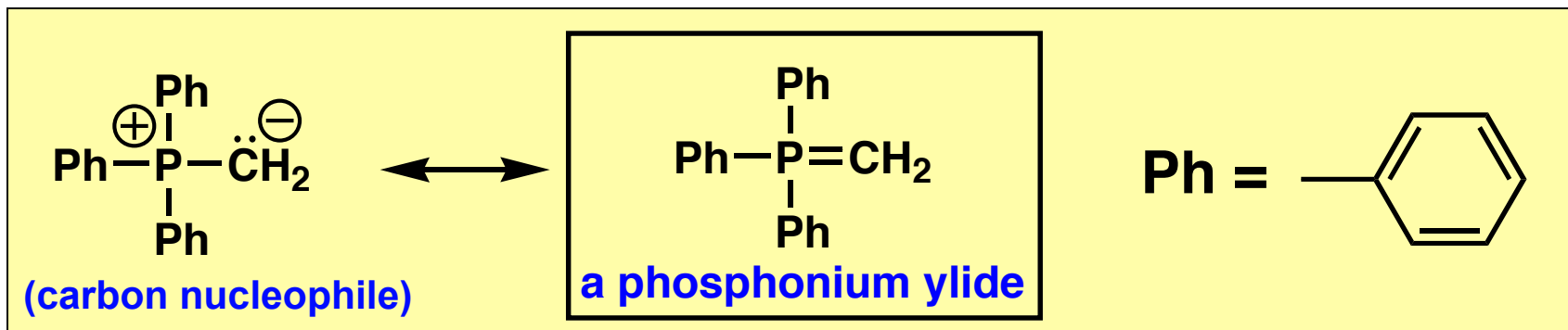


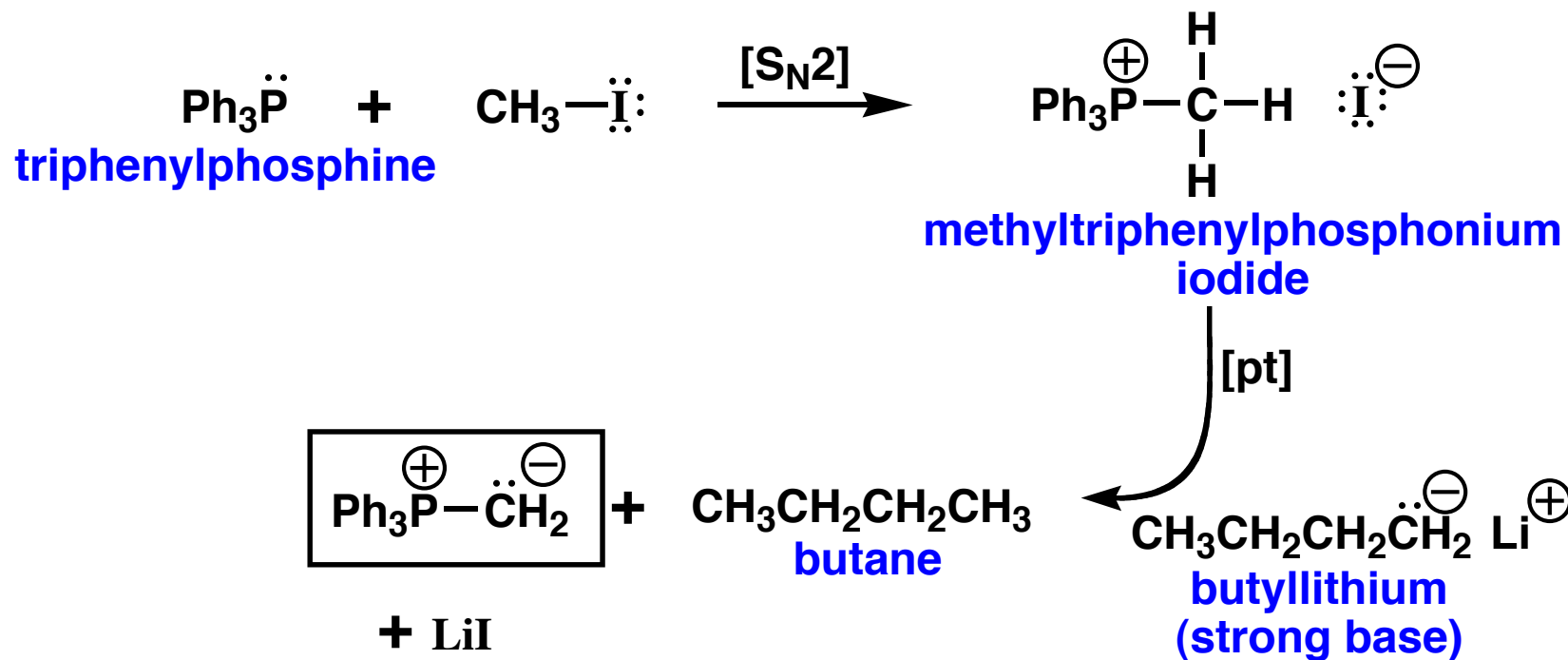
The Wittig Reaction: Substitution of =O by =C



Phosphonium ylides (powerful nucleophiles) add to aldehyde or ketone carbonyl groups via normal $[\text{Ad}_\text{N}]$. This tetrahedral intermediate, a betaine, (BAY-tah-eeen) has no leaving group, yet it's not stable. Because phosphorus has a high affinity for oxygen, the oxyanion attacks the positively charged P via $[\text{A}_\text{N}]$ to make a 4-membered ring (called a phosphaoxetane). This strained phosphaoxetane reacts further to split into $\text{Ph}_3\text{P}=\text{O}$ and an alkene. This elimination is a little funky, but you should be able to draw a reasonable set of curved arrows (and identify the frontier orbitals).



Formation of Ylides



C=O nucleophilic substitution

C=O addition - loss of carbonyl oxygen

Conjugate addition

Electrophilic addition to alkenes

Diels-Alder reactions

Acetal formation

Cyclic acetal formation

Enamine formation

Wittig reaction

Imine formation

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