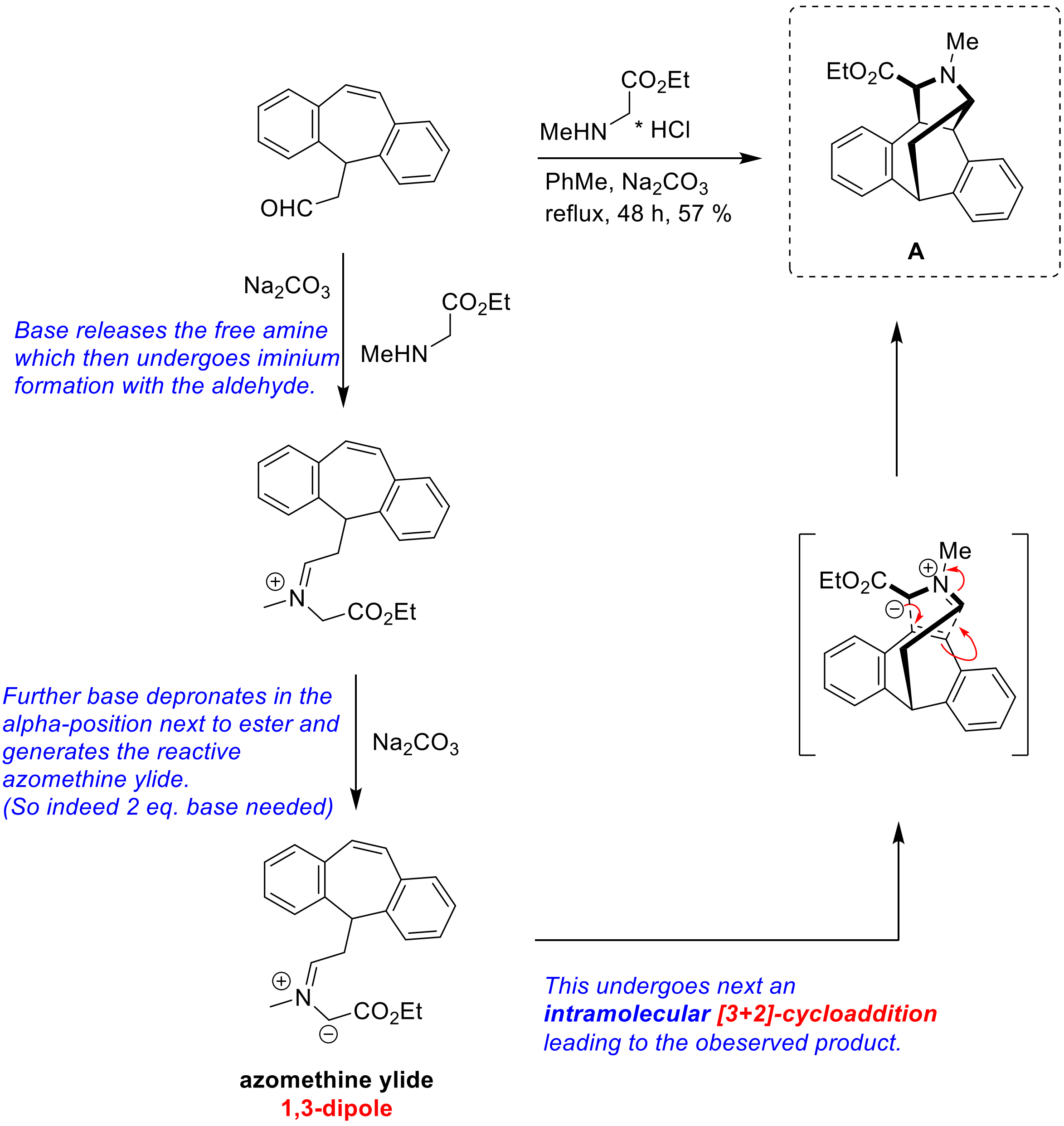
# SR2024 - POW 7 - Solutions

**1)** *Explain the shown transformation and draw the relevant intermediates?*



*Base releases the free amine which then undergoes iminium formation with the aldehyde.*

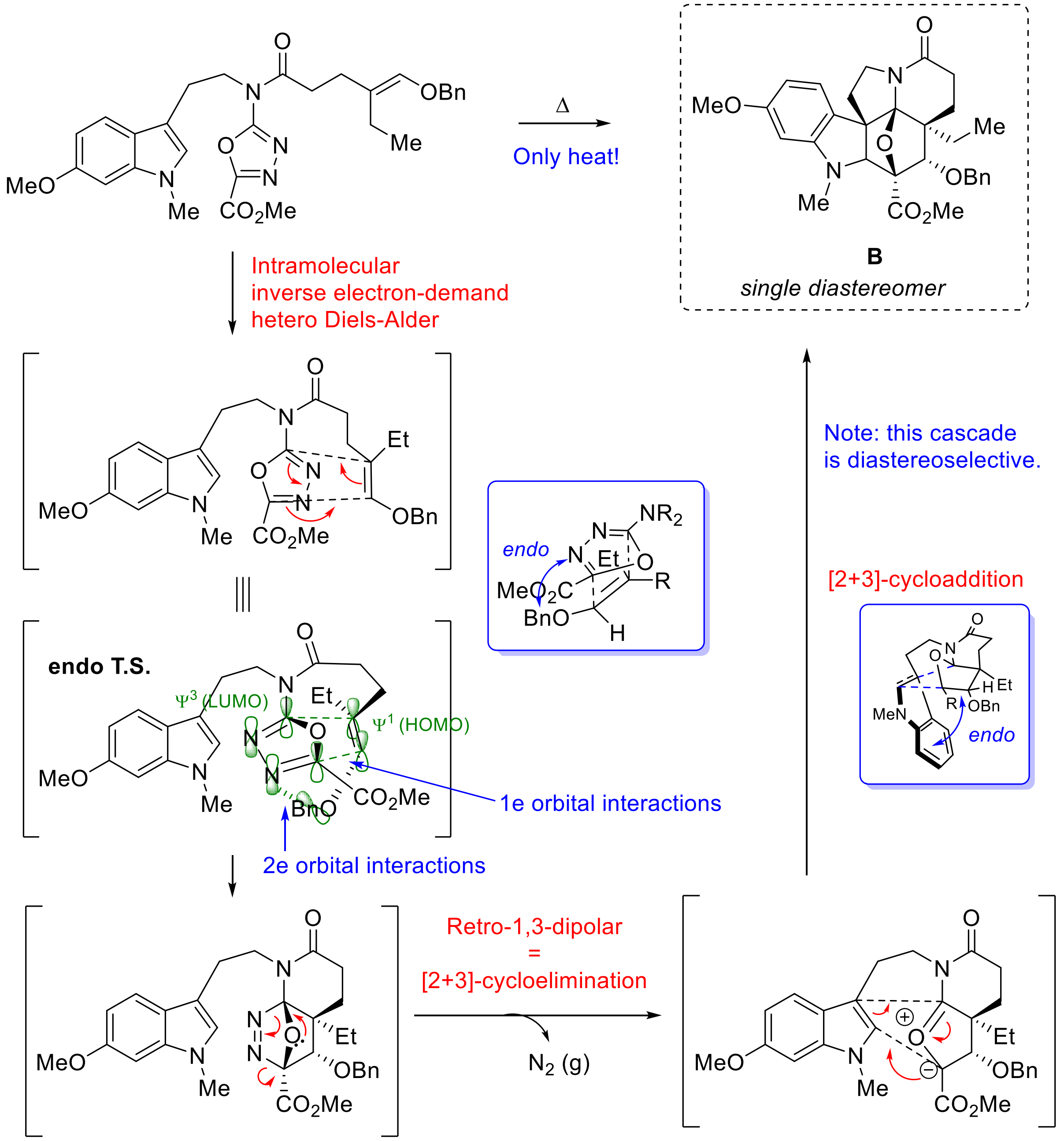
*Further base depronates in the alpha-position next to ester and generates the reactive azomethine ylide. (So indeed 2 eq. base needed)*

**azomethine ylide**

**1,3-dipole**

*This undergoes next an* ***intramolecular [3+2]-cycloaddition*** *leading to the obeserved product.*

**2)** *Identify the different cycloadditions, and draw all relevant synthetic intermediates.*



Only heat!

**B**

*single diastereomer*

Intramolecular inverse electron-demand hetero Diels-Alder

Note: this cascade is diastereoselective.

[2+3]-cycloaddition

1e orbital interactions

2e orbital interactions

Retro-1,3-dipolar = [2+3]-cycloelimination

For [4+2]-cycloaddition:

- 1,3,4-oxadiazole reacts with electron-rich enol ether.
- Inverse e-demand, so now LUMO of diene (e-poor) with HOMO of dienophile (e-rich), as depicted.
- Substituents in both diene and dienophile complement and reinforce the [4+2]-addition's regioselectivity, which is already dictated by the linking tether.
- The stereoselectivity is controlled by the dienophile's geometry (due to tether), and additionally for the shown (*E*)-olefin (OBn and Et on same side) it is also via the *endo* T.S. (OBn is inside the "boat" for secondary orbital interactions).

For [2+3]-cycloelimination:

- Formation of carbonyl ylide 1,3-dipole.
- Driven by release of nitrogen gas.
- 1,3-dipole is stabilised by the appropriate EWG (CO$_2$Me next to ⊖) and EDG (NR$_2$ next to ⊕) at both termini.

For [2+3]-cycloaddition:

- Exclusive *endo*-indole T.S.
- Again, likely this is strain-driven by the tether.
- Also here, the [3+2]-addition's regioselectivity is dictated by the tether, but the 1,3-dipolarophile (indole) complements it ($\delta$- next to $\delta$+).