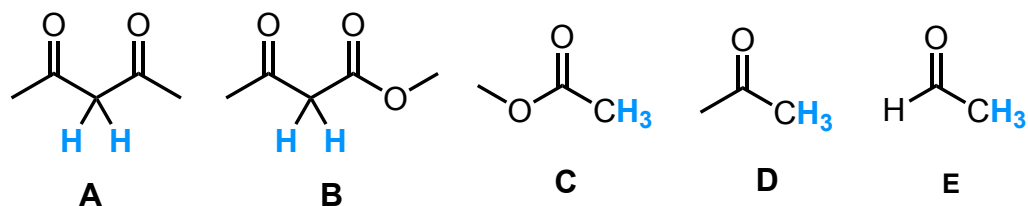


1. Rank α C—H atoms in each of the carbonyl compounds below in order of increasing acidity. Provide a brief explanation of your order.

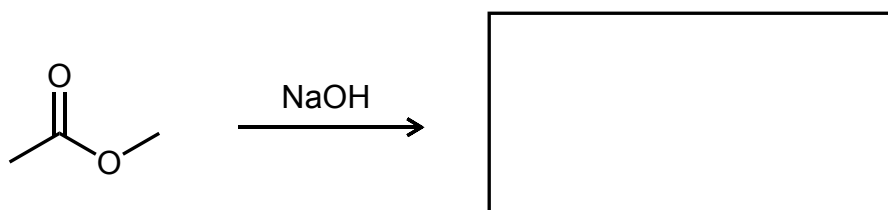


least acidic

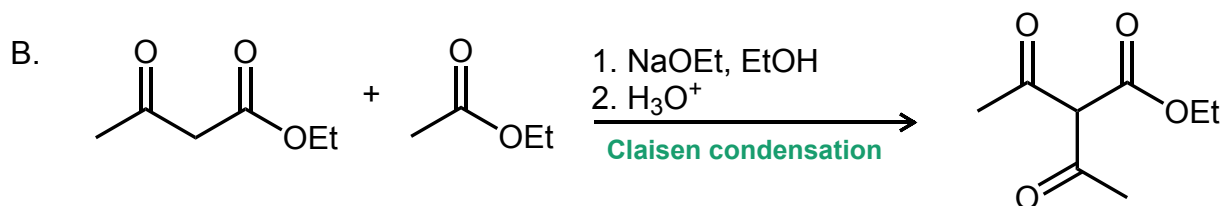
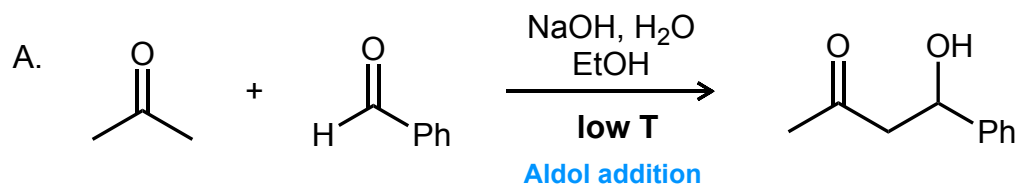
most acidic

Explanation:

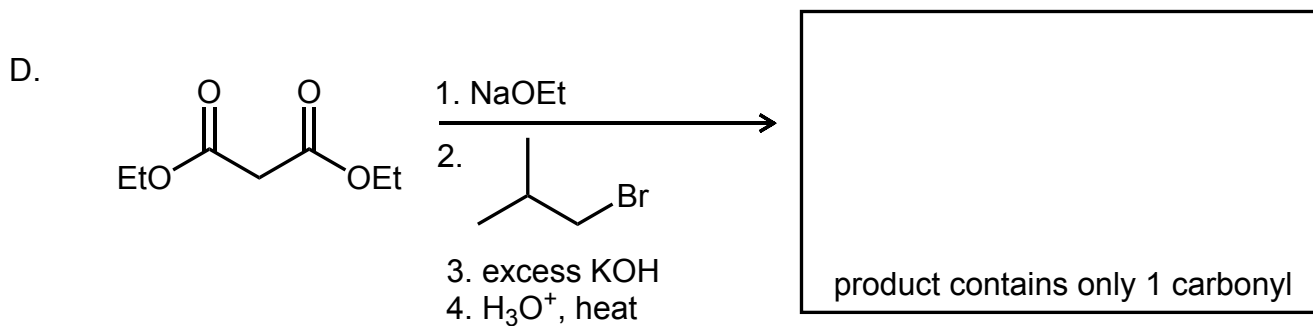
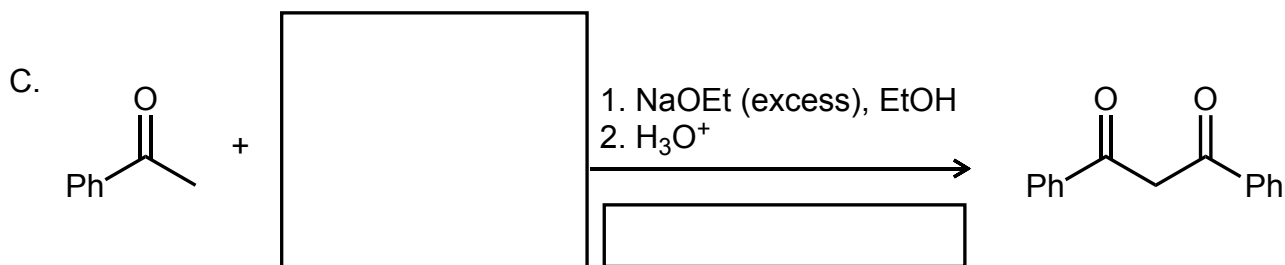
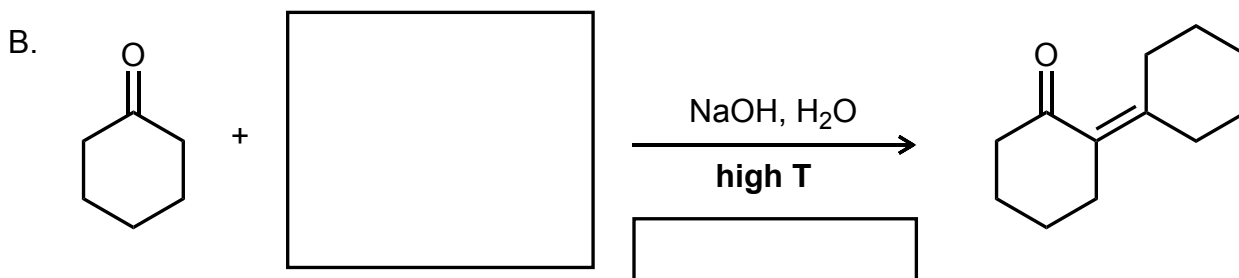
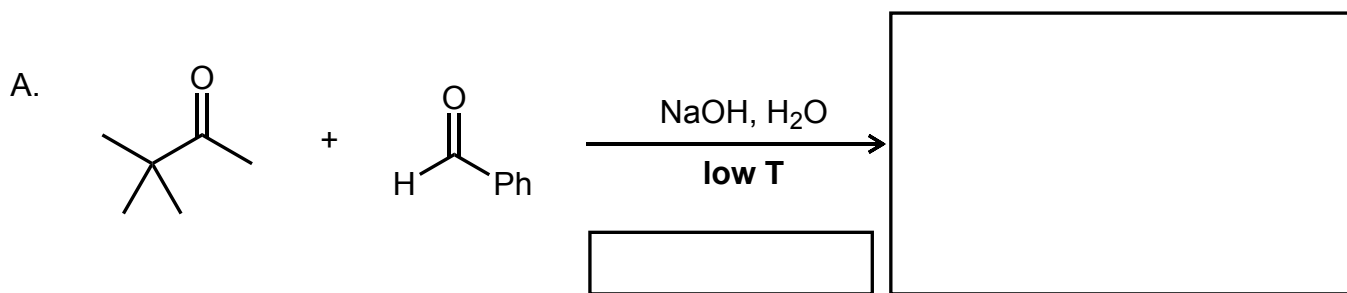
2. In Claisen condensations, the alkoxide base ^1OR is usually selected so that it is identical to the OR group of the ester. What would be the product of the reaction below, in which hydroxide is used instead of methoxide



3. In each of the reactions below, two carbonyl compounds are present. However, **each reaction is selective for the formation of only one product**. Describe why we only observe one major product in each reaction.

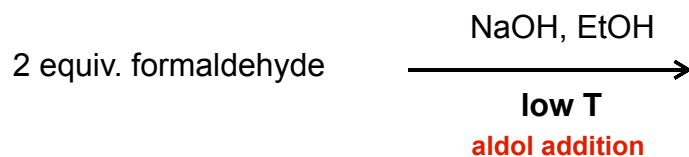


4. Provide the missing **electrophile** or **reaction product** in each scheme below. In each case, **assign the reaction** as an **α -alkylation**, **α -addition/condensation**, or **α -acyl substitution** process.

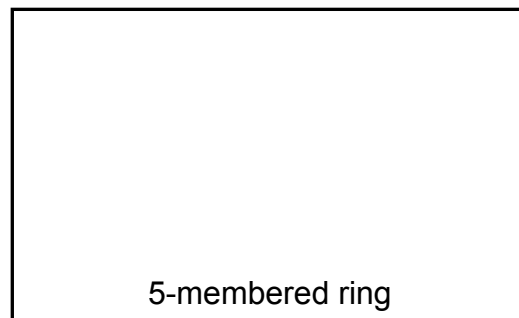
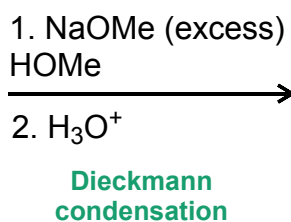
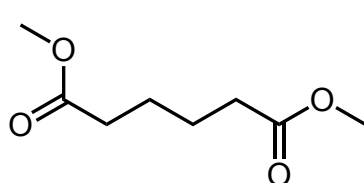


Step 2 is a:

5. Provide the curved-arrow mechanism and product for the **aldol addition** between two molecules of formaldehyde.

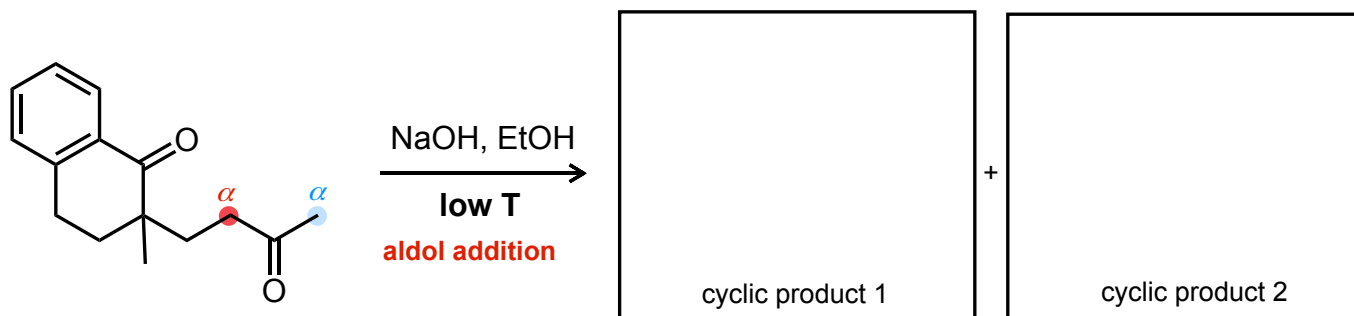


6. Provide the major product of the intramolecular Claisen condensation reaction below, also known as the Dieckmann condensation. Then, draw the curved-arrow mechanism for its formation.

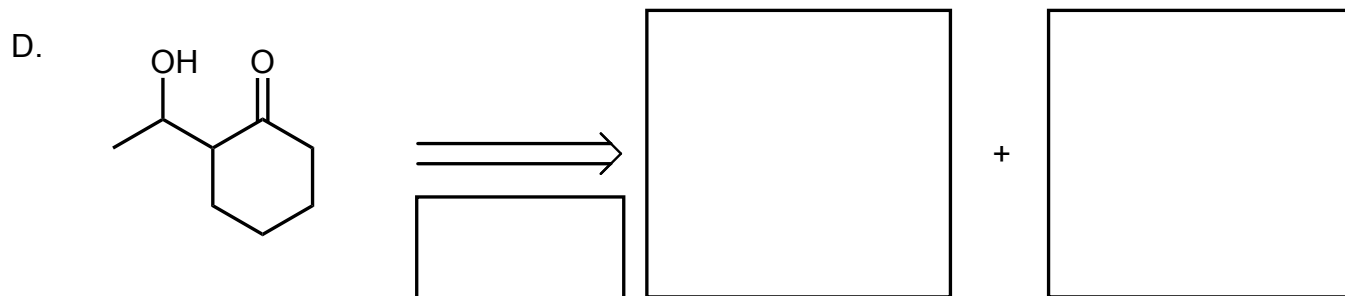
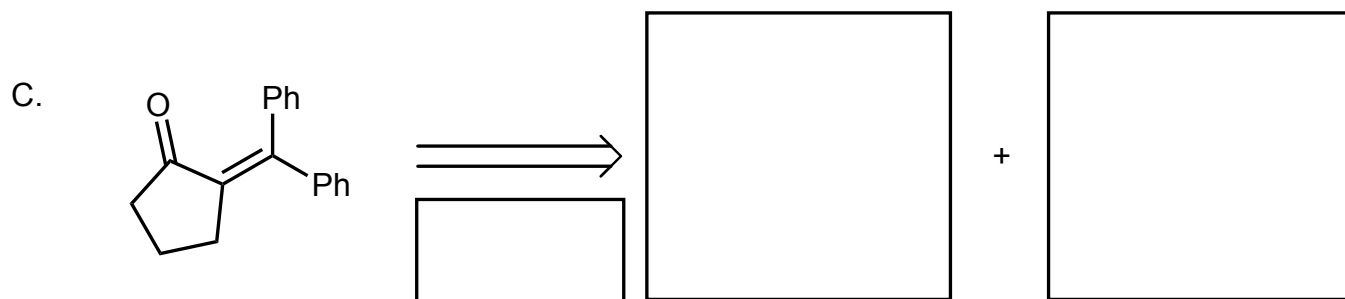
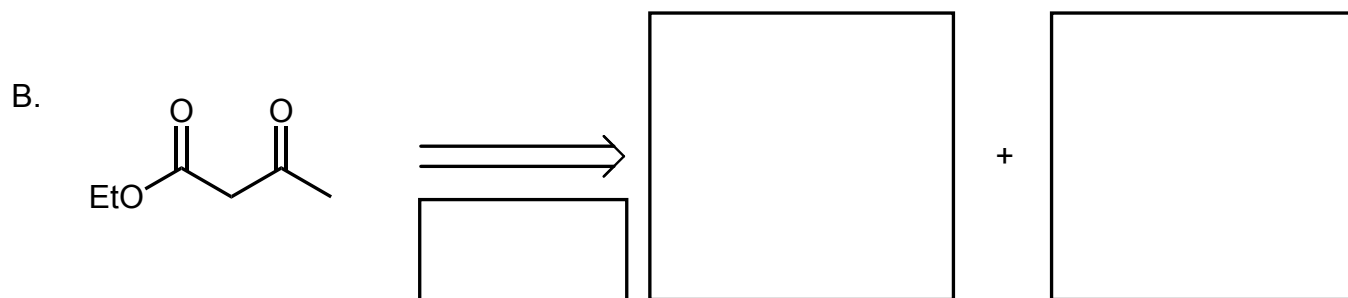
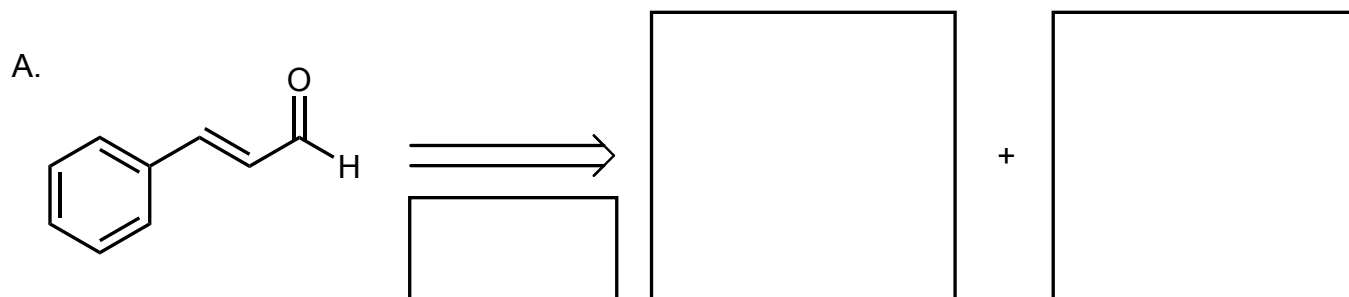


Curved-arrow mechanism

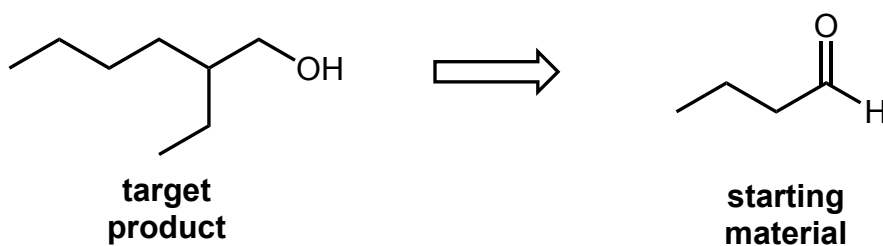
7. In the diketone below, multiple sites are enolizable. Therefore, two potential cyclic products can form from an **aldol addition** reaction. **Draw the potential product of each enolizable site reacting with the ketone in the molecule.** Then, **identify** which product is the **major product** of the reaction.



8. Each product below can be formed through one of the reactions described in the associated Core Concept Sheet. **Propose** the structures of the **two starting materials** and **determine which reaction** would form the product shown (alkylation, Aldol addition, Aldol condensation, or Claisen condensation)



9. Perform a retrosynthetic analysis on the target product and propose a full forward synthesis of the product from the given starting material.



10. Perform a retrosynthetic analysis on the target product and propose a full forward synthesis of the product from the given starting material.

Hint: the *last* step is a decarboxylation.

