Acetoacetic ester synthesis is a synthetic procedure used to convert a compound that has the general structural formula 1 into a ketone that has the general structural formula 2.

\[
R^1 - L \quad \rightarrow \quad R^1 - CH_2 - C - CH_3
\]

- \( R^1 \) = alkyl
- \( L \) = leang group

The group \( -CH_2COCH_3 \) in 2 is contributed by an acetoacetic ester, hence the term acetoacetic ester synthesis.

\[
R^1 - L
\]

\[
R^1 - CH_2 - C - CH_3
\]

- \( R^2 \) = alkyl, aryl

Acetoacetic ester synthesis consists of four consecutive reactions that can be carried out in the same pot.

- reaction 1: acid-base reaction
- reaction 2: nucleophilic substitution
- reaction 3: ester hydrolysis (using saponification)
- reaction 4: decarboxylation

eg:
A more direct method to convert 3 to 4 is the reaction of 3 with the enolate ion (5) of acetone.

However, the generation of 5 from acetone quantitatively in high yield is not an easy task because the reaction requires a very strong base, such as LDA, and must be carried out at very low temperature under strictly anhydrous conditions.

Acetoacetic ester synthesis provides a more convenient alternative to convert 3 to 4.

Acetoacetic ester synthesis can be adapted to synthesize compounds that have the general structural formula 6.
R³, R⁴ = identical or different alkyl groups

eg:

reaction 1:

reaction 2:

reaction 1 (repeat):

reaction 2 (repeat):

reaction 3:

reaction 4:
Contributors

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