EXERCISE 22.12

A lactone can also be alkylated after formation of its enolate. What is the expected species after each step in the following scheme? Given that an enolate ion is alkylated on its less-hindered face, what is the stereochemistry of the final product? (Models may be useful here.)

1. LDA, DME (solvent)
2. CH$_3$=CHCH$_2$CH$_2$CH$_2$Br
3. LDA, DME
4. CH$_3$I

\[ \text{Product} \quad (86\%) \]
EXERCISE 22.13

Propose a route to synthesize each of the following compounds using an enolate ion and any organic compounds with seven or fewer atoms:

a. 

![Chemical Structure](image-url)
Exercise 22.14

Draw resonance structures for the carbanions formed from diethyl malonate and ethyl cyanoacetate.
EXERCISE 22.15
Show how you would prepare each of the following compounds by making use of a β-dicarbonyl compound and an organohalide:

a. \[
\begin{align*}
\text{O} & \quad \text{COOEt} \\
\text{CH}_2(\text{CH}_2)_3 & \quad \text{COOEt}
\end{align*}
\]

b. \[
\begin{align*}
\text{O} & \quad \text{COOEt}
\end{align*}
\]
EXERCISE 22.16

Show how you would prepare each of the following compounds by making use of a dicarbonyl precursor and any other necessary compounds and reagents:

a.  

![Chemical Structure](image)

b.  

![Chemical Structure](image)
EXERCISE 22.17

Show how you would prepare pure samples of butylamine, dibutylamine, and tributylamine from 1-bromobutane and any necessary reagents. Recall that amides can be reduced to form amines (Section 21.8b).
EXERCISE 22.18

If an alcohol and alkoxide ion are used in the Hofmann reaction, a carbamate ester is obtained. These compounds are stable, but they can be hydrolyzed later to produce the carbamic acid, which will decarboxylate to form the amine. Propose a reasonable mechanism for the following transformation:

\[ \text{C}_{11}\text{H}_{23}\text{C}^\text{NH}_2 + \text{Br}_2, \text{NaOCH}_3 \xrightarrow{\text{CH}_3\text{OH}} \text{C}_{11}\text{H}_{23}\text{C}^\text{NH} = \text{OCH}_3 \]