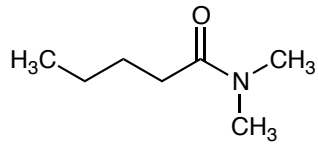
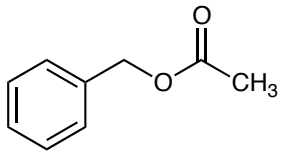
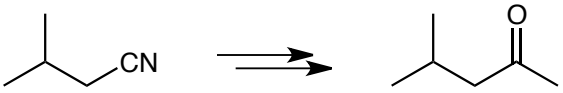
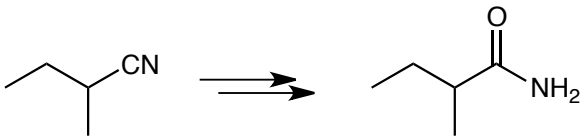
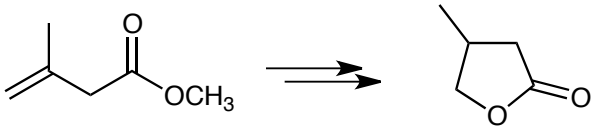
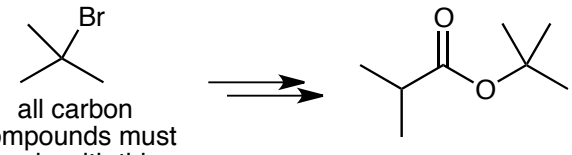
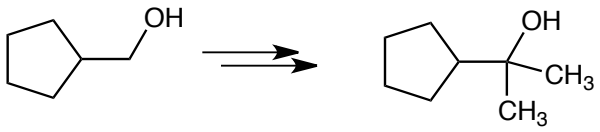
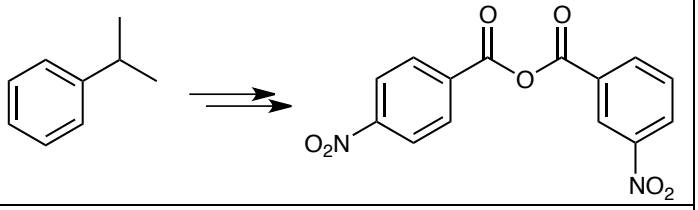
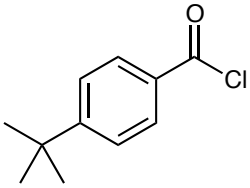
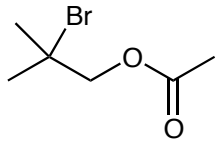
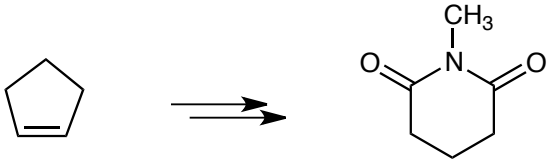
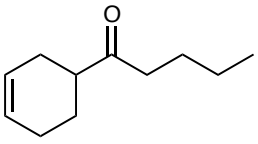
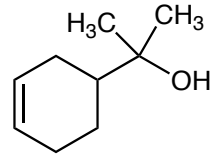
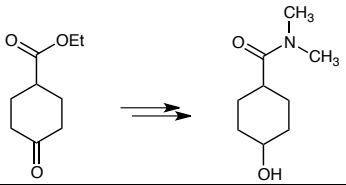
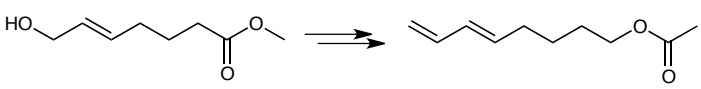
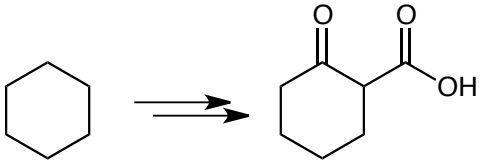
# Synthesis Problem Set 2

CHM 224 • Prof. Chad Landrie

## CHAPTER 21: CARBOXYLIC ACID DERIVATIVES

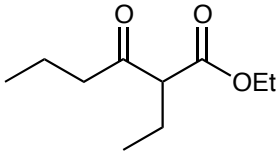
The key step in all of the syntheses below is nucleophilic acyl substitution to form a carboxylic acid derivative. Redox reactions of carbonyls and alcohols are also featured. Grignard additions to nitriles and esters is a common method for chain extension.

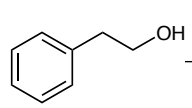
| | |
|---|---|
| any alcohols & any amines  | any alcohols  |
|  |  |
|  |  all carbon compounds must begin with this |
|  |  |
| hydrocarbrons w/ ≤ 6 carbons  | any alkenes  |
|  | any compounds with ≤ 4 carbons  |
| any compounds with ≤ 4 carbons  |  |
|  |  |

## CHAPTER 22 & 23: CONDENSATION REACTIONS OF ESTER ENOLATES

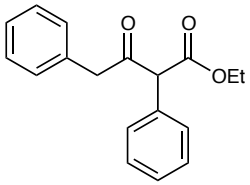
Condensation of ester enolates (Claisen) is the key reaction in most of these syntheses. Acetyl ketones are prepared by the acetoacetic ester synthesis. Subsituted acetic acids are prepared by the malonic ester synthesis.

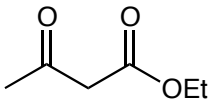
any alcohols with ≤ 5 carbons

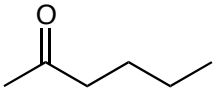


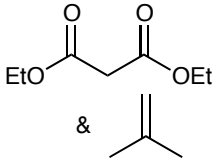



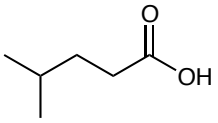

and any compounds w ≤ 3 carbons

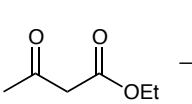


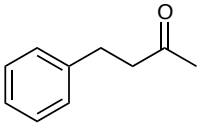



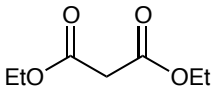



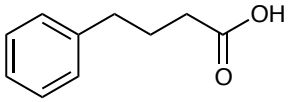



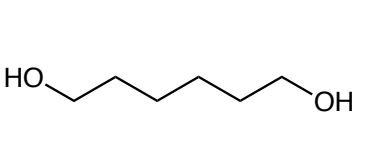

and any alcohols



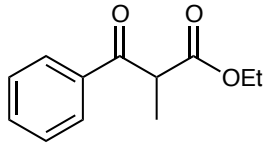




and any alcohols with ≤ 8 carbons

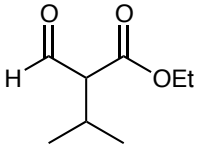


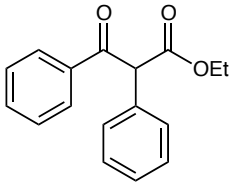

and any alcohols with ≤ 7 carbons

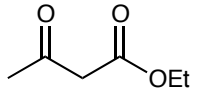



and any alcohols with ≤ 7 carbons

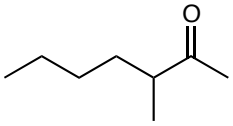


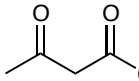

and any alcohols with ≤ 8 carbons



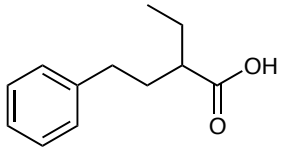



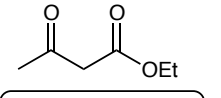

and any alcohols with ≤ 7 carbons



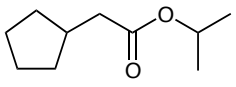




and any alcohols with ≤ 6 carbons



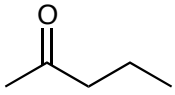



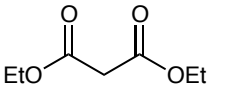

and any alkenes with ≤ 5 carbons



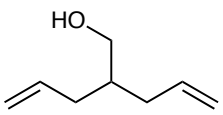

$H_2C{=}CH_2$

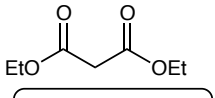
all carbon compounds must begin with this



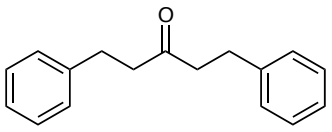



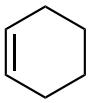

and any hydrocarbons with ≤ 7 carbons



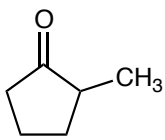




and any alcohols with ≤ 7 carbons



and any compounds with ≤ 2 carbons



## CHAPTER 22 & 23: ALPHA SUBSTITUTION REACTIONS; ALDOL CONDENSATION

Condensation of aldehydes (Aldol) gives b-hydroxycarbonyls and a,b-unsaturated carbonyls. Conjugate (1,4) addition of nucleophiles to a,b-unsaturated carbonyls is a key step in several syntheses. Substitution reactions at the a-carbon (e.g., Hell-Voldhart-Zelinski and Haloform) are also featured.