

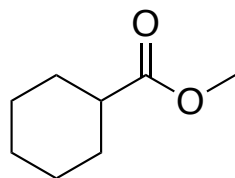
The background of the slide features a faint, light-gray diagram of a laboratory setup. At the top, there is a rectangular box labeled 'Ignition Box' with two wires (one red, one yellow) extending from it. To its right is a label 'Fuse'. Below the ignition box, a blue rounded rectangle contains the text 'CH362/362H', 'Week 3 Lecture', and 'Esterification'. Below this rectangle, a large, light-blue cylindrical vessel is shown. Inside the vessel, there is a yellow cylindrical component and a gray stirrer with two blades. To the left of the vessel is a digital display showing '23.00'. Below the vessel, there are four red arrows pointing upwards towards the yellow component, the bottom of the vessel, the stirrer, and a gray cylindrical component on the right. The labels 'Sample', 'Stirrer', and 'Ther' are partially visible at the bottom of the diagram.

CH362/362H

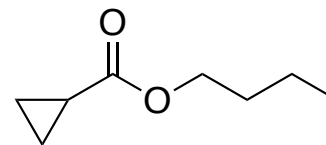
Week 3 Lecture

Esterification

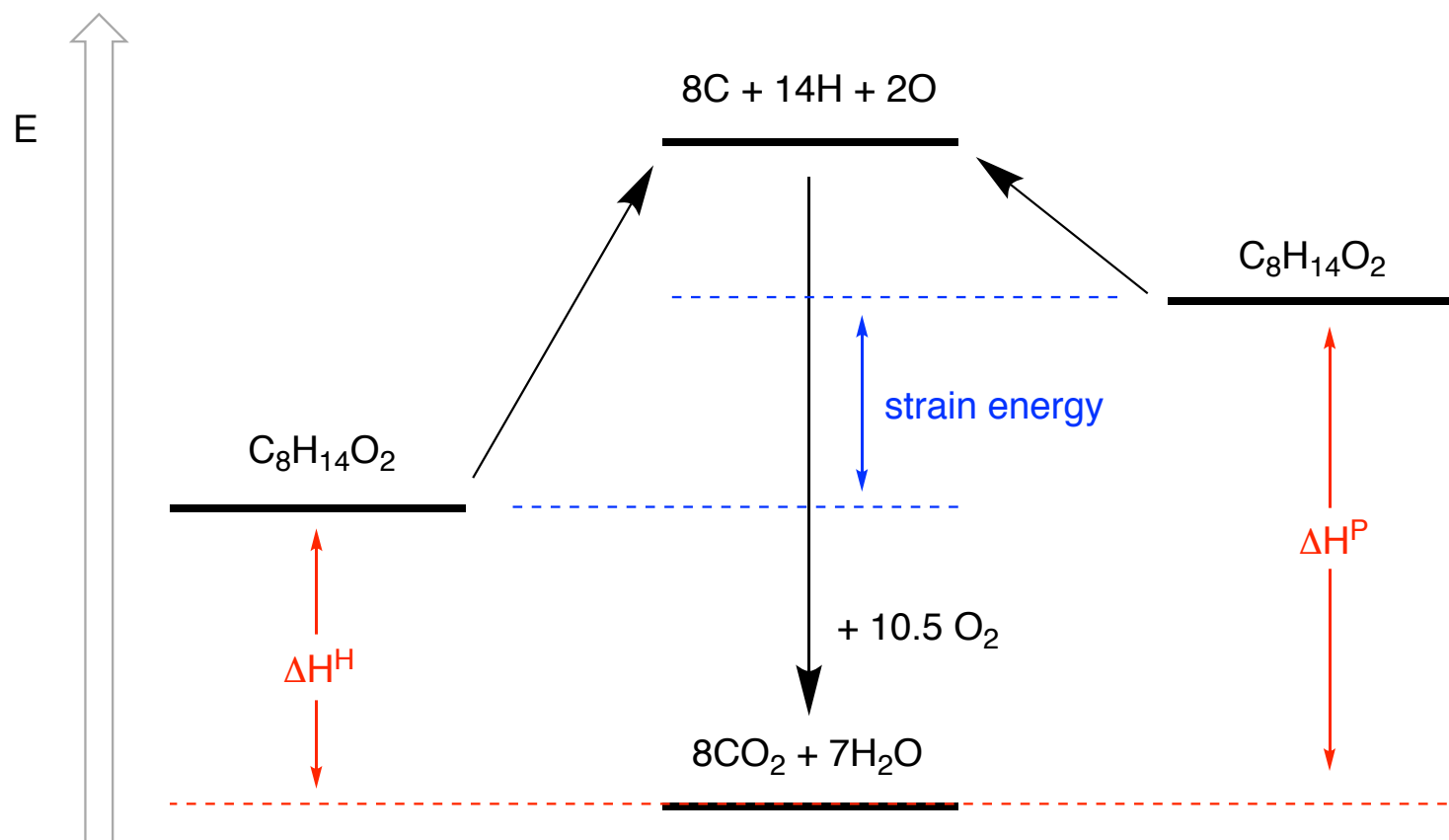
Project 1 Overview: Strain Energy of the Cyclopropane Ring from Heats of Combustion



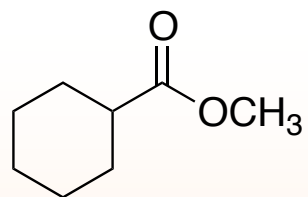
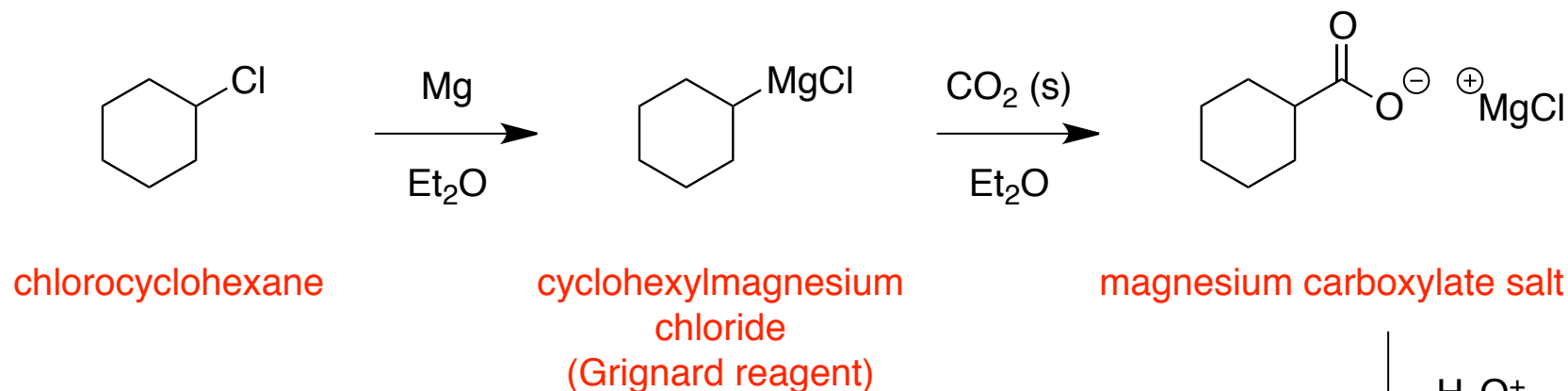
methyl cyclohexanecarboxylate
"H-ester"



butyl cyclopropanecarboxylate
"P-ester"

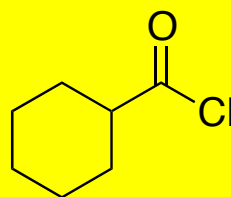


Synthesis of Methyl Cyclohexanecarboxylate (the "H-ester")



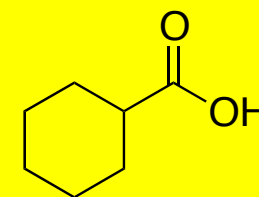
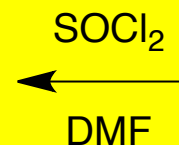
methyl cyclohexane-
carboxylate
"H-ester"

purify by vacuum distillation
characterize by IR
spectroscopy, bp/pressure
range, GC, and refractometry



acid chloride

synthetic activities for wk3

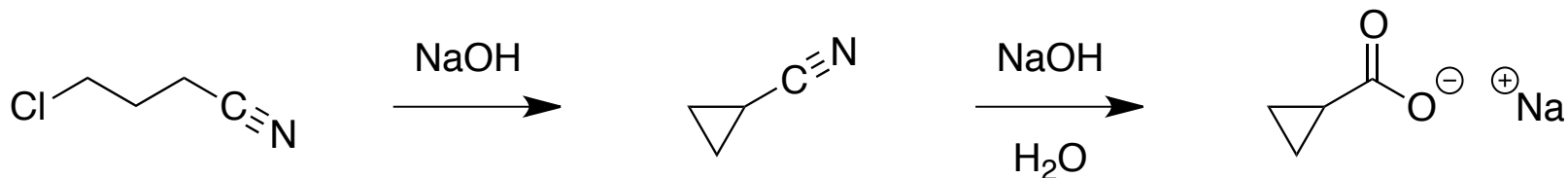


cyclohexanecarboxylic
acid
"H-acid"

purify by vacuum distillation
characterize by IR
spectroscopy
and bp/pressure range

- use at most 11.5 g (90 mmol)
- save 0.50 g for analysis

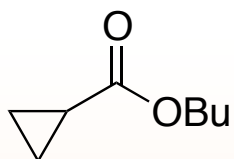
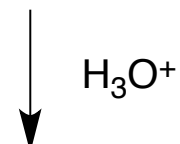
Synthesis of Butyl Cyclopropanecarboxylate (the "P-ester")



4-chlorobutyronitrile

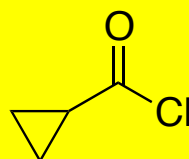
cyanocyclopropane

sodium carboxylate salt



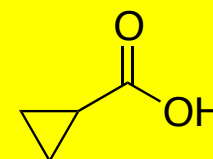
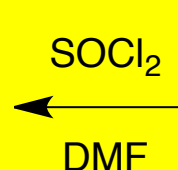
butyl cyclopropane-
carboxylate
"P-ester"

purify by vacuum distillation
characterize by IR
spectroscopy, bp/pressure
range, GC, and refractometry



acid chloride

synthetic activities for wk3

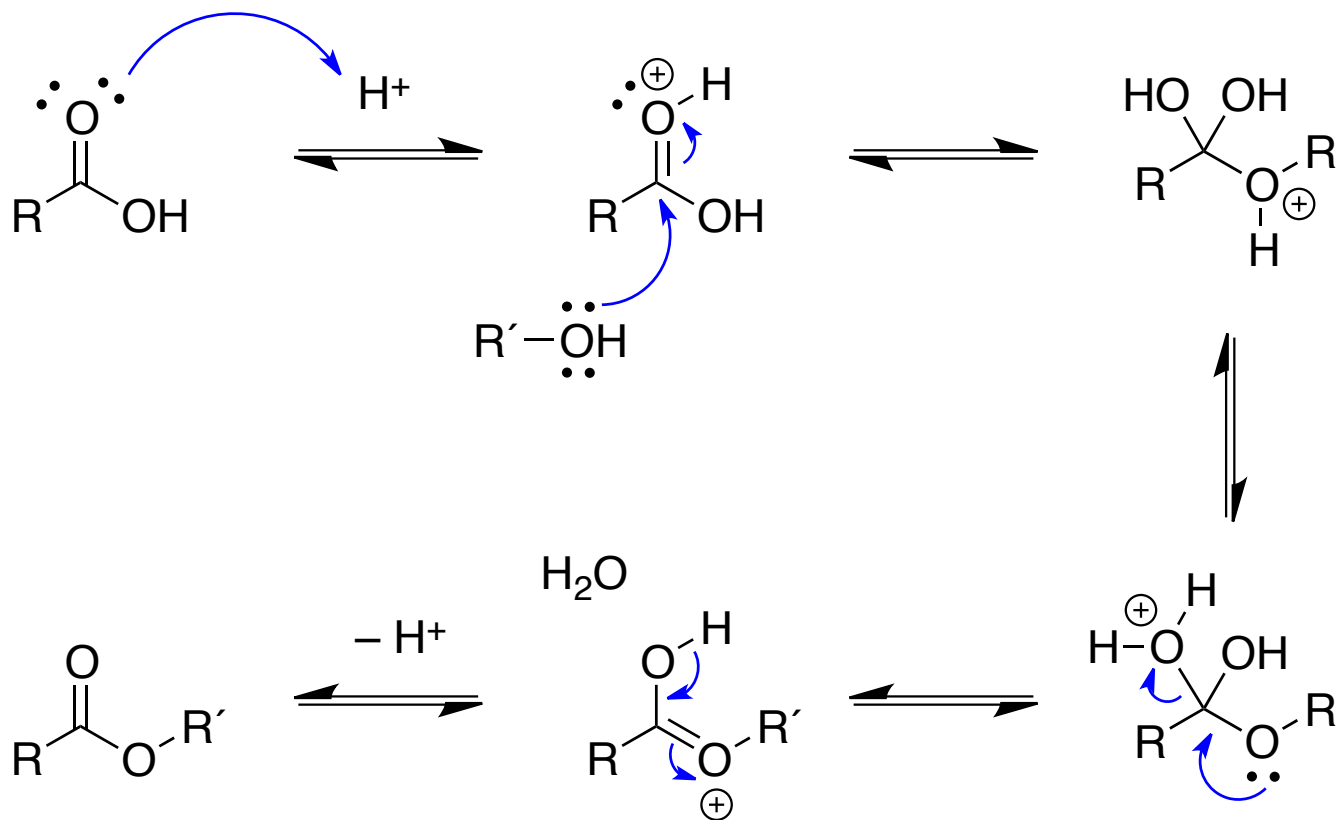
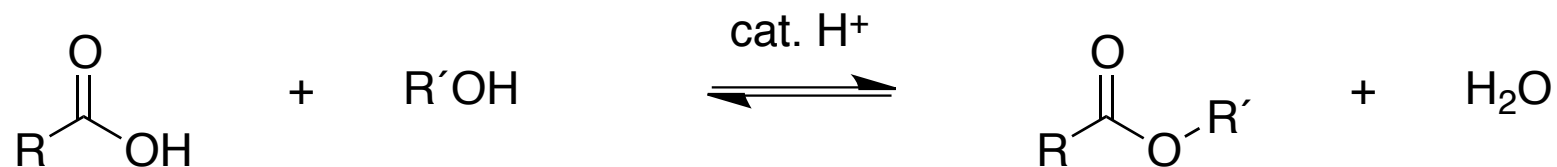


cyclopropanecarboxylic
acid
"P-acid"

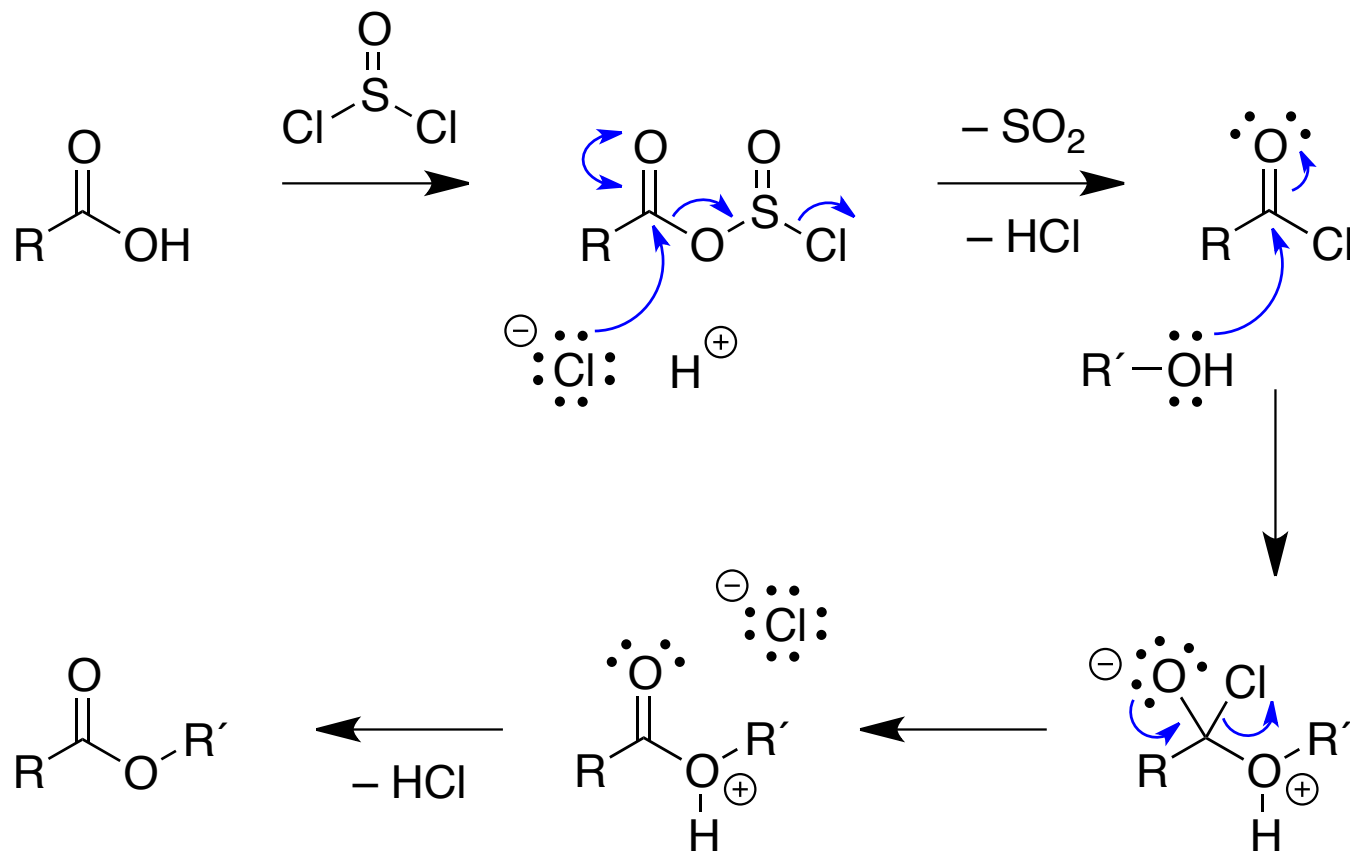
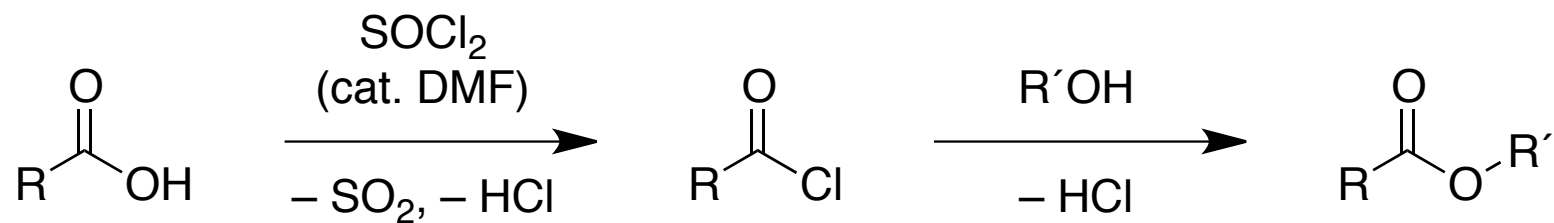
purify by vacuum distillation
characterize by IR
spectroscopy
and bp/pressure range

- use at most 14.2 g (200 mmol)
- save 0.50 g for analysis

Esterification of Carboxylic Acids: (1) The Fisher Esterification (Reversible)



Esterification of Carboxylic Acids: (2) via Acid Chloride (Irreversible)

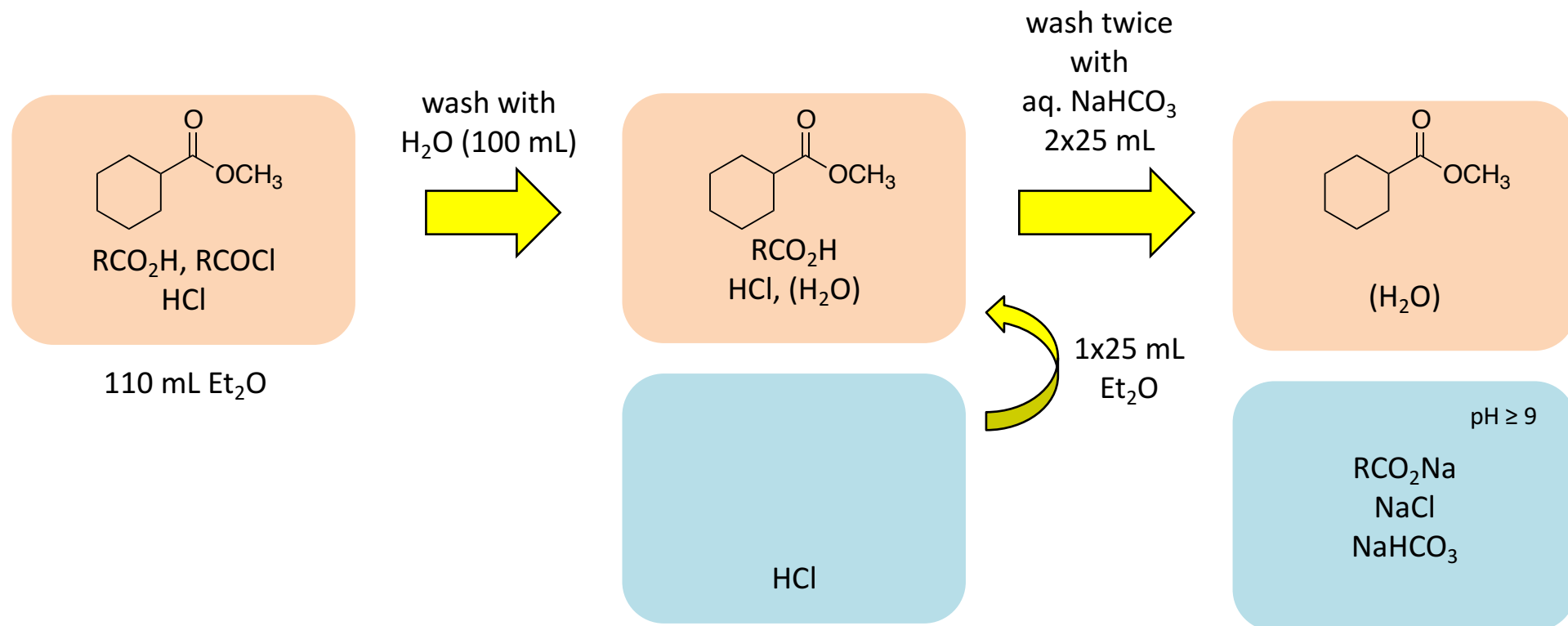


Summary of Work-up for H-Ester and P-Ester

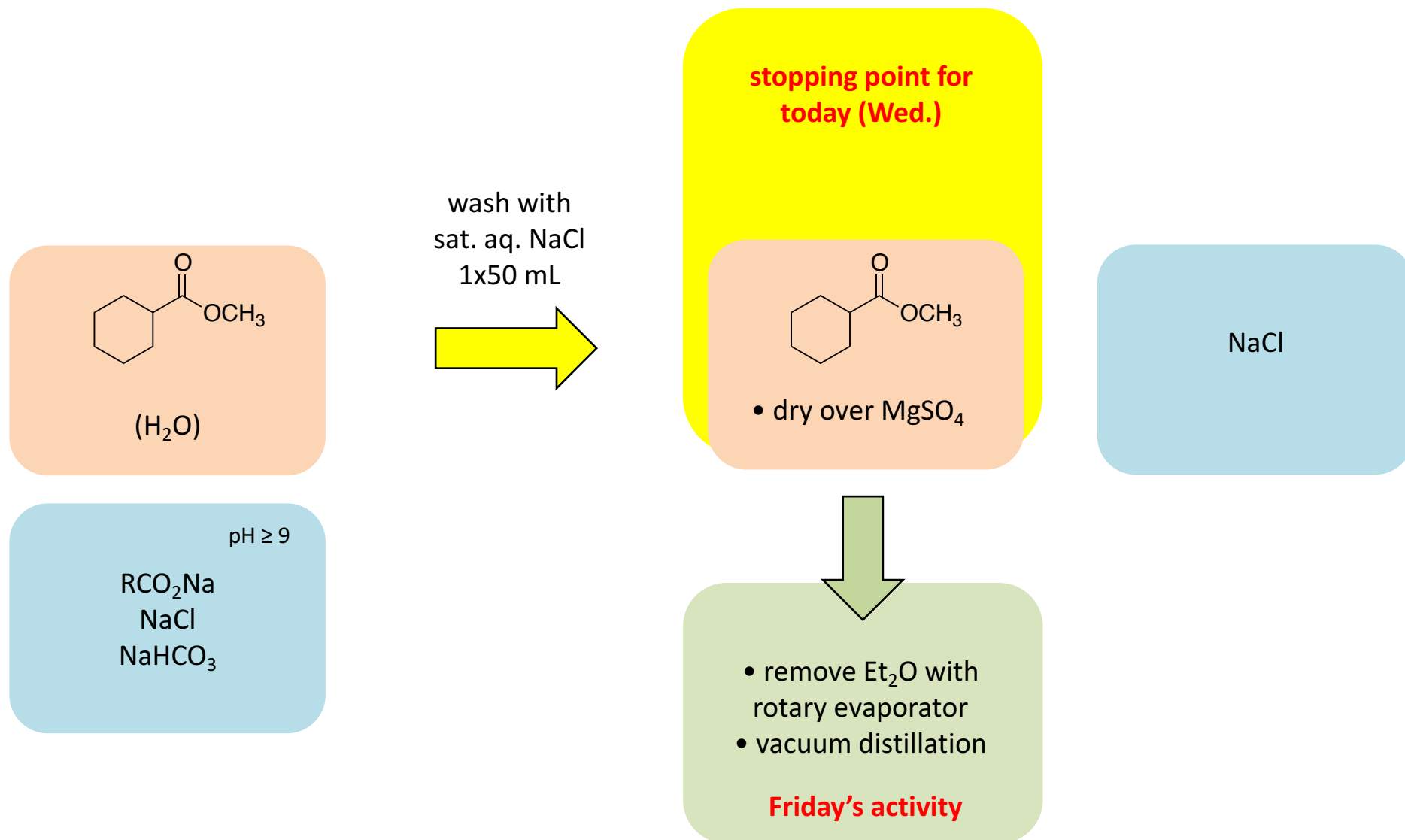
() = low solubility

□ = ethereal layer

□ = aqueous layer

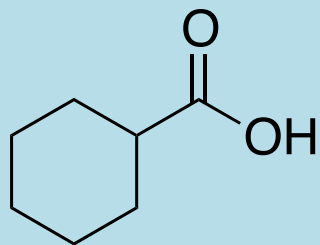


Summary of Work-up for H-Ester and P-Ester

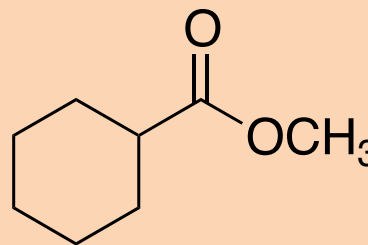


Considerations for Vacuum Distillation (see CH362 website)

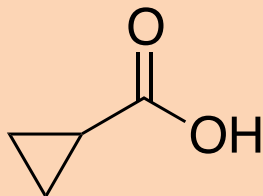
• ALL (H & P groups) in GBAD 409



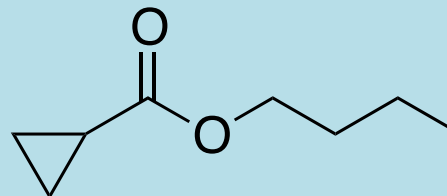
• bp (760 mmHg)
= 232-233 °C



• bp (760 mmHg)
= 119 °C



• bp (760 mmHg)
= 182-184 °C



• bp (760 mmHg)
= 177 °C

BuOH
• bp (760 mmHg)
= 117 °C

 = distill with rotary vane mechanical oil pump

 = distill with water aspirator pump

