

Activation Of Carboxylic Acids

from chapter(s) _____ in the recommended text

A. Introduction

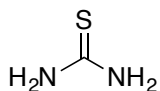
B. Reactivity

poor acylating agents because:

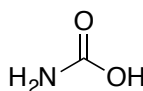
- (i) hydroxide is a *mediocre*
- (ii) exists *as a carboxylate*.

are reactive to nucleophiles.

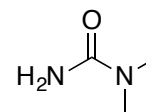
C. Common Carboxylic Acids Derivatives



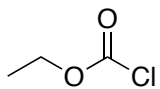
thiourea
C



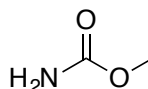
carbamic acid
B



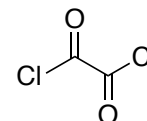
N,N'-dimethylurea
C



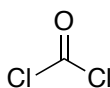
ethyl chloroformate
D



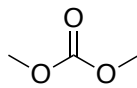
methyl carbamate
E



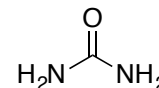
oxalyl chloride
D



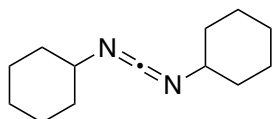
phosgene
D



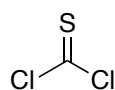
dimethyl carbonate
A



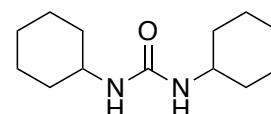
urea
C



dicyclohexylcarbodiimide (DCC)
E



thiophosgene
E

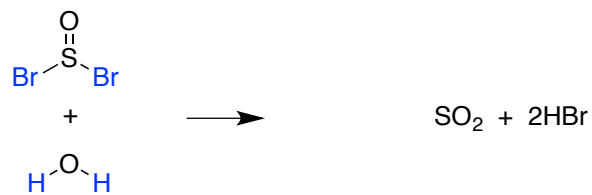
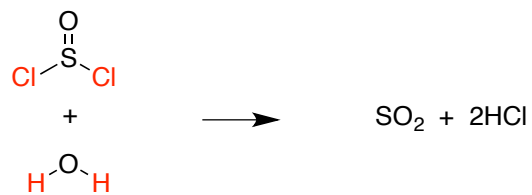


N,N'-dicyclohexylurea
C

D. Activation Of Carboxylic Acids By Conversion To Acid Chlorides

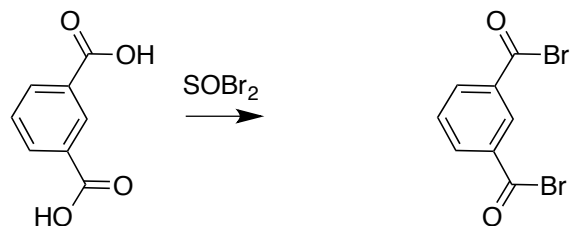
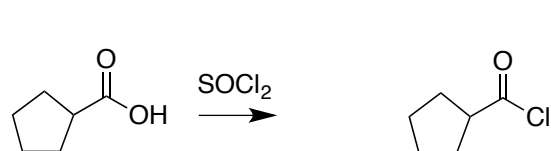
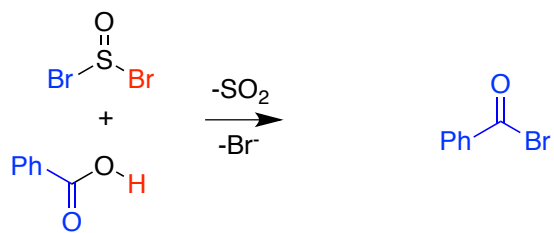
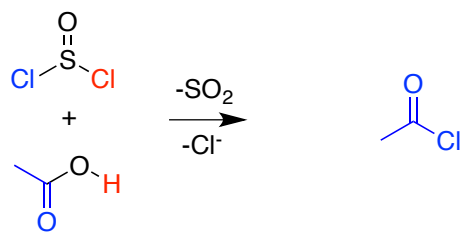
Thionyl Halides: Excellent Dehydrating Agents

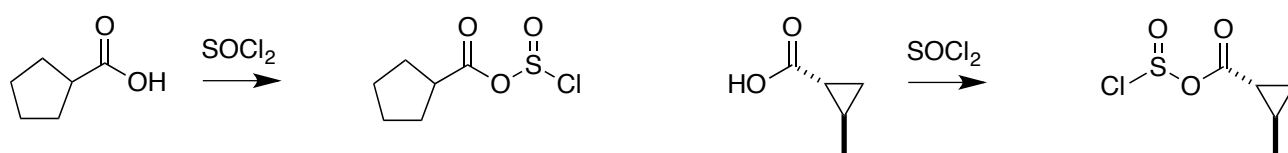
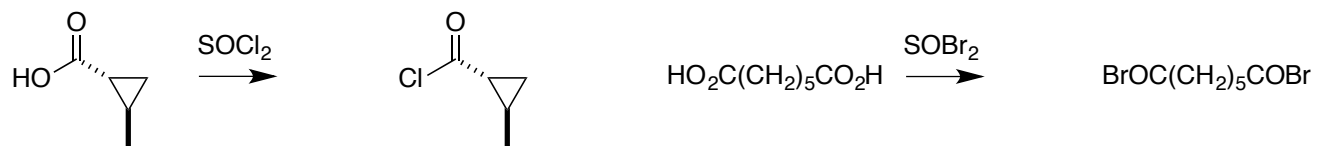
formula: SOBr_2



Thionyl Halide Plus Carboxylic Acid Gives Acid Halide, SO_2 , And HX

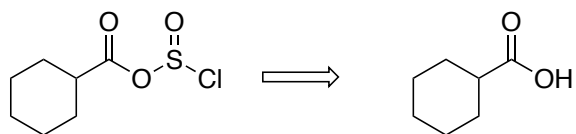
acid halides.

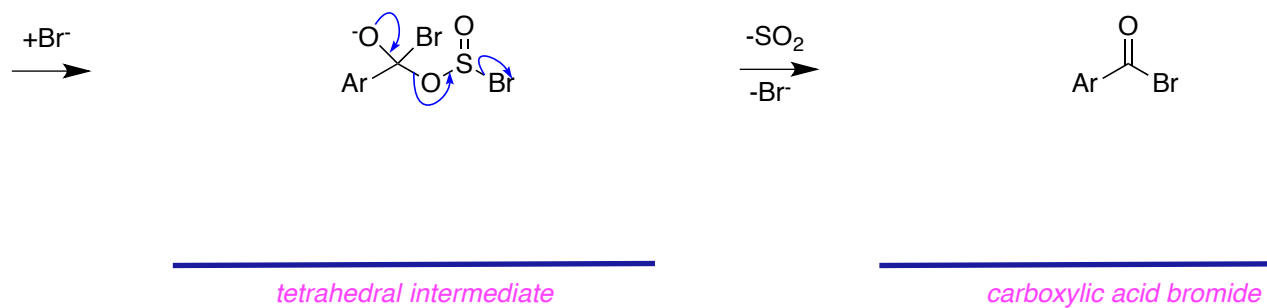
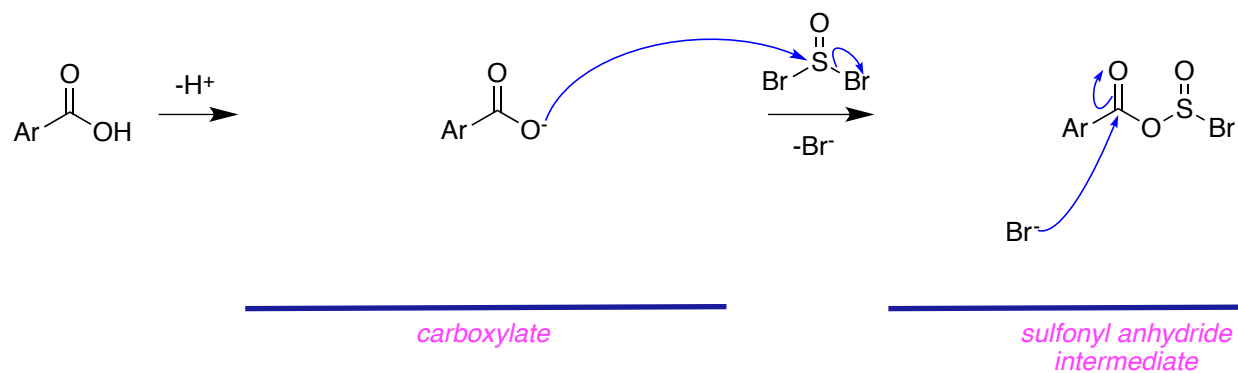




*sulfonyl anhydride
intermediate*

*sulfonyl anhydride
intermediate*



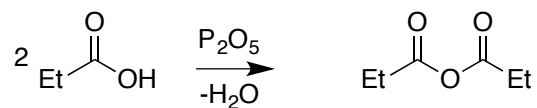


E. Activation By Forming Anhydrides

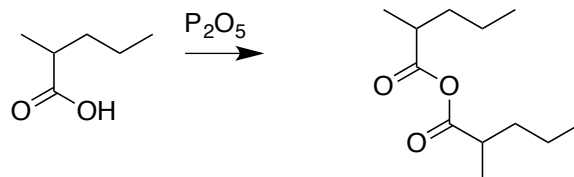
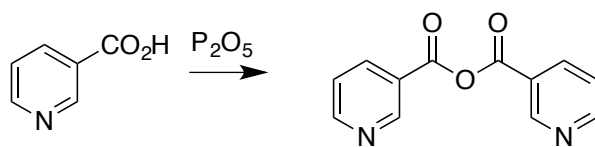
Symmetrical Anhydrides

2 molecules

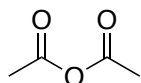
1 molecule



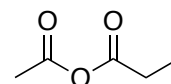
Symmetrical anhydrides
, but *unsymmetrical* ones



is *symmetrical*) and the *unsymmetrical* anhydride



acetic anhydride



anhydride from ethanoic and propionic acids

Unsymmetrical And Mixed Anhydrides

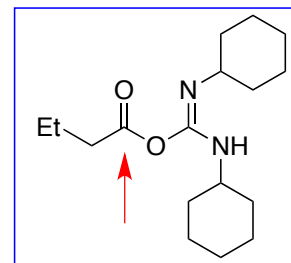
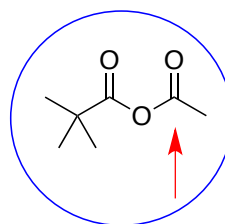
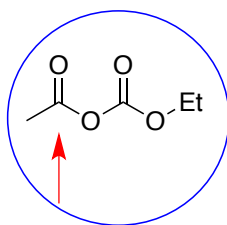
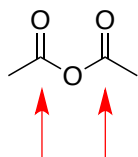
2

unsymmetrical.
another type of acid.

are not

that *can* be used

eg

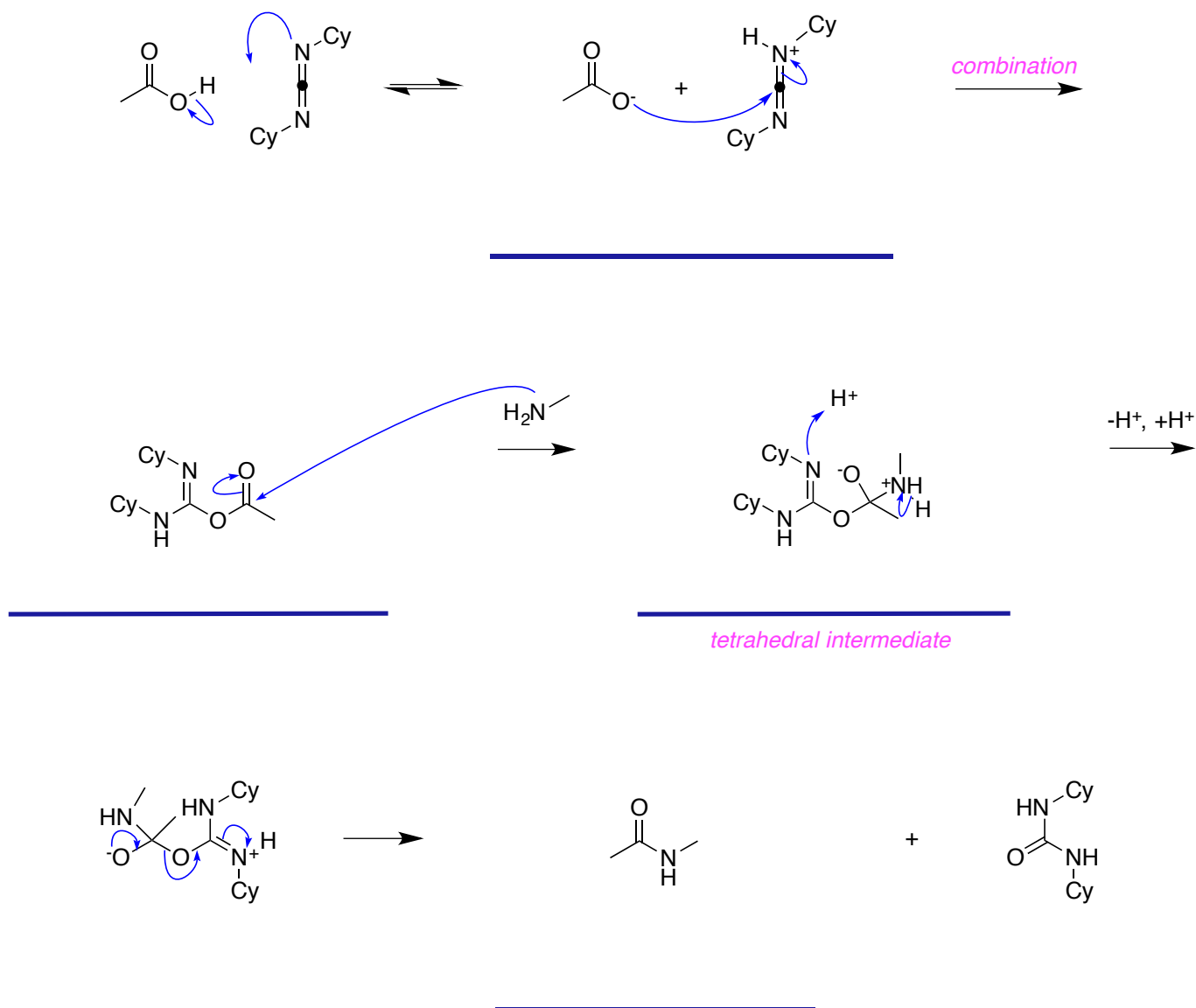


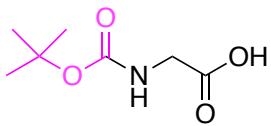
draw arrows to most reactive carbonyl carbon(s), circle unsymmetrical anhydrides, and box those that are mixed

different,

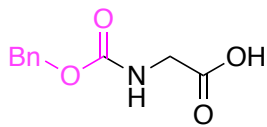
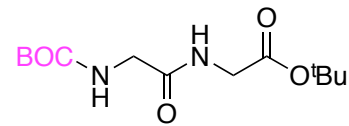
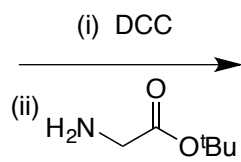
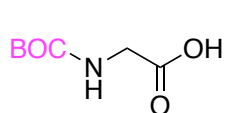
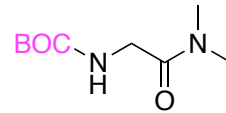
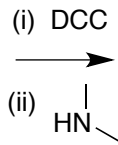
Formation Of Unsymmetrical Anhydride Derivatives Using Carbodiimides

urea.

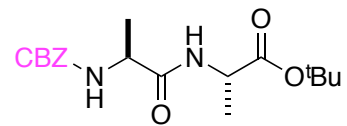
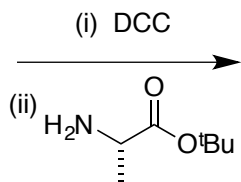
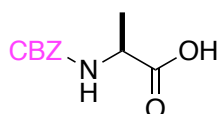
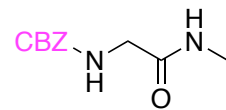
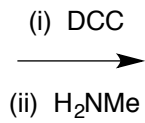




BOC
tert-ButylOxyCarbonyl



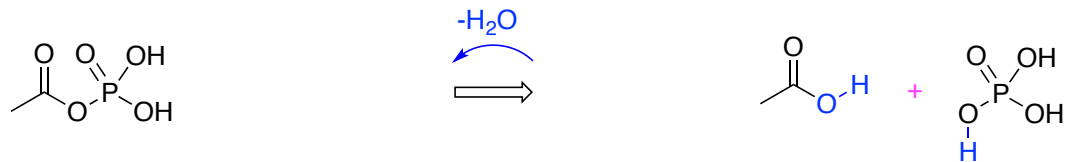
CBZ
CarboxyBenZyl



F. Activation Of Phosphate Acids In Cells Via Phosphate Anhydrides

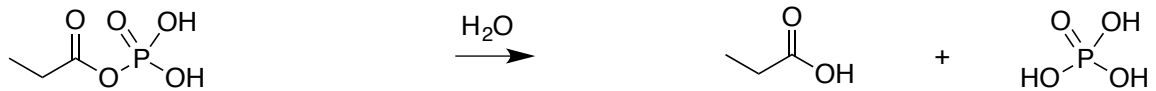
Formation Of Mixed Anhydrides Of Phosphorus Acids

mixed anhydrides



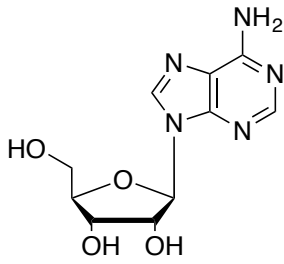
acyl phosphate

the *carbonyl* of
is a *better* leaving

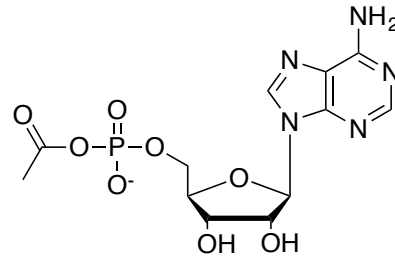


carboxylic and phosphoric acids

deprotonated

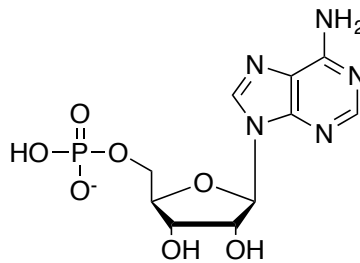


adenosine

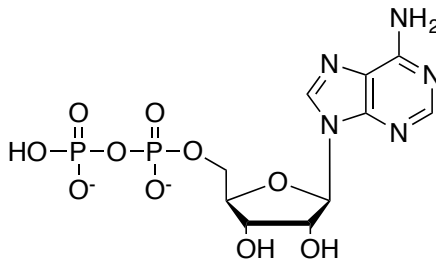


acyl adenylate

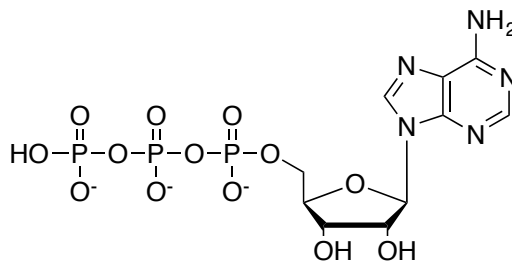
, *ADP / ATP*,



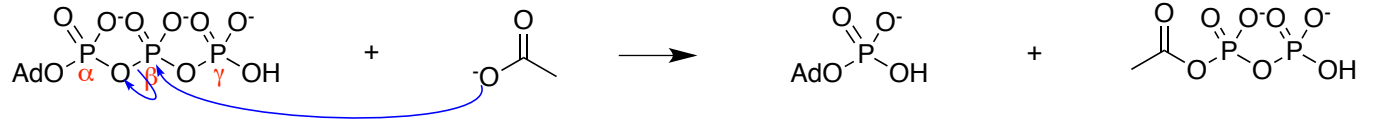
AMP



ADP



ATP



AMP and acyl pyrophosphate

β phosphorus.
on the γ phosphorus.

repel anionic
faster if encapsulated