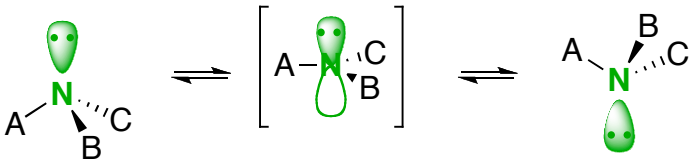
Chem 342 • Organic Chemistry II

Lecture Summary 33 - 6 May 2009

Chapter 24 - Amines

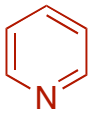
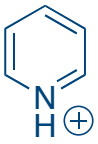
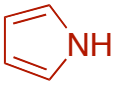
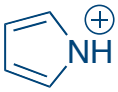
Amine Structure

Amines are sp^3-hybridized and tetrahedral with the lone pair taking up one of the four positions. Amines are inherently chiral, however, they undergo rapid inversion at room temperature. Thus, they are always racemic.



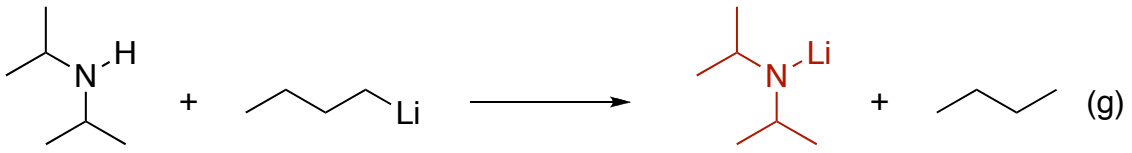
Amines Are Good Bases and Good Nucleophiles

Amines are very good bases - more basic than oxygen-containing compounds like alcohols or water. One way to measure the base strength is to look at the pK_a of the protonated amine (conjugate acid). The weaker this acid is, the stronger was the base that generated it.

amine	ammonium	pK_a (ammonium)
NH_3	$NH_4^{\oplus}$	9.26
CH_3NH_2	$CH_3NH_3^{\oplus}$	10.66
		11.27
Et_3N	$Et_3NH^{\oplus}$	11.01
$PhNH_2$	$PhNH_3^{\oplus}$	4.63
		5.24
		0.4

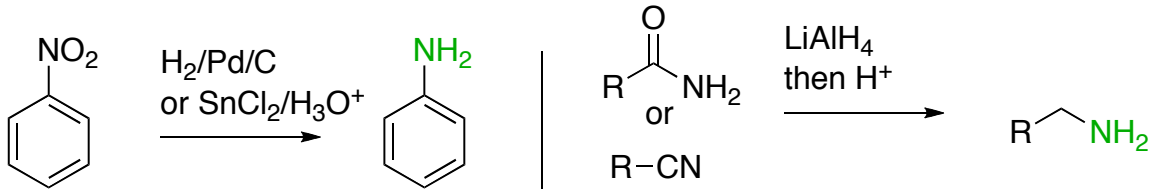
Amines are very poor acids

But they can be deprotonated with very very strong bases like bultyl lithium. For example, this is how chemists prepare LDA.



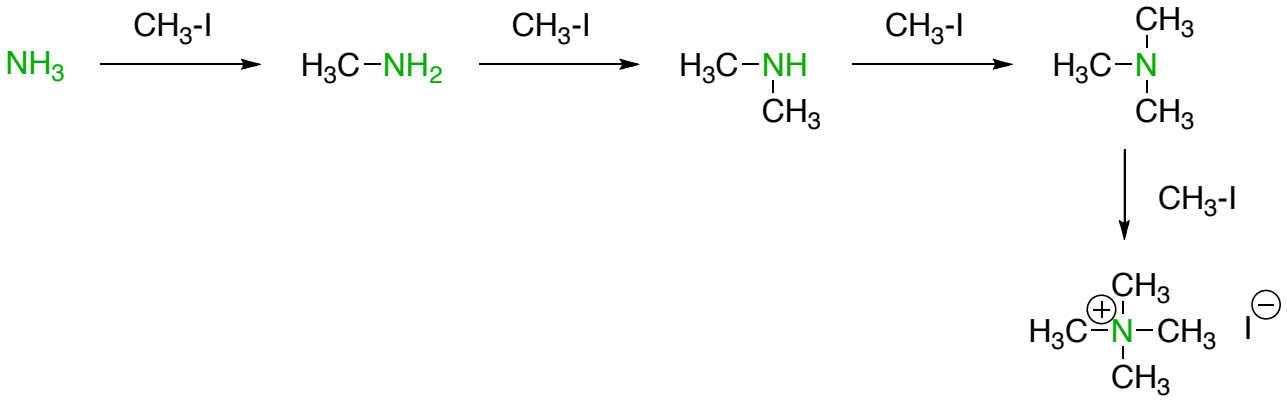
Preparation of Amines - from previous chapters

Aromatic nitro compounds can be reduced to afford anilines and amides can be reduced to form amines.



Alkylation of Amines

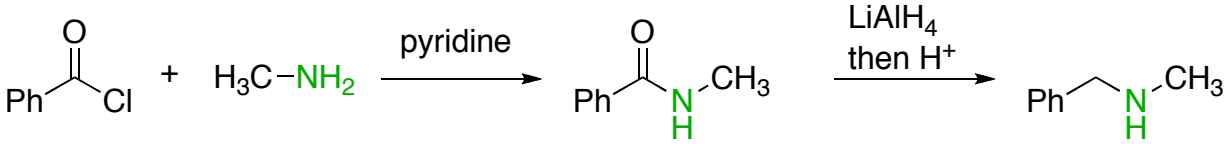
Amines are very good nucleophiles. Too good as a matter of fact. It is difficult to stop the reaction with just one alkylation.



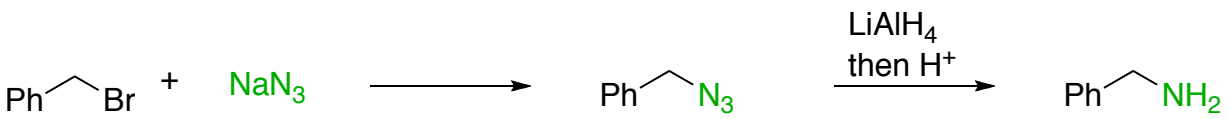
Controlling the Alkylation of Amines

In order to avoid problems with over alkylation, there are several strategies that can be undertaken.

Make Amide then Reduce

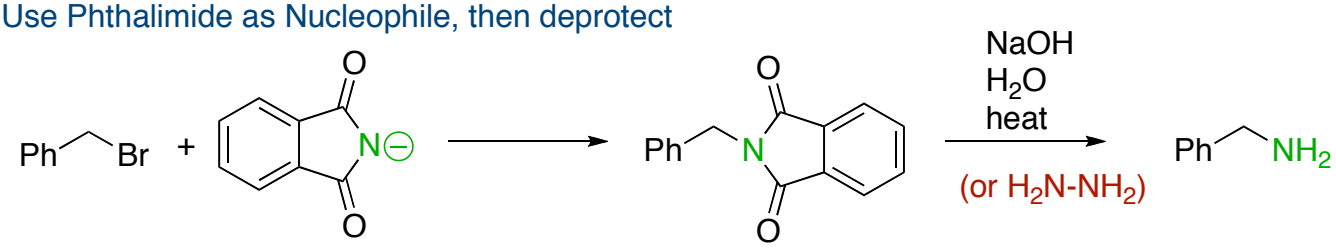


Use Azide as Nucleophile, then reduce



azides will alkylate only once

Use Phthalimide as Nucleophile, then deprotect



Reductive Amination with amine and Aldehyde or Ketone