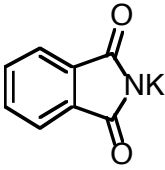
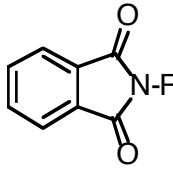

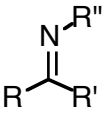
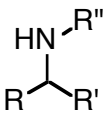
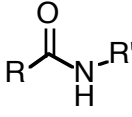
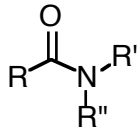
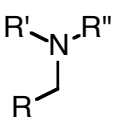
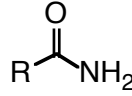
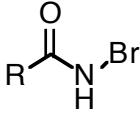


Chemistry 0320 - Organic Chemistry 2

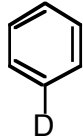
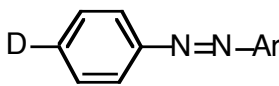
Amines

Amines are moderately strong organic bases; their pK_a is a function of relative resonance stabilization and inductive effects. Amines are also good nucleophiles and react with a variety of carbonyl compounds and carboxylic acid derivatives as well as other electrophiles.

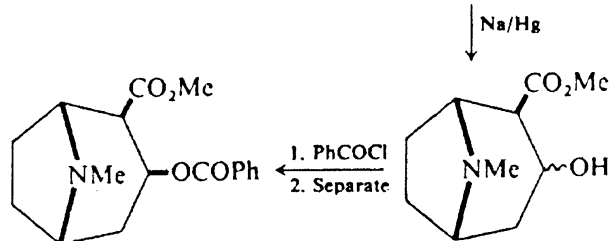
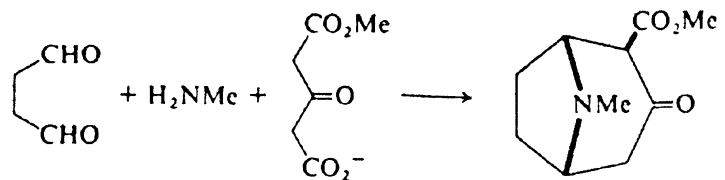
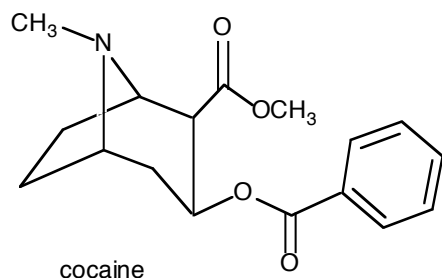
Preparations of amines:

Starting Material	Reagent	Intermediate	Reagent in 2. Step	Product
R-X R= prim. or sec. alkyl group	NH ₃	$R-NH_3^+ X^-$	RX; OH ⁻	R-NH ₂ R ₂ NH R ₃ N R ₄ N ⁺ X ⁻
R-X			H ₂ NNH ₂	R-NH ₂
R-X	NaCN	R-CN	H ₂ , Pd or LAH	R-CH ₂ NH ₂
R-X	NaN ₃	R-N ₃	H ₂ , Pd or LAH	R-NH ₂
Ar-NO ₂	H ₂ /Pd or Fe/HCl	-	-	Ar-NH ₂
	R''-NH ₂		H ₂ , Pd or NaCNBH ₃	
	1. NaH 2. R''-X		LAH	
	NaOBr		OH ⁻ , H ₂ O	R-NH ₂

Diazomethane can be generated by base treatment of N-methyl-N-nitrosourea and is a useful methylating agent for carboxylic acids. In the presence of Cu, or by heating or irradiation, diazomethane is converted to methylene carbene and cyclopropanates alkenes. A zinc carbenoid is generated in the Simmons-Smith reaction, and base treatment of chloroform provides dichloromethylene carbene for alkene cyclopropanation reactions.

Starting Material	Reagent	Intermediate	Reagent in 2. Step	Product
$R-NH_2$ $R = \text{alkyl or aryl}$	$NaNO_2, HCl$	$ \begin{array}{c} R-\overset{\oplus}{N}\equiv N^{\ominus} Cl \\ \downarrow R=\text{alkyl} \\ N_2 + R^{\oplus} + Cl^{\ominus} \end{array} $	CuX $(CuCl, CuBr, CuCN)$ KI $H_3O^{\oplus}, \text{heat}$ 	$Ar-X$ $Ar-I$ $Ar-OH$  <i>Azo compound</i>
HNR_2	$NaNO_2, HCl$	-	-	$R_2N-N=O$ <i>N-Nitroso compound</i>
$RR'NH$	$TsCl, \text{pyridine}$	-	-	$TsNRR'$
$R-CH_2\overset{\underset{ }{NH_2}}{CHR'}$	$MeI \text{ (excess)}$ OH^-, H_2O	$R-CH_2\overset{\underset{ }{NMe_3^{\oplus}}}{CHR'}$	Ag_2O, heat <i>anti elimination</i>	$R-CH=CHR'$ <i>Hofmann rule:</i> <i>the least substituted olefin is formed</i>

The Mannich reaction is often applied for the preparation of functionalized amines, both in the lab and in nature.



a mixture of diastereoisomers