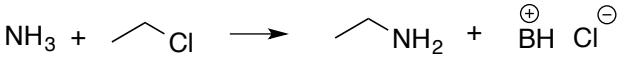
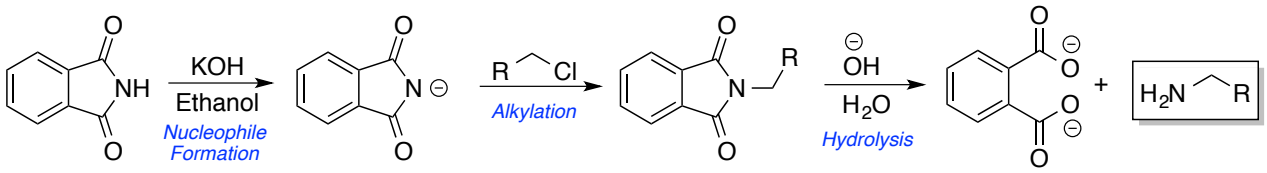
Chapter 24: Amine Reaction Summary
Preparation and Reactions of Amines

Preparation of Amines

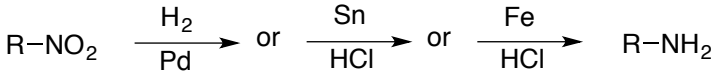
- S_N2



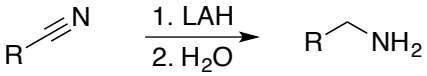
  - The reaction is plagued by the potential for polyalkylation of the amine, especially in the presence of excess alkyl chloride.
- Gabriel Amine Synthesis



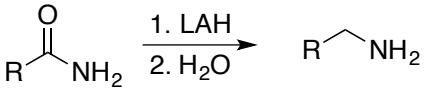
  - This reaction is an alternative to the direct S_N2 method and allows for the preparation of primary amines in good yields. Polyalkylation is not a problem.
  - Synthetically, this results in the same product as mono-alkylation of ammonia.
  - Since the alkylation step follows an S_N2 mechanism, methyl and primary alkyl halides work best. Secondary can also be used while tertiary can not.
- Reduction of $-NO_2$



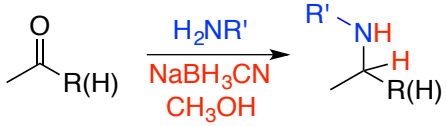
- LAH Reduction of Nitriles



- LAH Reduction of Amides



- Reductive Amination of Aldehydes and Ketones



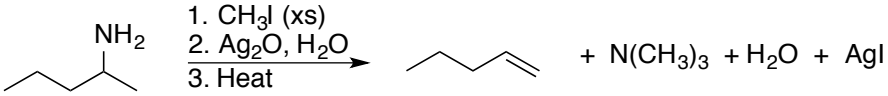
  - Reaction works with any amine that contains at least one hydrogen.
  - Aldehydes and ketones are the only carbonyl compounds that can undergo reductive amination.
  - Requires the use of a mild reducing agent (sodium cyanoborohydride) in the presence of a protic solvent (usually methanol).

The Amine Lone Pair Is Basic

- As a rule of thumb the lone pair on a nitrogen will take a proton from an acid with a pKa of 10 or less.

  - Electron donating groups on N increase its basicity.
  - Electron withdrawing groups on N decrease its basicity.
  - A lone pair that is delocalized through resonance is less basic than one that is not.

Hoffmann Elimination



- The less substituted alkene is the major product.
- Addition of the iodomethane turns the amine into a quaternary ammonium salt, which then acts as a leaving group.
- The elimination process is E2.
- The H and leaving group must be able to orient in an antiperiplanar fashion.