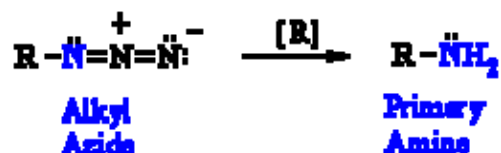


Reduction of Functional Groups that Contain Nitrogen:

- Azides
- Nitriles
- Nitro Groups
- Amides

1 Reduction of Azides



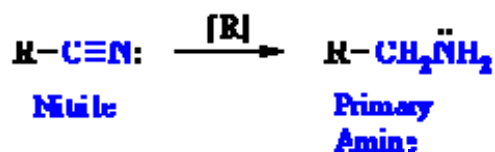
Azides are reduced to primary amines

Reagents

- lithium aluminum hydride (LiAlH₄) / ether solvent or
- catalytic hydrogenation (*e.g.* H₂/Pd)

Alkyl azides are prepared by SN2 reaction of azide ion with 1° or 2° halides

2 Reduction of Nitriles



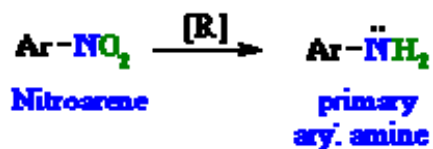
Nitriles are reduced to 1° amines

Reagents

- lithium aluminum hydride (LiAlH₄) / ether solvent
- catalytic hydrogenation (*e.g.* H₂/Pd)

Alkyl nitriles are prepared by SN2 reaction of cyanide ion with 1° or 2° halides. Aryl nitriles can also be reduced to aryl amines.

3 Reduction of Nitro Groups



Nitroarenes are reduced to primary aryl amines

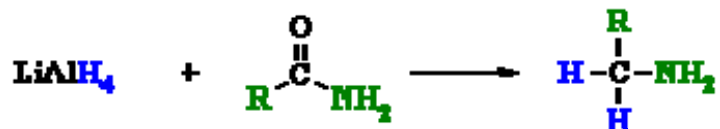
Reagents

- Fe / H⁺, Sn / H⁺
- catalytic hydrogenation (*e.g.* H₂ / Pd)

Nitroarenes are prepared by nitration of aromatic rings.

This is the most common method for synthesis of anilines (Ar-NH₂)

4 Reduction of Amides



Amides, RCONR'₂ are reduced to amines (conversion of C=O to CH₂)

Reactions usually in Et₂O or THF followed by H₃O⁺ work-ups

Amides can be reduced by LiAlH₄ but **NOT** the less reactive NaBH₄

Reagents

- LiAlH₄ / ether solvent followed by aqueous work-up.

Note that this reaction is different to that of other C=O compounds which reduce to **alcohols**

The structure of the amine depends on the substituents on the original amide:

- 1° amides → 1° amine
- 2° amides → 2° amine
- 3° amides → 3° amine