

# Amines 'Topic Tree

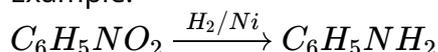


Here are some important reactions related to *Amines*:

## 1. Reduction of Nitro Compounds:

- Nitro compounds (R-NO<sub>2</sub>) are reduced to primary amines (R-NH<sub>2</sub>) using hydrogen gas and catalysts like Ni, Pt, or Pd.

- Example:



## 2. Ammonolysis of Alkyl Halides:

- Alkyl halides (R-X) react with ammonia to form primary, secondary, or tertiary amines and quaternary ammonium salts.

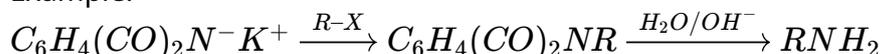
- Example:



## 3. Gabriel Phthalimide Synthesis:

- A method for preparing primary amines by reacting phthalimide with alkyl halides followed by hydrolysis.

- Example:



## 4. Hoffmann Bromamide Degradation Reaction:

- Conversion of an amide (RCONH<sub>2</sub>) into a primary amine (RNH<sub>2</sub>) by treating with bromine and aqueous sodium hydroxide.

- Example:



## 5. Reduction of Nitriles:

- Nitriles (R-C≡N) are reduced to primary amines (R-CH<sub>2</sub>NH<sub>2</sub>) using hydrogen gas and a catalyst or by lithium aluminium hydride (LiAlH<sub>4</sub>).

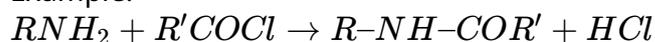
- Example:



## 6. Acylation Reaction:

- Amines react with acid chlorides or anhydrides to form amides.

- Example:



## 7. Alkylation Reaction:

- Amines react with alkyl halides to form higher amines or quaternary ammonium salts.

- Example:



## 8. Carbylamine Reaction:

- Primary amines react with chloroform (CHCl<sub>3</sub>) and alcoholic KOH to form isocyanides (R-NC), a foul-smelling compound.

- Example:



## 9. Reaction with Nitrous Acid:

- Primary aliphatic amines react with nitrous acid (HNO<sub>2</sub>) to form alcohols, and aromatic amines form diazonium salts.

- Example for aliphatic amines:  

$$RNH_2 + HNO_2 \rightarrow ROH + N_2 + H_2O$$
- Example for aromatic amines:  

$$C_6H_5NH_2 + HNO_2 \rightarrow C_6H_5N_2^+Cl^- + H_2O$$

#### 10. Hinsberg Test:

- Differentiates between primary, secondary, and tertiary amines using benzenesulfonyl chloride ( $C_6H_5SO_2Cl$ ).
- Example:  

$$RNH_2 + C_6H_5SO_2Cl \rightarrow R-SO_2-C_6H_5$$
 Primary amines form soluble sulfonamides, secondary amines form insoluble sulfonamides, and tertiary amines do not react.

#### 11. Diazotization Reaction:

- Primary aromatic amines react with nitrous acid to form diazonium salts, which are used in various substitution and coupling reactions.
- Example:  

$$C_6H_5NH_2 + NaNO_2 + HCl \xrightarrow{273-278K} C_6H_5N_2^+Cl^- + 2H_2O$$

#### 12. Sandmeyer Reaction:

- Diazonium salts react with copper(I) salts ( $CuCl$ ,  $CuBr$ ,  $CuCN$ ) to form aryl halides or nitriles.
- Example:  

$$C_6H_5N_2^+Cl^- \xrightarrow{CuCl/HCl} C_6H_5Cl + N_2$$

#### 13. Gattermann Reaction:

- Diazonium salts react with halogen acids in the presence of copper powder to form aryl halides.
- Example:  

$$C_6H_5N_2^+Cl^- + HCl + Cu \rightarrow C_6H_5Cl + N_2$$

#### 14. Coupling Reaction:

- Diazonium salts couple with phenols or aromatic amines to form azo compounds.
- Example:  

$$C_6H_5N_2^+Cl^- + C_6H_5OH \rightarrow C_6H_5-N=N-C_6H_4OH$$

#### 15. Electrophilic Substitution in Aromatic Amines:

- Aromatic amines undergo electrophilic substitution reactions, such as bromination, nitration, and sulfonation.
- Example for bromination:  

$$C_6H_5NH_2 + Br_2 \rightarrow C_6H_2Br_3NH_2(2,4,6 - tribromoaniline)$$

These reactions cover key transformations involving amines and are important for understanding their behavior in organic chemistry.