Chapter 10: Amines

10.1 Amines

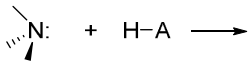
Classification

1° 2° 3° 4°

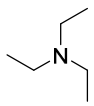
Structure and Properties of Amines

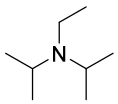
sp^3-hybridized (aliphatic amines)
highly polar

Amines are basic compounds and react with acids:

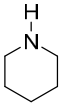


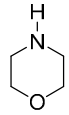
Aliphatic Amines



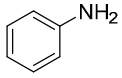


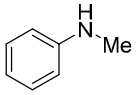
Heterocyclic Aliphatic Amines



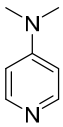


Aryl Amines

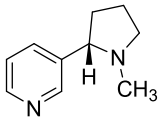




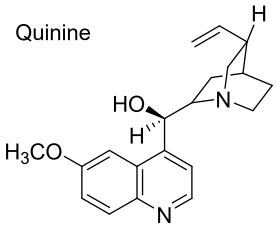
Heterocyclic Aromatic Amines



Natural Products



Nicotine



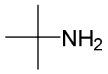
10.2 Nomenclature of Amines

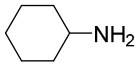
Rules:
If there are no higher-priority functional groups:
- Name the three substituents in alphabetical order and add “amine”.
- Use the prefixes “di” and “tri” if the groups are the same.
- If two or three -NH_2 groups are present use di and tri before the parent name

With unsymmetrically N-substituted secondary and tertiary amines:
- The largest organic group is the parent chain
- The location of the smaller groups are indicated by the prefix “*N*”

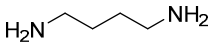
With higher-priority functional groups:
- Name -NH_2 as a substituent- “amino”

Examples:

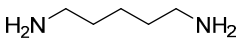




Common names

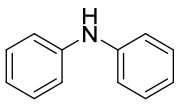


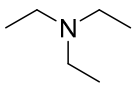
Putrescine

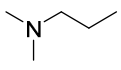


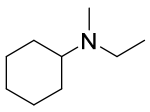
Cadaverine

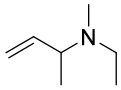
IUPAC

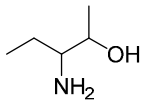


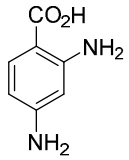






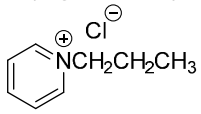


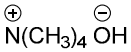




4° ammonium salts

- *Replace amine with ammonium (or pyridinum)*
- *Add the name of the anion (e.g. chloride)*

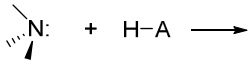




10.3 Structure and Properties of Amines

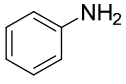
sp^3-hybridized (aliphatic amines)
highly polar

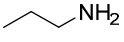
Amines are basic compounds and react with acids:



Much stronger bases than alcohols, ethers, or water

Aryl amines are weaker bases than alkyl amines due to resonance moving electrons away from the N



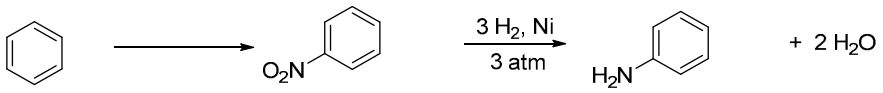


Amides ($RCONH_2$) are non-basic due to resonance

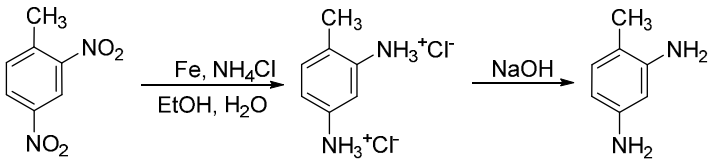
10.4 Synthesis of Arylamines

Nitration followed by reduction.

Hydrogenation:



Reduction by a metal (Fe, Zn, Sn) in presence of a proton source:



10.5 Amines as Nucleophiles