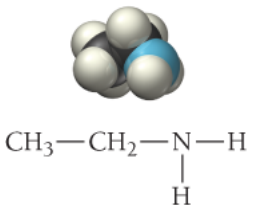
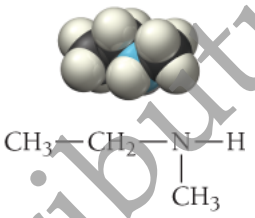
Pearson

21.13: Amines

The simplest nitrogen-containing compound is ammonia (NH_3). **Amines** are organic compounds containing nitrogen that are derived from ammonia, with one or more of the hydrogen atoms replaced by alkyl groups. Like ammonia, amines are weak bases. We systematically name amines according to the hydrocarbon groups attached to the nitrogen and assign the ending *-amine*:

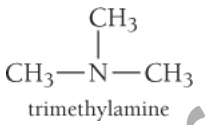


ethylamine



ethylmethylamine

Amines are most commonly known for their awful odors. When a living organism dies, the bacteria that feast on its proteins emit amines. For example, trimethylamine causes the smell of rotten fish, and cadaverine causes the smell of decaying animal flesh:



trimethylamine

cadaverine

Amine Reactions

Just as carboxylic acids act as weak acids, so amines act as weak bases:

$$RNH_2\,(aq) + H_2O\,(l) \rightleftharpoons RNH_3^+\,(aq) + OH^-\,(aq)$$

Like all bases, amines react with strong acids to form salts called ammonium salts. For example, methylamine reacts with hydrochloric acid to form methylammonium chloride:

$$CH_3NH_2\,(aq) + HCl\,(aq) \rightarrow \underset{\text{methylammonium chloride}}{CH_3NH_3^+Cl^-\,(aq)}$$

A biochemically important amine reaction is the condensation reaction between a carboxylic acid and an amine.

$$CH_3COOH\,(aq) + HNHR\,(aq) \rightarrow CH_3CONHR\,(aq) + HOH\,(l)$$

This reaction is responsible for the formation of proteins from amino acids.