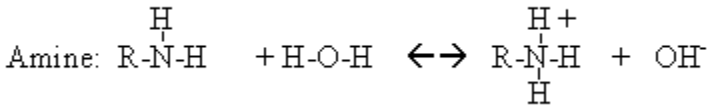
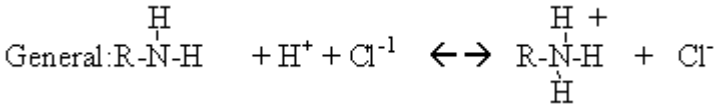
7.2 Amines as bases.

Amines are weak bases, like ammonia:

Ammonia: $NH_3 + H_2O \longleftrightarrow NH_4^+ + OH^{-1}$



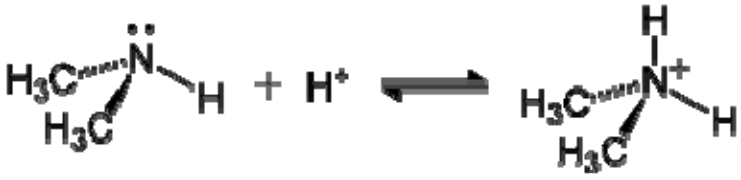
Amines undergo **neutralization** reactions with acids to form alkylammonium ions



a) $CH_3NH_2 + HCl \longleftrightarrow CH_3NH_3^+ Cl^{-1}$

Methylamine hydrochloric acid methylammonium chloride

b) dimethylamine $+ H^+ \longleftrightarrow$ dimethylammonium ion



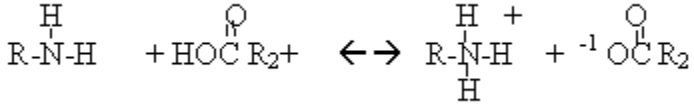
www.answers.com/topic/ammonium

Write the equation for the neutralization of trimethylamine with HCl

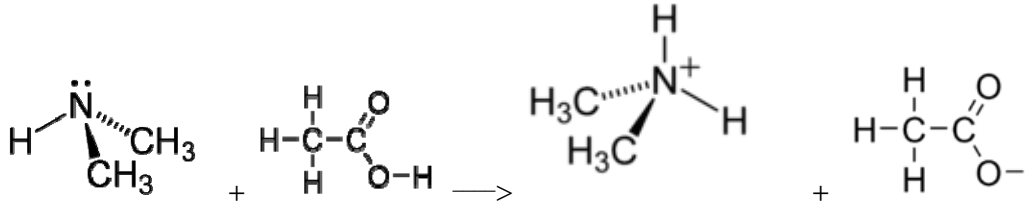
A molecule with two amine groups can react with **two** molecules of HCl or other acid.

$NH_2(CH_2)_4NH_2 + 2\ HCl \longleftrightarrow Cl^{-1}\ {}^+NH_3(CH_2)_4NH_3^+\ Cl^{-1}$

Neutralization of an amine with a carboxylic acid at room temperature



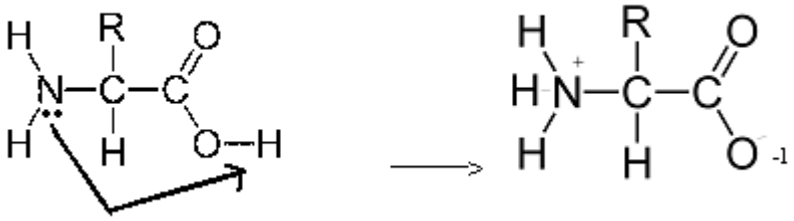
Sample problem:
Write the equation for the neutralization of acetic acid with dimethylamine.



Dimethylammonium acetate

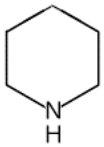
Practice problem:
Write the equation for the neutralization of trimethylamine with formic acid.

This neutralization reaction can occur in amino acids within the same molecule:

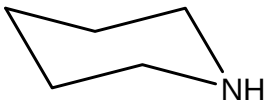


Amine groups in Rings

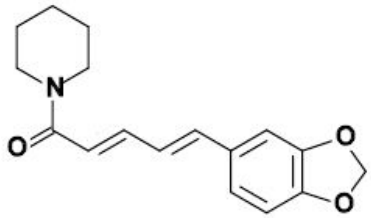
N can also exist in rings such as the 6-membered ring **piperidine.** Even though it is frequently drawn flat, it has a conformation similar to cyclohexane.



really looks like



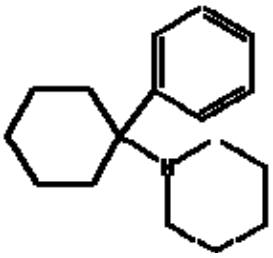
One example of a molecule containing the piperidine ring is **piperine,** the primary molecule responsible for giving black pepper its flavor.



Redraw the piperidine ring showing its actual conformation. What will the bond angle of the other two rings in the molecule be? Are the double bonds between the two ring systems in the cis or trans configuration?

PCP (ANGEL DUST)

Another example of a molecule containing a piperidine ring is **phencyclidine (a shortened version of** phenylcyclohexylpiperidine**),** better known by its street name of PCP or "angel dust". Name the 3 rings in this molecule. Redraw the molecule showing the real shape of each of the rings. Are there any chiral centers in this molecule?



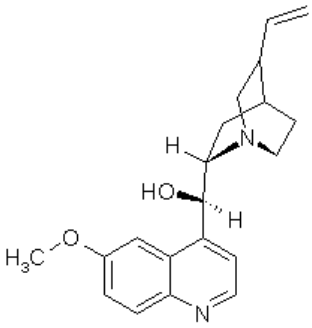
justice.gov

Phencyclidine was developed in the 1950's as an intravenous anesthetic but never was put on the market because early clinical trials found frequent adverse effects (agitation, delusions and sometimes violent behavior) occurred as patients came out from anesthesia. PCP is most typically dissolved in solution and then soaked in tobacco or marijuana to be smoked. The effects of phencyclidine tend to be very erratic among individuals and although a few people enjoy the hallucinations of strength, power and invulnerability, many people find the drug causes anxiety attacks, paranoia, suicidal thoughts and violent hostility. PCP first became available on the streets in the 1960's. According to the 2004 Monitoring the Future Survey, 1.7% of high school seniors have tried PCP at least once. Results of the 2003 National Survey on Drug Use and Health indicated that 3.0% of the population over 12 have tried PCP at least once.

Quinine

A third medically important molecule containing the piperidine ring is **quinine,** the first drug used to treat malaria. It is isolated from the bark of the Cinchona tree found in the Andes. It is added at 83 ppm (parts per million) to tonic water and is responsible for the bitter taste of tonic water. (This concentration is much less than that needed to treat malaria. You would have to drink a LOT of tonic water to treat malaria!) Quinine at therapeutic doses is *extremely* bitter and can cause nausea and vomiting; other adverse effects include excessive sweating, tinnitus (ringing of the ears), blurred vision, headache, and dizziness. This assemblage of adverse effects is referred to as **cinchonism.** With numerous adverse effects, quinine has largely been replaced by other

drugs for the treatment of malaria. It was marketed for treating nocturnal leg cramps until 1994 before being banned by the FDA. It has a rather complex structure with multiple rings and several chiral centers. Label the chiral centers.



Quinine

wikipedia.org/wiki/Image:Tonic_water_uv.jpg