USE THE STRATEGY

PROBLEM 23 ♦

Give each of the following a systematic name and indicate whether each is a primary, secondary, or tertiary alcohol:

a. $CH_3CH_2CH_2CH_2CH_2OH$

b. $CH_3C(CH_3)(OH)CH_2CH_2CH_2Cl$

c. $CH_3CH(CH_3)CH_2CH(OH)CH_2CH_3$

d. $CH_3CH(CH_3)CH_2CH(OH)CH_2CH(OH)CH_2CH_3$

PROBLEM 24

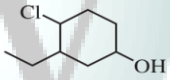
Draw the structures of a homologous series of alcohols that have from one to six carbons and give each of them a common name and a systematic name.

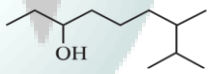
PROBLEM 25 ♦

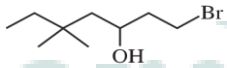
Write condensed and skeletal structures for all the tertiary alcohols with molecular formula $C_6H_{14}O$ and give each a systematic name.

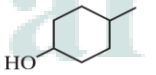
PROBLEM 26 ♦

Give each of the following a systematic name and indicate whether each is a primary, secondary, or tertiary alcohol:

a. 

b. 

c. 

d. 

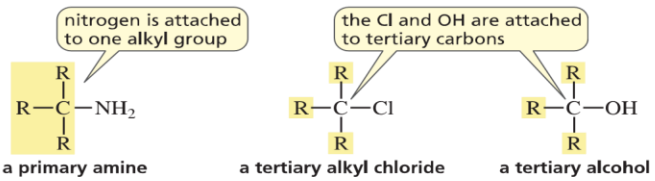
THE NOMENCLATURE OF AMINES

An **amine** is a compound in which one or more hydrogens of ammonia have been replaced by alkyl groups. Amines are classified as **primary, secondary,** and **tertiary,** depending on how many alkyl groups are attached to the nitrogen.

- A **primary amine** has one alkyl group attached to the nitrogen.
- A **secondary amine** has two alkyl groups attached to the nitrogen.
- A **tertiary amine** has three alkyl groups attached to the nitrogen.

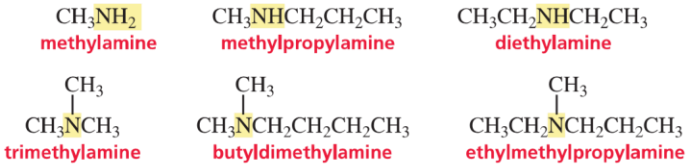
The number of alkyl groups attached to the nitrogen determines whether an amine is primary, secondary, or tertiary.

Be sure to note that the number of alkyl groups *attached to the nitrogen* determines whether an amine is primary, secondary, or tertiary. In contrast, whether the X (halogen) or OH group is *attached to a primary, secondary, or tertiary carbon* determines whether an alkyl halide or alcohol is primary, secondary, or tertiary (Sections 3.4 and 3.6).



Common Names

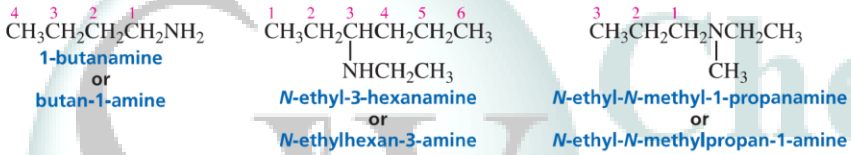
The common name of an amine consists of the names of the alkyl groups bonded to the nitrogen, in alphabetical order, followed by "amine." The entire name is written as one word (unlike the common names of alcohols, ethers, and alkyl halides, in which "alcohol," "ether," and "halide" are separate words).



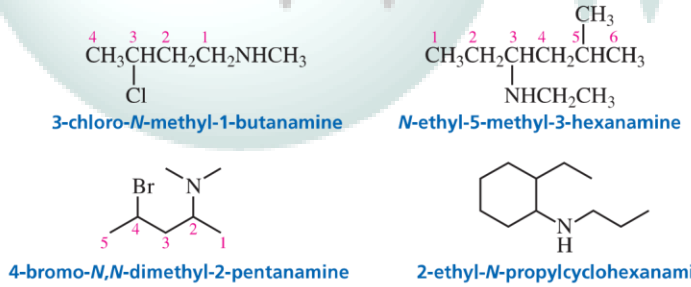
Systematic Names

LEARN THE STRATEGY

The IUPAC system uses the suffix "amine" to denote the amine functional group. The "e" at the end of the name of the parent hydrocarbon is replaced by "amine"—similar to the way alcohols are named. Also similar to the way alcohols are named, a number identifies the carbon to which the nitrogen is attached, and the number can appear before the name of the parent hydrocarbon or before "amine." The name of any alkyl group bonded to nitrogen is preceded by an "*N*" (in italics) to indicate that the group is bonded to a nitrogen rather than to a carbon.



The substituents—regardless of whether they are attached to the nitrogen or to the parent hydrocarbon—are listed in alphabetical order, and then a number or an "*N*" is assigned to each one. The chain is numbered in the direction that gives the functional group suffix the lowest number.



Nitrogen compounds with four alkyl groups attached to the nitrogen—thereby giving the nitrogen a positive formal charge—are called **quaternary ammonium salts.** Their names consist of the names of the alkyl groups in alphabetical order, followed by "ammonium" (all one word) and then the name of the accompanying anion as a separate word.