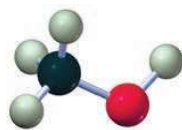
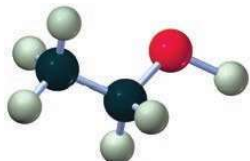


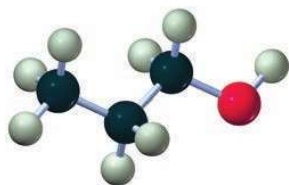
3.6 THE NOMENCLATURE OF ALCOHOLS



methyl alcohol



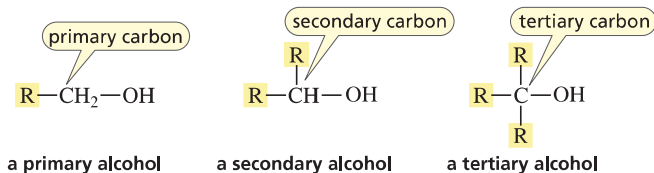
ethyl alcohol



propyl alcohol

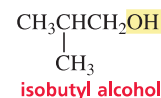
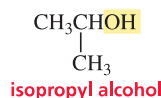
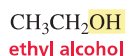
An **alcohol** is a compound in which a hydrogen of an alkane has been replaced by an OH group. Alcohols are classified in the same way as alkyl halides are classified.

- A **primary alcohol** has an OH group attached to a primary carbon.
- A **secondary alcohol** has an OH group attached to a secondary carbon.
- A **tertiary alcohol** has an OH group attached to a tertiary carbon.



Common Names

The common name of an alcohol consists of the name of the alkyl group to which the OH group is attached, followed by the word “alcohol.”

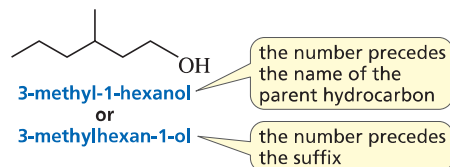
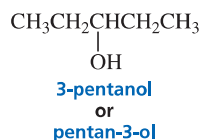


Systematic Names

The **functional group** is the center of reactivity in an organic molecule. The IUPAC system uses *suffixes* to denote certain functional groups. The functional group of an alcohol is the OH group, which is denoted by the suffix “ol.” Thus, the systematic name of an alcohol is obtained by replacing the “e” at the end of the name of the parent hydrocarbon with “ol.”



When necessary, the position of the functional group is indicated by a number immediately preceding the name of the parent hydrocarbon or immediately preceding the suffix. The most recently approved IUPAC names are those with the number immediately preceding the suffix. However, the chemical community has been slow to adopt this change, so the names most likely to appear in the literature, on reagent bottles, and on standardized tests are those with the number preceding the name of the parent hydrocarbon. They are also the ones that appear most often in this book. Because they are not the most recently approved IUPAC names, they will be referred to as systematic names.

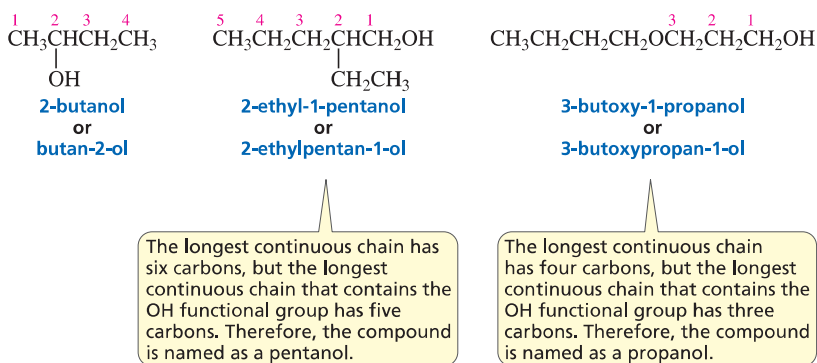


The following rules are used to name a compound that has a functional group suffix:

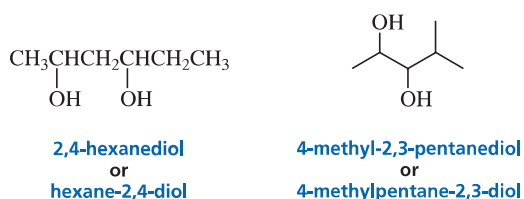
1. The parent hydrocarbon is the longest continuous chain that *contains the functional group*.
2. The parent hydrocarbon is numbered in the direction that gives the *functional group suffix the lowest possible number*.

LEARN THE STRATEGY

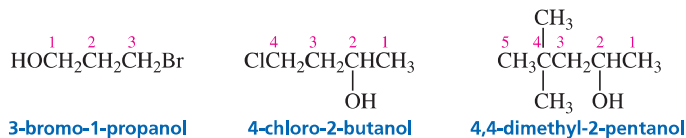
The carbon to which the OH group is attached determines whether an alcohol is primary, secondary, or tertiary.



3. If there are two OH groups, the suffix “diol” is added to the name of the parent hydrocarbon.



4. If there is a functional group suffix and a substituent, the functional group suffix gets the lowest possible number.

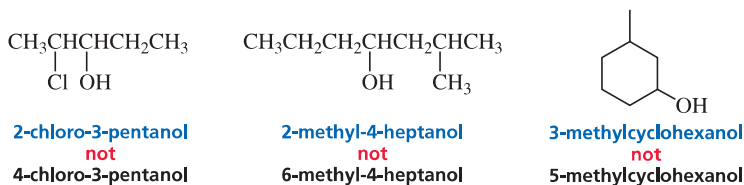


When there is only a substituent, the substituent gets the lowest possible number.

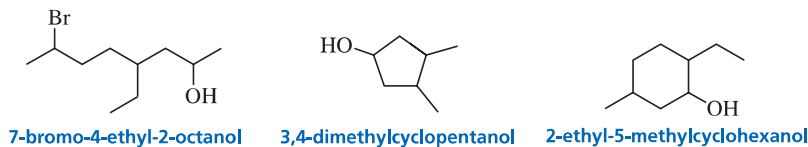
When there is only a functional group, the functional group suffix gets the lowest possible number.

When there is both a functional group and a substituent, the functional group suffix gets the lowest possible number.

5. If counting in either direction gives the same number for the functional group suffix, then the chain is numbered in the direction that gives a substituent the lowest possible number. Notice that a number is not needed to designate the position of a functional group suffix in a cyclic compound, because it is assumed to be at the 1 position.



6. If there is more than one substituent, the substituents are listed in alphabetical order.



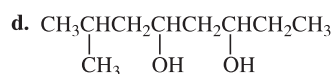
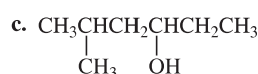
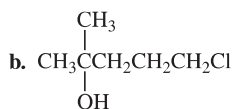
Remember that the name of a substituent is stated *before* the name of the parent hydrocarbon and a functional group suffix is stated *after* the name of the parent hydrocarbon.



USE THE STRATEGY

PROBLEM 23 ♦

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



PROBLEM 24

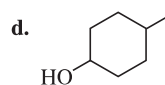
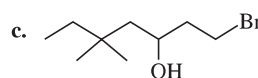
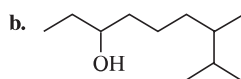
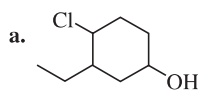
Draw the structures of a homologous series of alcohols that have from one to six carbons and give each of them a common name and a systematic name.

PROBLEM 25 ♦

Write condensed and skeletal structures for all the tertiary alcohols with molecular formula $\text{C}_6\text{H}_{14}\text{O}$ 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:



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

3.7 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.



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).

