TABLE 12.2 IUPAC Names for the First Ten Continuous-Chain Alkanes*

Molecular Formula	IUPAC Prefix	IUPAC Name	Condensed Structural Formula
CH_4	meth-	methane	CH_4
C_2H_6	eth-	ethane	$CH_3—CH_3$
C_3H_8	prop-	propane	$CH_3—CH_2—CH_3$
C_4H_{10}	but-	butane	$CH_3—CH_2—CH_2—CH_3$
C_5H_{12}	pent-	pentane	$CH_3—CH_2—CH_2—CH_2—CH_3$
C_6H_{14}	hex-	hexane	$CH_3—CH_2—CH_2—CH_2—CH_2—CH_3$
C_7H_{16}	hept-	heptane	$CH_3—CH_2—CH_2—CH_2—CH_2—CH_2—CH_3$
C_8H_{18}	oct-	octane	$CH_3—CH_2—CH_2—CH_2—CH_2—CH_2—CH_2—CH_3$
C_9H_{20}	non-	nonane	$CH_3—CH_2—CH_2—CH_2—CH_2—CH_2—CH_2—CH_2—CH_3$
$C_{10}H_{22}$	dec-	decane	$CH_3—CH_2—CH_2—CH_2—CH_2—CH_2—CH_2—CH_2—CH_2—CH_3$

*The IUPAC naming system also includes prefixes for naming continuous-chain alkanes that have more than 10 carbon atoms, but we will not consider them in this text.

carbon atoms. Note that *substituent* is a general term that applies to carbon-chain attachments in all organic molecules, not just alkanes.

For branched-chain alkanes, the substituents are specifically called *alkyl groups.* An **alkyl group** *is the group of atoms that would be obtained by removing a hydrogen atom from an alkane.*

The two most commonly encountered alkyl groups are the two simplest: the one-carbon and two-carbon alkyl groups. Their formulas and names are

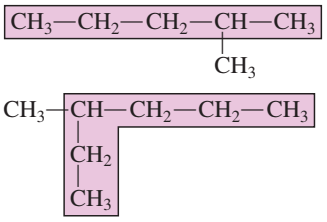
The extra long bond in these formulas (on the left) denotes the point of attachment to the carbon chain. Note that alkyl groups do not lead a stable, independent existence; that is, they are not molecules. They are always found attached to another entity (usually a carbon chain).

Alkyl groups are named by taking the stem of the name of the alkane that contains the same number of carbon atoms and adding the ending *-yl.* Table 12.3 gives the names for small continuous-chain alkyl groups.

We are now ready for the IUPAC rules for naming branched-chain alkanes.

Rule 1: *Identify the longest continuous carbon chain (the parent chain), which may or may not be shown in a straight line, and name the chain.*

An additional guideline for identifying the longest continuous carbon chain: If two different carbon chains in a molecule have the same largest number of carbon atoms, select as the parent chain the one with the larger number of substituents (alkyl groups) attached to the chain.



The parent chain name is *pentane,* because it has five carbon atoms.

The parent chain name is *hexane,* because it has six carbon atoms.

TABLE 12.3 Names for the First Six Continuous-Chain Alkyl Groups

The ending *-yl,* as in meth*yl,* eth*yl,* prop*yl,* and but*yl,* appears in the names of all alkyl groups.

Number of Carbons	Structural Formula	Stem of Alkane Name	Suffix	Alkyl Group Name
1	—CH_3	meth-	−yl	methyl
2	—CH_2—CH_3	eth-	−yl	ethyl
3	—CH_2—CH_2—CH_3	prop-	−yl	propyl
4	—CH_2—CH_2—CH_2—CH_3	but-	−yl	butyl
5	—CH_2—CH_2—CH_2—CH_2—CH_3	pent-	−yl	pentyl
6	—CH_2—CH_2—CH_2—CH_2—CH_2—CH_3	hex-	−yl	hexyl