

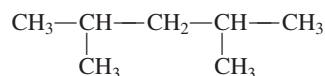
## Practice Exercise 12.1

Determine whether the members of each of the following pairs of structural formulas represent (1) different conformations of the same molecule, (2) different compounds that are constitutional isomers, or (3) different compounds that are not constitutional isomers.

- a.  $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—CH}_3$  and  $\begin{array}{c} \text{CH}_3\text{—CH}_2 \\ | \\ \text{CH}_2\text{—CH}_2 \\ | \\ \text{CH}_3 \end{array}$
- b.  $\begin{array}{c} \text{CH}_3\text{—CH—CH}_2\text{—CH}_3 \\ | \\ \text{CH}_3 \end{array}$  and  $\begin{array}{c} \text{CH}_3\text{—CH—CH}_2 \\ | \quad | \\ \text{CH}_3 \quad \text{CH}_3 \end{array}$
- c.  $\begin{array}{c} \text{CH}_3\text{—CH—CH}_2\text{—CH}_3 \\ | \\ \text{CH}_3 \end{array}$  and  $\begin{array}{c} \text{CH}_2\text{—CH}_2\text{—CH}_2 \\ | \quad \quad | \\ \text{CH}_3 \quad \quad \text{CH}_3 \end{array}$

**Answers:** a. Different conformations; b. Different conformations; c. Constitutional isomers

The condensed structural formulas for branched-chain alkanes can be further condensed to give linear (straight-line) condensed structural formulas. The linear condensed structural formula for the alkane



is



Groups in parentheses in such formulas are understood to be attached to the carbon atom that *precedes* the group in the structural formula, unless the parenthesized group starts the formula. In that case the group is attached to the carbon atom that *follows*. Writing structural formulas in this format is done primarily to reduce the vertical space that the structural formula takes.

## 12.8 IUPAC NOMENCLATURE FOR ALKANES

When relatively few organic compounds were known, chemists arbitrarily named them using what today are called *common names*. These common names gave no information about the structures of the compounds they described. However, as more organic compounds became known, this nonsystematic approach to naming compounds became unwieldy.

Today, formal systematic rules exist for generating names for organic compounds. These rules, which were formulated and are updated periodically by the International Union of Pure and Applied Chemistry (IUPAC), are known as *IUPAC rules*. The advantage of the IUPAC naming system is that it assigns each compound a name that not only identifies it but also enables one to draw its structural formula.

IUPAC names for the first ten *continuous-chain* alkanes are given in Table 12.2. Note that all of these names end in *-ane*, the characteristic ending for all alkane names. Note also that beginning with the five-carbon alkane, Greek numerical prefixes are used to denote the actual number of carbon atoms in the continuous chain.

To name *branched-chain* alkanes, we must be able to name the branch or branches that are attached to the main carbon chain. These branches are formally called substituents. A **substituent** is an atom or group of atoms attached to a chain (or ring) of

IUPAC is pronounced “eye-you-pack.”

Continuous-chain alkanes are also frequently called *straight-chain alkanes* and *normal-chain alkanes*.

You need to memorize the prefixes in column two of Table 12.2. This is the way to count from 1 to 10 in “organic chemistry language.”