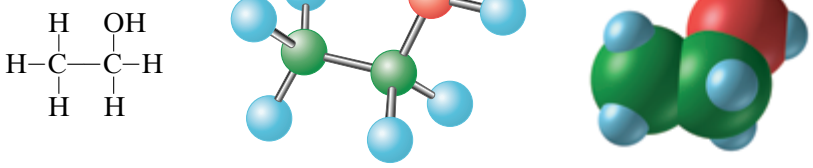


Ball-and-stick model

Space-filling model

FIGURE 4 The structure of ethanol can be represented in different ways. Ball-and-stick and space-filling models represent the three-dimensional shape of the molecule.

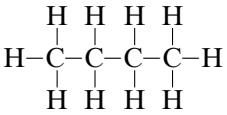
Remember that the structural formula does not accurately show the three-dimensional shape of the molecule. Three-dimensional shape is depicted with drawings or models, as shown for ethanol in **Figure 4.**

Isomers

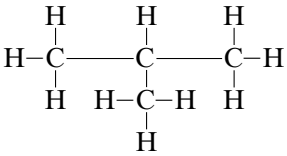
You have learned that isomers are compounds that have the same molecular formula but different structural formulas. Isomers can be further classified by structure and geometry.

Structural Isomers

Structural isomers, *also called "constitutional isomers," are isomers in which the atoms are bonded together in different orders.* For example, the atoms of the molecular formula C_4H_{10} can be arranged in two different ways.



butane



methylpropane

Notice that the formula for butane shows a continuous chain of four carbon atoms. The chain may be bent or twisted, but it is continuous. The formula of methylpropane shows a continuous chain of three carbon atoms, with the fourth carbon atom attached to the second carbon atom of the chain.

Structural isomers can have different physical or chemical properties. For example, butane and methylpropane have different melting points, boiling points, and densities, as shown in **Table 1.**

TABLE 1 ***Physical Properties of the Structural Isomers Butane and 2-Methylpropane***

	Melting point (°C)	Boiling point (°C)	Density at 20°C (g/mL)
butane	–138.4	–0.5	0.5788
2-methylpropane	–159.4	–11.633	0.549

extension

Chemical Content

Go to **go.hrw.com** for another version of this content. See the chapters "Carbon and Hydrocarbons" and "Other Organic Compounds."

Keyword: HC6ORGX