

Chapter 29

CRITICAL THINKING/PROBLEM SOLVINGISOMERISM

The existence of two or more substances with the same molecular formula but different structural formulas is called isomerism. Three basic types of isomerism occur:

1. Structural isomers have the same molecular formulas but different arrangements of their atoms. For example, $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_3$ (butane) and $\text{CH}_3\text{-CH(CH}_3\text{)-CH}_3$ (methylpropane)



are structural isomers of C_4H_{10} . Functional isomers are similar to structural isomers, but they contain one or more functional groups. $\text{CH}_3\text{-CH}_2\text{-OH}$ (ethanol) and $\text{CH}_3\text{-O-CH}_3$ (methoxymethane) are examples.

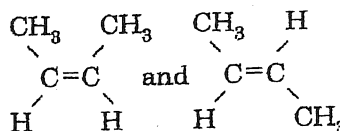
2. Positional isomers differ in the position of double or triple bonds or of substituted atoms.

$\text{CH}_2=\text{CH-CH}_2\text{-CH}_2\text{-CH}_3$ and $\text{CH}_3\text{-CH=CH-CH}_2\text{-CH}_3$ are examples of the first situation. $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$ and $\text{CH}_3\text{-CH(OH)-CH}_3$

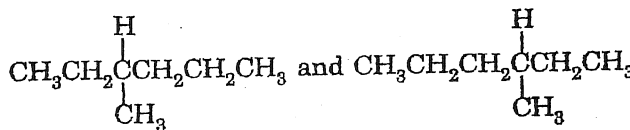


are examples of the second.

3. Stereoisomers exist when the atoms are bonded in the same sequence but differ in their arrangement in space. Geometric isomers occur when atoms are arranged differently around a double bond.



named *cis*-2-butene and *trans*-2-butene, respectively, are examples. Optical isomers occur when a single carbon atom is bonded to four different kinds of atoms or groups of atoms. One of the optically active isomers rotates plane-polarized light clockwise, the other does so counterclockwise. Examples of such isomers are



1. Draw and name all possible structural and functional isomers for each of the following:

a. C_5H_{12}



b. $\text{C}_5\text{H}_{11}\text{OH}$ (keep -OH together as the hydroxyl radical.)

2. Look at the structures you drew in response to question 1. Write the letter O beside those that exist as optical isomers.

Draw structural formulas of the optical isomers of $\text{CH}_3\text{CHBrCH}_2\text{CH}_3$.