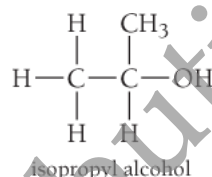
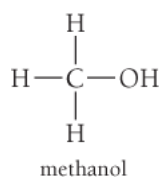


21.8: Functional Groups

Most other families of organic compounds are hydrocarbons with a **functional group**—a characteristic atom or group of atoms—inserted into the hydrocarbon. A group of organic compounds that all have the same functional group is a *family*. For example, the members of the family of alcohols each have an —OH functional group and the general formula R—OH, where R represents a hydrocarbon group. (That is, we refer to the hydrocarbon group as an “R group.”) Some specific examples include methanol and isopropyl alcohol (also known as rubbing alcohol):



The presence of a functional group in a hydrocarbon alters the properties of the compound significantly. For example, methane is a nonpolar gas. By contrast, methanol—methane with an —OH group substituted for one of the hydrogen atoms—is a polar, hydrogen-bonded liquid at room temperature. Although each member of a family is unique and different, their common functional group causes some similarities in both their physical and chemical properties. Table 21.10 lists some common functional groups, their general formulas, and an example of each.

Table 21.10 Some Common Functional Groups

Family	General Formula*	Condensed General Formula	Example	Name
Alcohols	R—OH	ROH	CH ₃ CH ₂ OH	ethanol (ethyl alcohol)
Ethers	R—O—R	ROR	CH ₃ OCH ₃	dimethyl ether
Aldehydes	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$	RCHO	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$	ethanal (acetaldehyde)
Ketones	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{R}$	RCOR	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$	propanone (acetone)
Carboxylic acids	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$	RCOOH	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$	ethanoic acid (acetic acid)
Esters	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OR}$	RCOOR	$\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{OCH}_3$	methyl acetate
Amines	$\text{R}-\overset{\text{R}}{\underset{ }{\text{N}}}-\text{R}$	R ₃ N	$\text{CH}_3\text{CH}_2-\overset{\text{H}}{\underset{ }{\text{N}}}-\text{H}$	ethylamine

*In ethers, ketones, esters, and amines, the R groups may be the same or different.

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