

**Table 19.1 Classes of Organic Compounds**

Class of compound	General formula*	IUPAC name**	Molecular formula	Condensed structural formula	Structural formula
Alkane	RH	Ethane (Ethane)	C <sub>2</sub> H <sub>6</sub>	CH <sub>3</sub> CH <sub>3</sub>	$\begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{H}-\text{C}-\text{C}-\text{H} \\   \quad   \\ \text{H} \quad \text{H} \end{array}$
Alkene	R-CH=CH <sub>2</sub>	Ethene (Ethylene)	C <sub>2</sub> H <sub>4</sub>	H <sub>2</sub> C=CH <sub>2</sub>	$\begin{array}{c} \text{H} \quad \quad \text{H} \\ \diagdown \quad \diagup \\ \text{C}=\text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \quad \text{H} \end{array}$
Alkyne	R-C≡C-H	Ethyne (Acetylene)	C <sub>2</sub> H <sub>2</sub>	HC≡CH	$\text{H}-\text{C}\equiv\text{C}-\text{H}$
Alkyl halide	RX	Chloroethane (Ethyl chloride)	C <sub>2</sub> H <sub>5</sub> Cl	CH <sub>3</sub> CH <sub>2</sub> Cl	$\begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{H}-\text{C}-\text{C}-\text{Cl} \\   \quad   \\ \text{H} \quad \text{H} \end{array}$
Alcohol	ROH	Ethanol (Ethyl alcohol)	C <sub>2</sub> H <sub>6</sub> O	CH <sub>3</sub> CH <sub>2</sub> OH	$\begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{H}-\text{C}-\text{C}-\text{OH} \\   \quad   \\ \text{H} \quad \text{H} \end{array}$
Ether	R-O-R	Methoxymethane (Dimethyl ether)	C <sub>2</sub> H <sub>6</sub> O	CH <sub>3</sub> OCH <sub>3</sub>	$\begin{array}{c} \text{H} \quad \quad \text{H} \\   \quad \quad   \\ \text{H}-\text{C}-\text{O}-\text{C}-\text{H} \\   \quad \quad   \\ \text{H} \quad \quad \text{H} \end{array}$
Aldehyde	$\begin{array}{c} \text{R}-\text{C}=\text{O} \\   \\ \text{H} \end{array}$	Ethanal (Acetaldehyde)	C <sub>2</sub> H <sub>4</sub> O	CH <sub>3</sub> CHO	$\begin{array}{c} \text{H} \quad \quad \text{H} \\   \quad \quad   \\ \text{H}-\text{C}-\text{C}-\text{H} \\   \quad \quad    \\ \text{H} \quad \quad \text{O} \end{array}$
Ketone	$\begin{array}{c} \text{R}-\text{C}-\text{R} \\    \\ \text{O} \end{array}$	Propanone (Dimethyl ketone)	C <sub>3</sub> H <sub>6</sub> O	CH <sub>3</sub> COCH <sub>3</sub>	$\begin{array}{c} \text{H} \quad \quad \text{H} \quad \quad \text{H} \\   \quad \quad   \quad \quad   \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\   \quad \quad    \quad \quad   \\ \text{H} \quad \quad \text{O} \quad \quad \text{H} \end{array}$
Carboxylic acid	$\begin{array}{c} \text{R}-\text{C}-\text{OH} \\    \\ \text{O} \end{array}$	Ethanoic acid (Acetic acid)	C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>	CH <sub>3</sub> COOH	$\begin{array}{c} \text{H} \quad \quad \text{H} \\   \quad \quad   \\ \text{H}-\text{C}-\text{C}-\text{OH} \\   \quad \quad    \\ \text{H} \quad \quad \text{O} \end{array}$
Ester	$\begin{array}{c} \text{R}-\text{C}-\text{OR} \\    \\ \text{O} \end{array}$	Methyl ethanoate (Methyl acetate)	C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>	CH <sub>3</sub> COOCH <sub>3</sub>	$\begin{array}{c} \text{H} \quad \quad \text{H} \quad \quad \text{H} \\   \quad \quad   \quad \quad   \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{C}-\text{H} \\   \quad \quad    \quad \quad   \\ \text{H} \quad \quad \text{O} \quad \quad \text{H} \end{array}$
Amide	$\begin{array}{c} \text{R}-\text{C}-\text{NH}_2 \\    \\ \text{O} \end{array}$	Ethanamide (Acetamide)	C <sub>2</sub> H <sub>5</sub> ON	CH <sub>3</sub> CONH <sub>2</sub>	$\begin{array}{c} \text{H} \quad \quad \text{H} \\   \quad \quad   \\ \text{H}-\text{C}-\text{C}-\text{N} \\   \quad \quad    \quad \quad \diagup \quad \diagdown \\ \text{H} \quad \quad \text{O} \quad \quad \text{H} \quad \quad \text{H} \end{array}$
Amine	R-CH <sub>2</sub> -NH <sub>2</sub>	Aminoethane (Ethylamine)	C <sub>2</sub> H <sub>7</sub> N	CH <sub>3</sub> CH <sub>2</sub> NH <sub>2</sub>	$\begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{H}-\text{C}-\text{C}-\text{N}-\text{H} \\   \quad   \\ \text{H} \quad \text{H} \end{array}$

\* The letter R is used to indicate any of the many possible alkyl groups. \*\* Class name ending in *italic*. \*\*\* Common name in parentheses.

**TABLE 19.2 | Important Functional Groups in Biochemistry**

Biochemical class	Functional groups important to the biochemical		
Carbohydrates	$\begin{array}{c} \text{R}-\text{C}=\text{O} \\   \\ \text{H} \end{array}$ aldehyde	$\begin{array}{c} \text{R}-\text{C}-\text{R} \\    \\ \text{O} \end{array}$ ketone	ROH alcohol
Fatty acids	$\begin{array}{c} \text{R}-\text{C}-\text{OH} \\    \\ \text{O} \end{array}$ carboxylic acid		
Proteins	$\begin{array}{c} \text{R}-\text{C}-\text{OH} \\    \\ \text{O} \end{array}$ carboxylic acid		RCH <sub>2</sub> NH <sub>2</sub> amine
Nucleic acids	ROH alcohol	$\left[ \begin{array}{c} \text{H}_3\text{PO}_4 \\ \text{phosphoric acid} \end{array} \right]$	

**TABLE 19.3 | Names, Formulas, and Physical Properties of Straight-Chain Alkanes**

Name	Molecular formula C <sub>n</sub> H <sub>2n+2</sub>	Condensed structural formula	Boiling point (°C)	Melting point (°C)
Methane	CH <sub>4</sub>	CH <sub>4</sub>	-161	-183
Ethane	C <sub>2</sub> H <sub>6</sub>	CH <sub>3</sub> CH <sub>3</sub>	-89	-172
Propane	C <sub>3</sub> H <sub>8</sub>	CH <sub>3</sub> CH <sub>2</sub> CH <sub>3</sub>	-42	-187
Butane	C <sub>4</sub> H <sub>10</sub>	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	-0.6	-135
Pentane	C <sub>5</sub> H <sub>12</sub>	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	36	-130
Hexane	C <sub>6</sub> H <sub>14</sub>	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	69	-95
Heptane	C <sub>7</sub> H <sub>16</sub>	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	98	-90
Octane	C <sub>8</sub> H <sub>18</sub>	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	125	-57
Nonane	C <sub>9</sub> H <sub>20</sub>	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	151	-54
Decane	C <sub>10</sub> H <sub>22</sub>	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	174	-30

**TABLE 19.4 | Names and Formulas of Selected Alkyl Groups**

Formula	Name	Formula	Name
CH <sub>3</sub> —	methyl	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3\text{CH}- \end{array}$	isopropyl
CH <sub>3</sub> CH <sub>2</sub> —	ethyl	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3\text{CHCH}_2- \end{array}$	isobutyl
CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> —	propyl	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3\text{CH}_2\text{CH}- \end{array}$	sec-butyl (secondary butyl)
CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> —	butyl	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3\text{C}- \\   \\ \text{CH}_3 \end{array}$	tert-butyl or t-butyl (tertiary butyl)
CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> CH <sub>2</sub> —	pentyl		
CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> CH <sub>2</sub> —	hexyl		
CH <sub>3</sub> (CH <sub>2</sub> ) <sub>5</sub> CH <sub>2</sub> —	heptyl		
CH <sub>3</sub> (CH <sub>2</sub> ) <sub>6</sub> CH <sub>2</sub> —	octyl		
CH <sub>3</sub> (CH <sub>2</sub> ) <sub>7</sub> CH <sub>2</sub> —	nonyl		
CH <sub>3</sub> (CH <sub>2</sub> ) <sub>8</sub> CH <sub>2</sub> —	decyl		