

4.2 Alkanes

- Acyclic (no rings) = alkane

$$\begin{array}{ccccccc} & \text{H} & & \text{H} & & \text{H} & & \text{H} & & \text{H} \\ & | & & | & & | & & | & & | \\ \text{H} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{H} \\ & | & & | & & | & & | & & | \\ & \text{H} & & \text{H} & & \text{H} & & \text{H} & & \text{H} \end{array}$$

- Cyclic (contains rings)

Section 1.12

$$\begin{array}{ccccc} & & \text{C} & & \\ & & / & & \backslash \\ \text{C} & & & & \text{C} \\ & \backslash & & & / \\ & & \text{C} & & \\ & & / & & \backslash \\ \text{C} & & & & \text{C} \\ & \backslash & & & / \\ & & \text{C} & & \\ & & \backslash & & / \\ & & & & \text{C} \end{array}$$

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4.2 Alkanes (cont.)

- Are acyclic “saturated” hydrocarbons.
- Contain only single bonds C-C
- Every carbon is sp^3 (tetrahedral)
- General formula of alkanes is C_nH_{2n+2}
 - CH_4
 - C_2H_6
 - C_3H_8

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4.2 Alkanes

(a) Methane

(b) Ethane

(c) Propane

← Fig. 1.3 Molecular structures of (a) methane, (b) ethane, and (c) propane, the three simplest alkanes.

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Table 1.2 IUPAC Names for the First Ten Continuous-Chain Alkanes				
Number of Carbon Atoms	Prefix	Name	Molecular Formula	Condensed Structural Formula
1	Meth	Methane	CH_4	CH_4
2	Eth	Ethane	C_2H_6	CH_3-CH_3
3	Prop	Propane	C_3H_8	$CH_3-CH_2-CH_3$
4	But	Butane	C_4H_{10}	$CH_3-CH_2-CH_2-CH_3$
5	Pent	Pentane	C_5H_{12}	$CH_3-CH_2-CH_2-CH_2-CH_3$
6	Hex	Hexane	C_6H_{14}	$CH_3-CH_2-CH_2-CH_2-CH_2-CH_3$
7	Hept	Heptane	C_7H_{16}	$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$
8	Oct	Octane	C_8H_{18}	$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$
9	Non	Nonane	C_9H_{20}	$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$
10	Dec	Decane	$C_{10}H_{22}$	$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$

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4.2 Structural formulas

- Expanded (Lewis structure)

$$\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{C}-\text{H} \\ | \\ \text{H} \end{array}$$

Methane

$$\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{H}-\text{C}-\text{C}-\text{H} \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$$

Ethane

$$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ | \quad | \quad | \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ | \quad | \quad | \\ \text{H} \quad \text{H} \quad \text{H} \end{array}$$

Propane

THESE TAKE A LOT OF SPACE TO DRAW
THEY TAKE A LONG TIME TO DRAW

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4.2 Structural formulas

Condensed (easier and faster to draw)

Methane	CH_4
Ethane	$\text{CH}_3\text{-CH}_3$
Propane	$\text{CH}_3\text{-CH}_2\text{-CH}_3$

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4.2 Structural formulas

Condensed

Octane: $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_3$

More condensed $\text{CH}_3\text{-(CH}_2\text{)}_6\text{-CH}_3$

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4.2 LINE NOTATION

Organic chem models:
<http://www.umanitoba.ca/chemistry/courses/chem130/molecules/models.html>

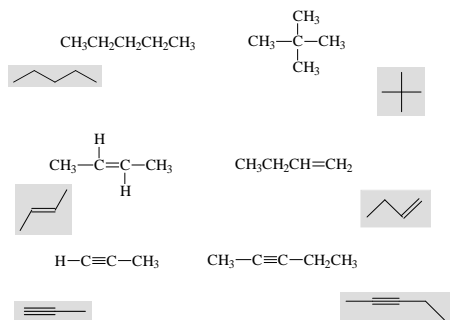
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RULES FOR LINE NOTATION

- 1) The end of any line indicates a carbon atom, unless another atom is indicated.
- 2) Any place where two or more lines meet represents a carbon atom, unless another atom is indicated.
- 3) Any missing valencies are filled by adding hydrogens.
- 4) All non-carbon atoms are clearly indicated.
- 5) Unshared pairs are implied, but not shown.

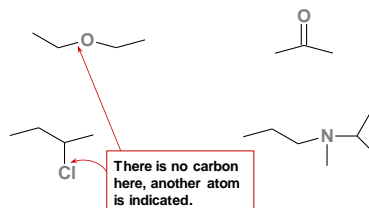
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LINE NOTATION



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STRUCTURES INVOLVING HETEROATOMS



A "heteroatom" is any atom different from carbon or hydrogen.

"hetero" = different (Greek)

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