

1.1: Unbranched Alkanes

Learning Objective

- Naming Unbranched Alkanes (Organic Chemistry)

An **alkane** is a type of **hydrocarbon** (a compound consisting of only carbon and hydrogen atoms). When the carbon-carbon backbone consists only of single bonds, the hydrocarbon contains as many hydrogen atoms as possible, and is therefore **saturated**. Alkanes are saturated hydrocarbons.



Figure 1.1.1. Hexane is an unbranched, saturated alkane containing six carbon atoms: Hexane

Below is a table of the names of unbranched, saturated alkanes containing up to ten carbons, with their condensed structural formulas, molecular formulas, and boiling points.

Alkane	Condensed Structural Formula	Molecular Formula	Boiling Point (degrees C)
Methane	CH ₄	CH ₄	-161
Ethane	CH ₃ CH ₃	C ₂ H ₆	-89
Propane	CH ₃ CH ₂ CH ₃	C ₃ H ₈	-42
Butane	CH ₃ CH ₂ CH ₂ CH ₃		-0.5
Pentane	CH ₃ (CH ₂) ₃ CH ₃		36
Hexane	CH ₃ (CH ₂) ₄ CH ₃		69
Heptane			98
Octane			126
Nonane			151
Decane			174

Table of names, condensed structural formulas, molecular formulas, and boiling points of unbranched saturated alkanes containing up to ten carbon atoms.

Practice Questions

- Fill in the blank spaces in the table.
- Draw the structures of these ten unbranched alkanes, using Figure 1.1.1 (hexane) as a model.
- What do the names of these molecules have in common?
- What is the relationship between the number of carbon atoms and the number of hydrogen atoms in an unbranched alkane? Provide a general formula (use *n* for the number of carbon atoms).
- Draw a graph of boiling points versus number of carbon atoms in unbranched alkanes.
- How do the boiling points vary with the number of carbons? Propose an explanation for this observation.

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