

Organic Chemistry

A brief introduction

Organic Chemistry

**the study of carbon-containing compounds
and their properties**

**excluding: CO, CO₂, CS₂, carbonates
and cyanides**

eight million known organic compounds

Hydrocarbons

compounds composed of hydrogen and carbon

Aromatic hydrocarbons

contain one or more benzene rings (C_6H_6)

Aliphatic hydrocarbons

have no benzene rings

Alkanes

The simplest hydrocarbon

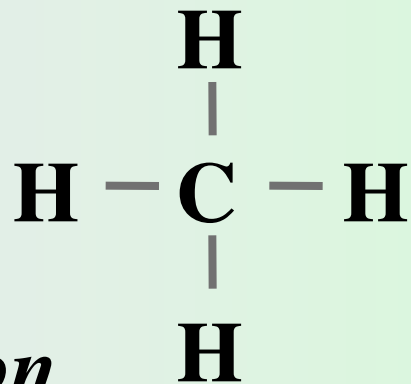
Alkanes

a hydrocarbon containing only single covalent bonds

generic chemical formula



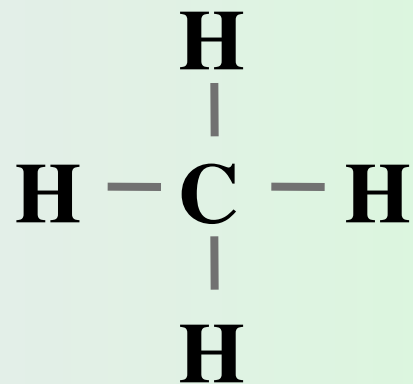
Methane



sp³ hybridization

Alkanes

Methane

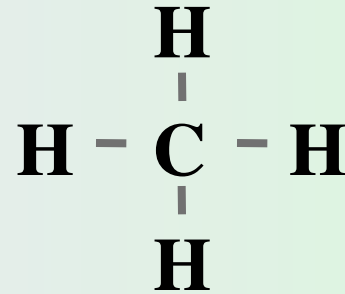


these molecules are said to be **saturated**

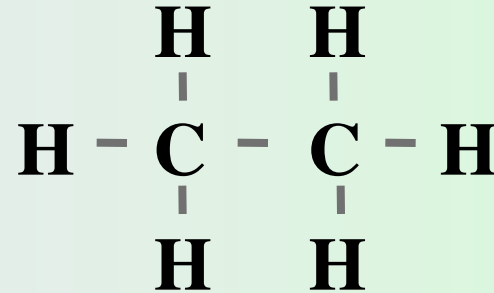
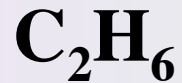
Saturated: no more hydrogen atoms can be added to the molecule

Alkanes

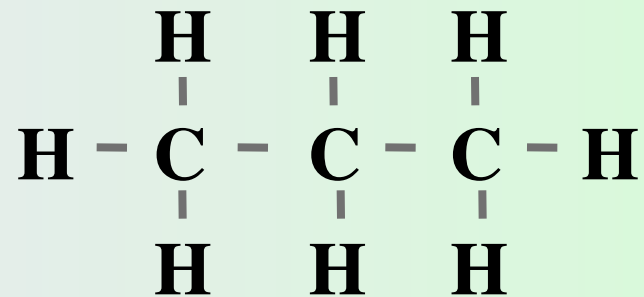
Methane



Ethane



Propane



Butane



Two possible schemes

Levels of Structure

Elemental Composition ✓

Empirical Formula ✓

Molecular Formula ✓



Constitution

**the order in which the atoms are
connected**

Alkane Nomenclature

the names of alkanes beyond butane are obtained by adding the suffix *-ane* to the Greek root for the number of carbon atoms



the longest continuous chain of carbon atoms determines the root name

Alkane Nomenclature

When alkane groups appear as substituents, they are named by dropping the *-ane* and adding *-yl*.



Methyl



Ethyl



Propyl



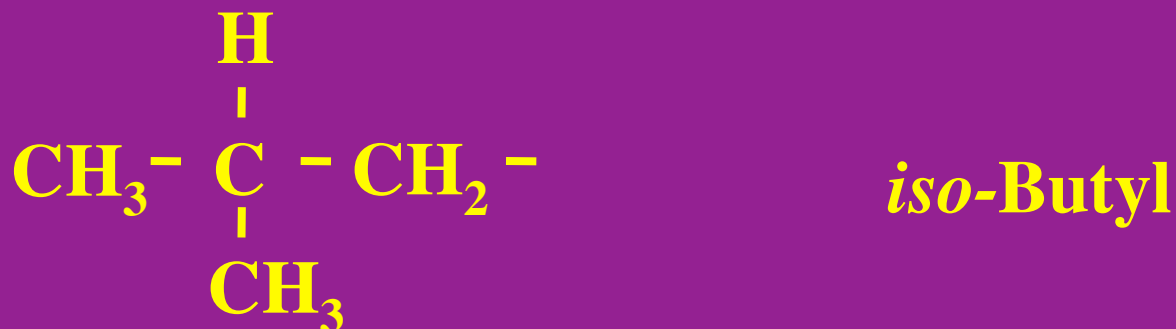
Isopropyl



Butyl

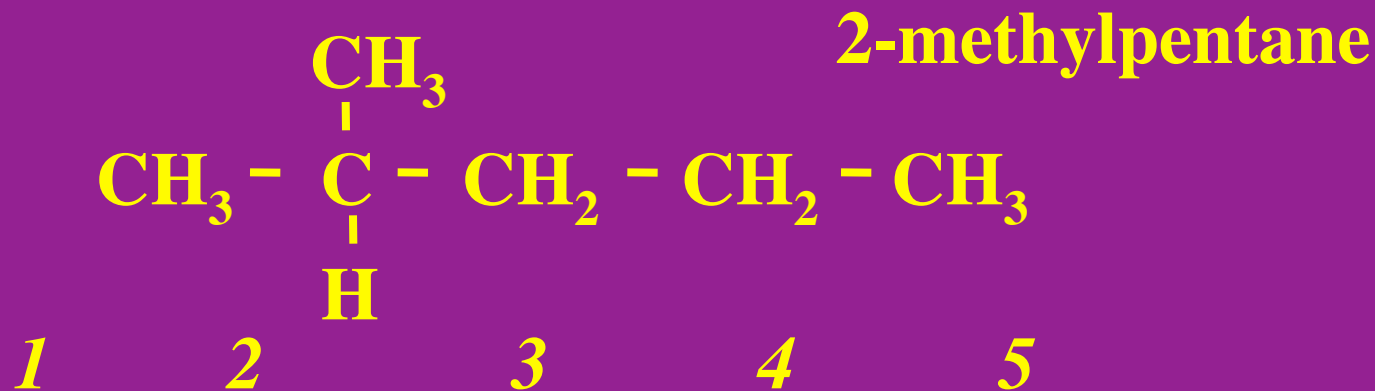
Alkane Nomenclature

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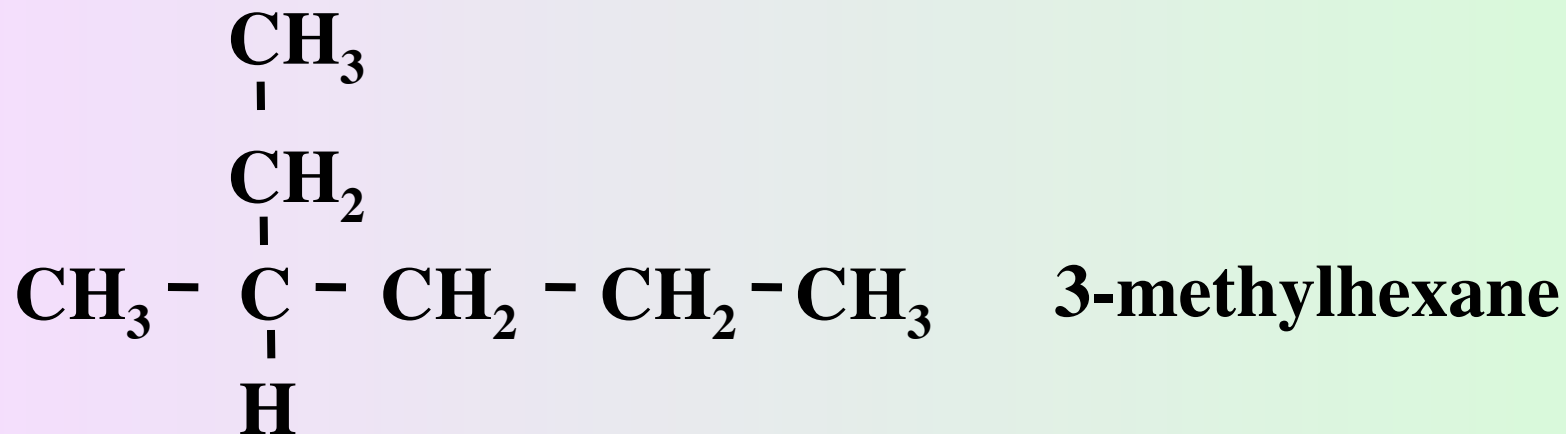
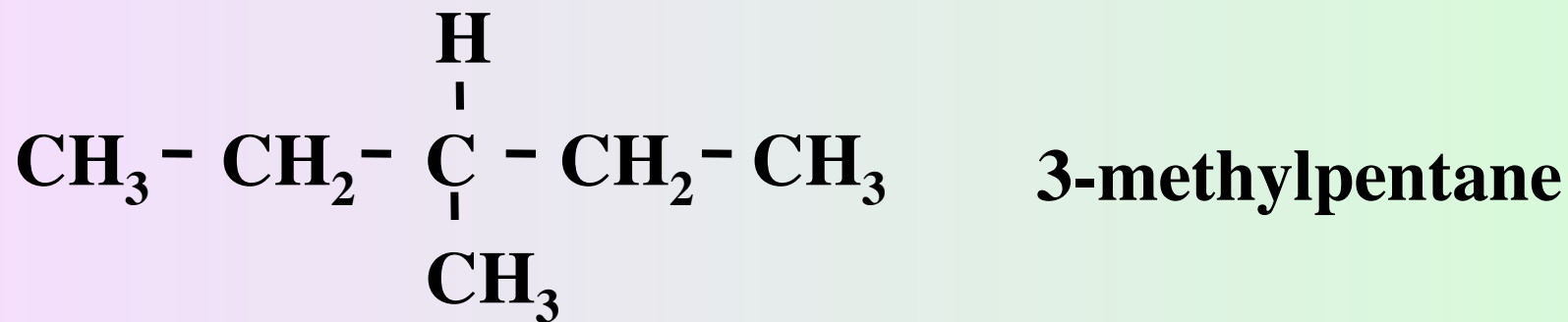
Alkane Nomenclature

The position of substituent groups are specified by numbering the longest chain of carbon atoms sequentially, starting at the end closest to the substituent.

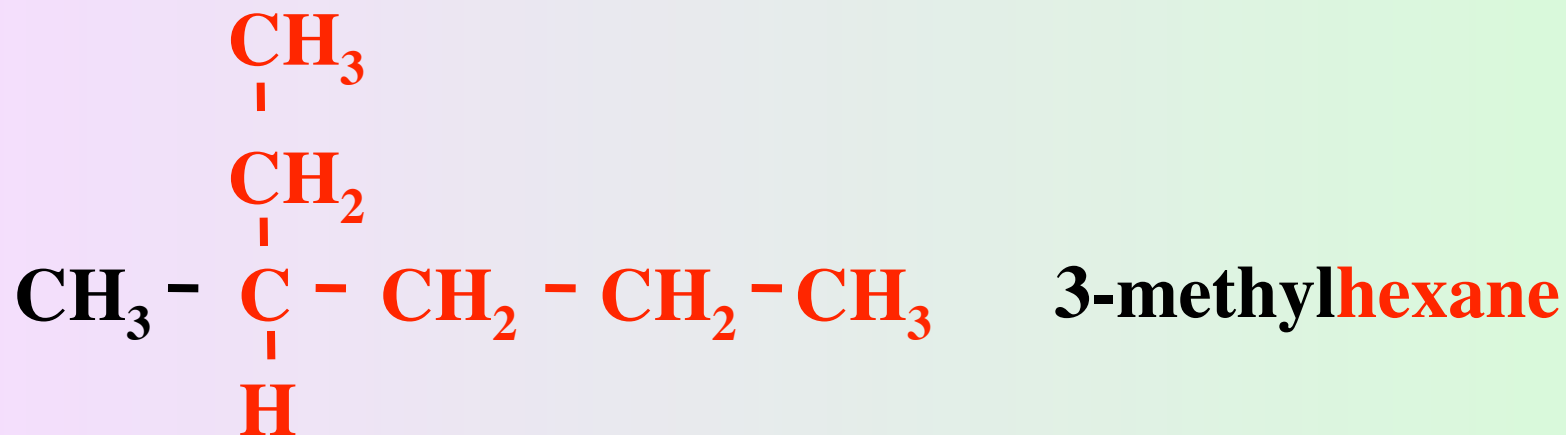
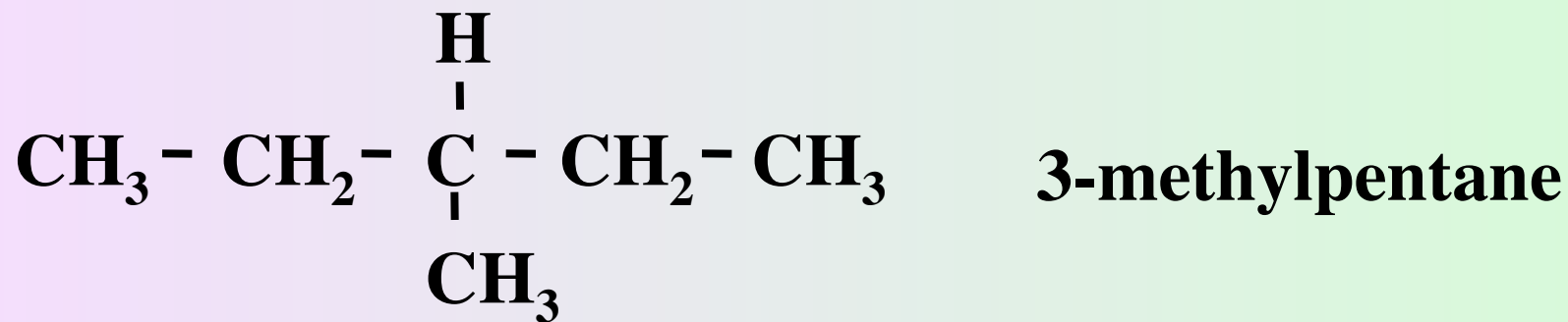


The location and name of each substituent is followed by the root alkane name.

Example

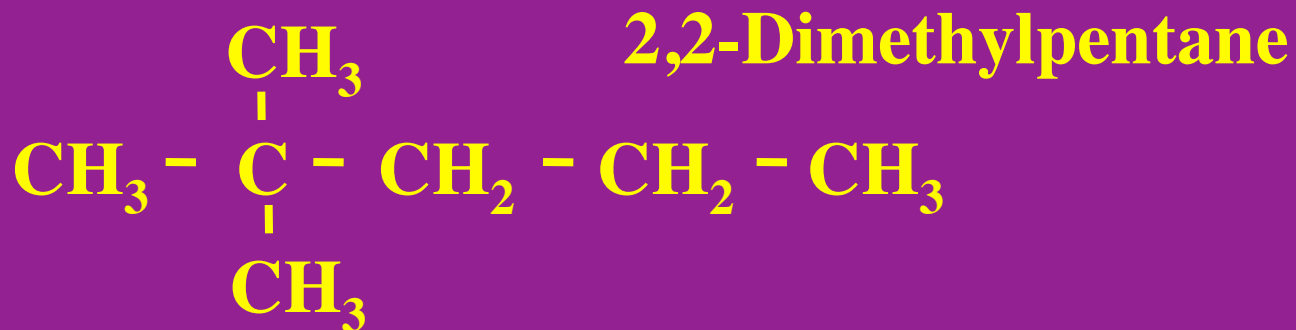


Example

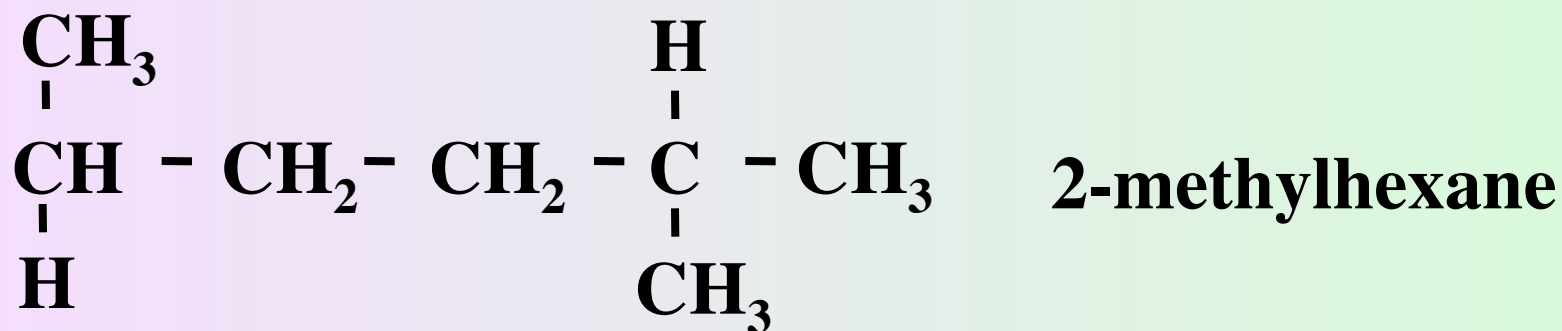
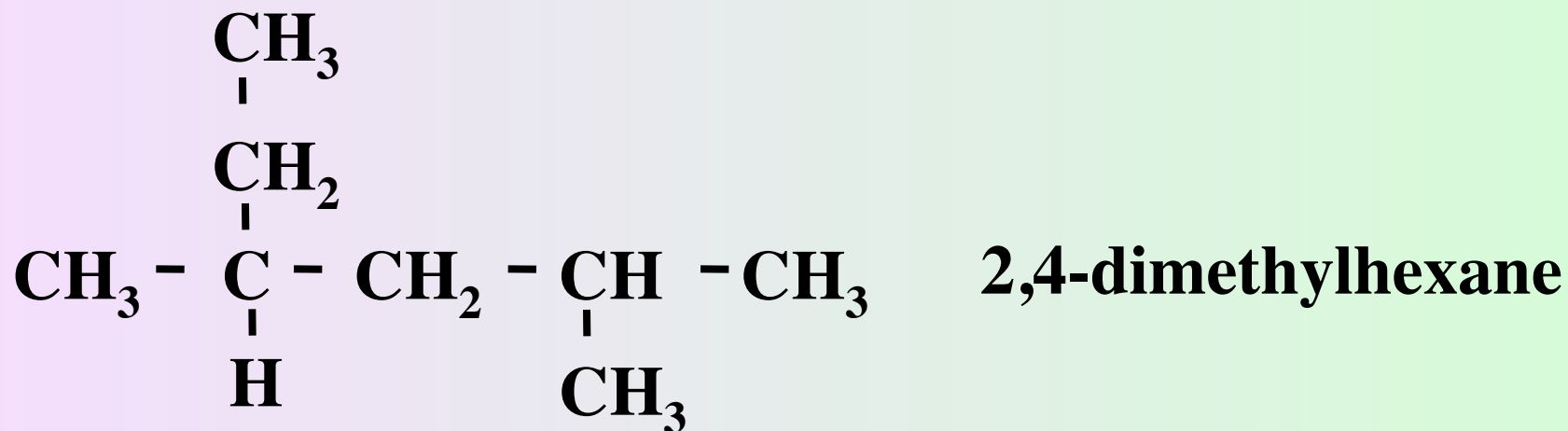


Alkane Nomenclature

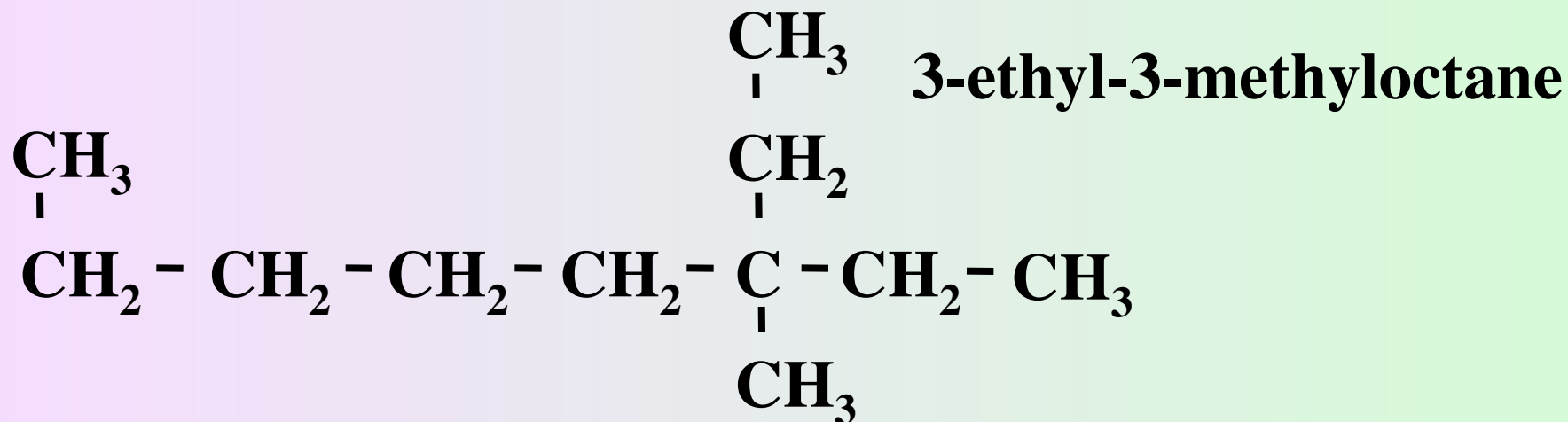
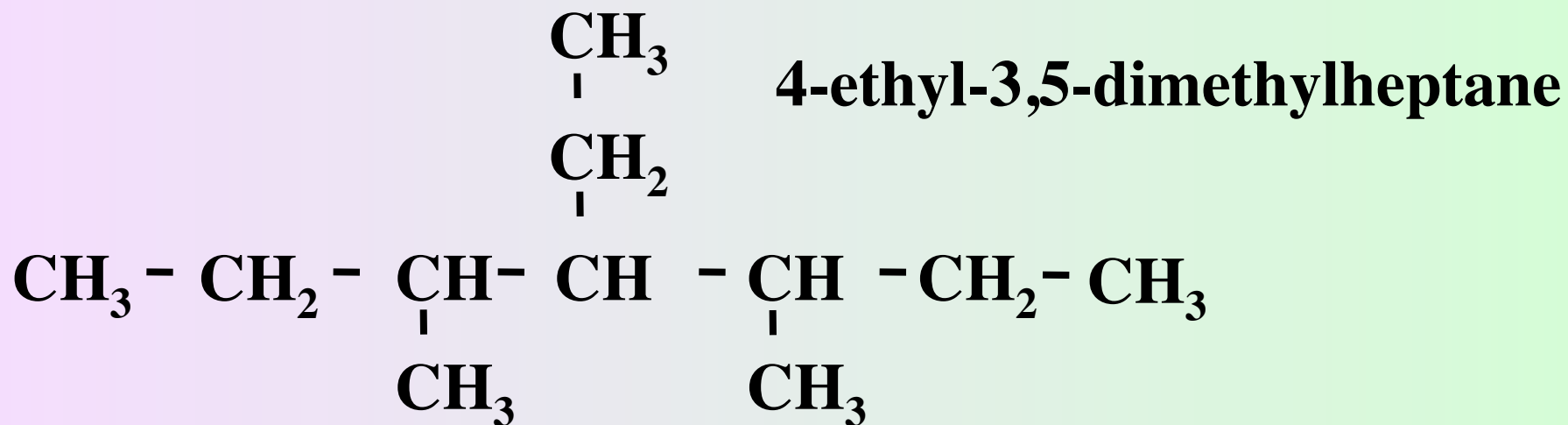
The substituents are listed in alphabetical order, and the prefixes *di-*, *tri-*, and so on are used to indicate multiple, identical substituents.



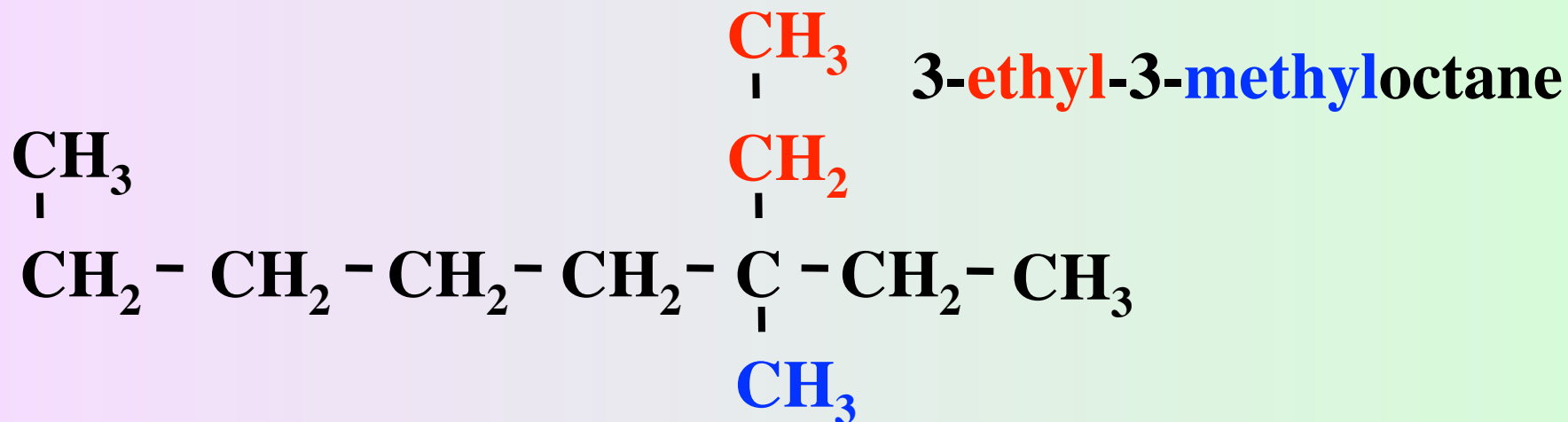
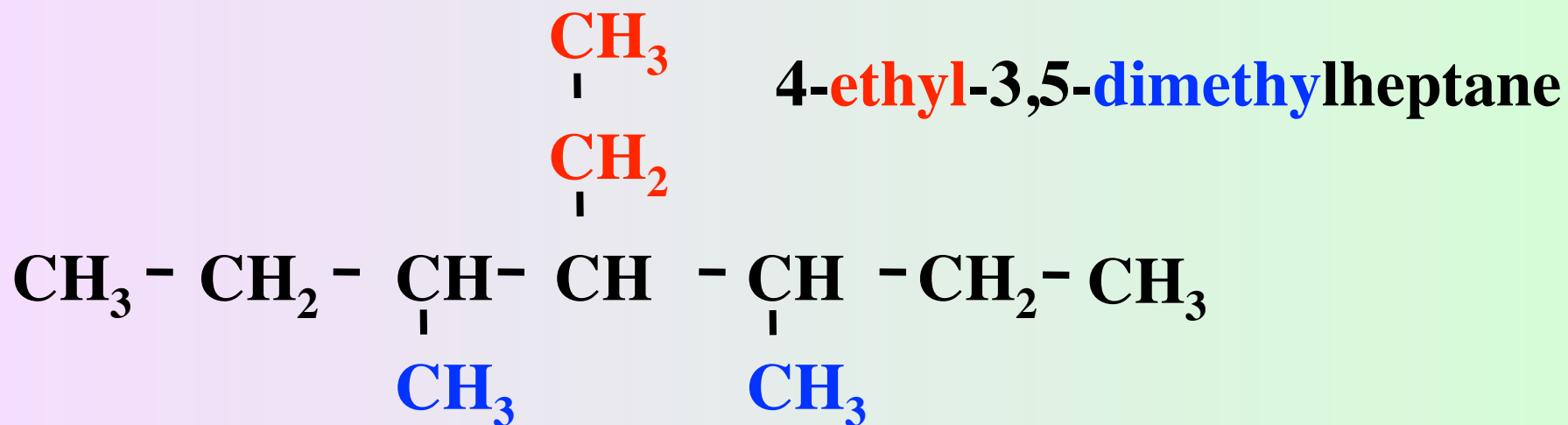
Example



Example

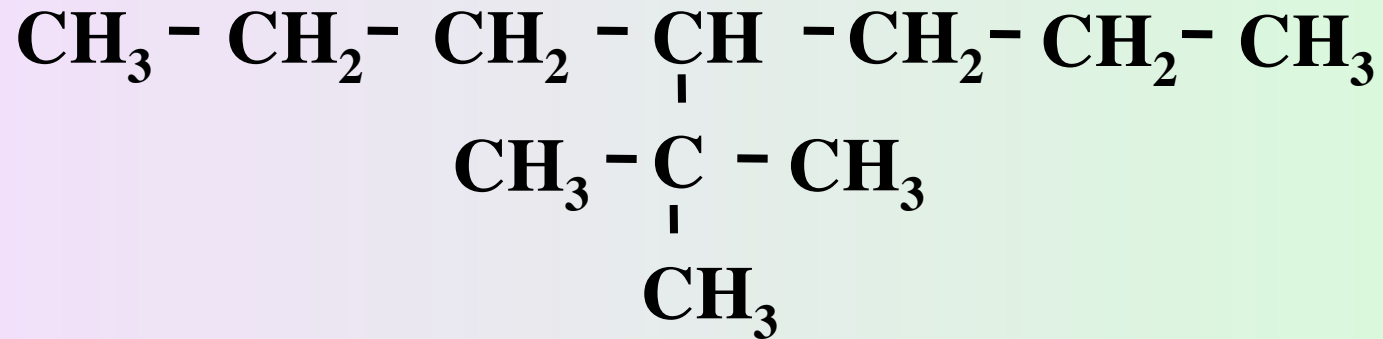


Example



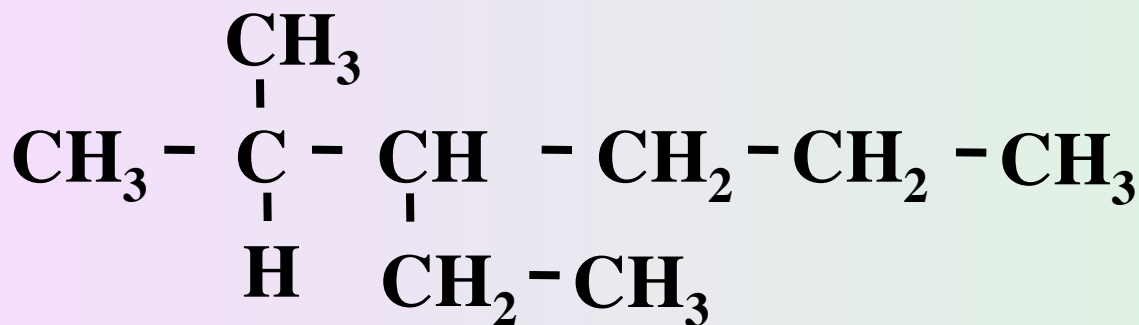
Example

4-*tert*-butylheptane



Alkane Nomenclature

If two chains of equal length are present, choose the one with the larger number of branch points as the parent.

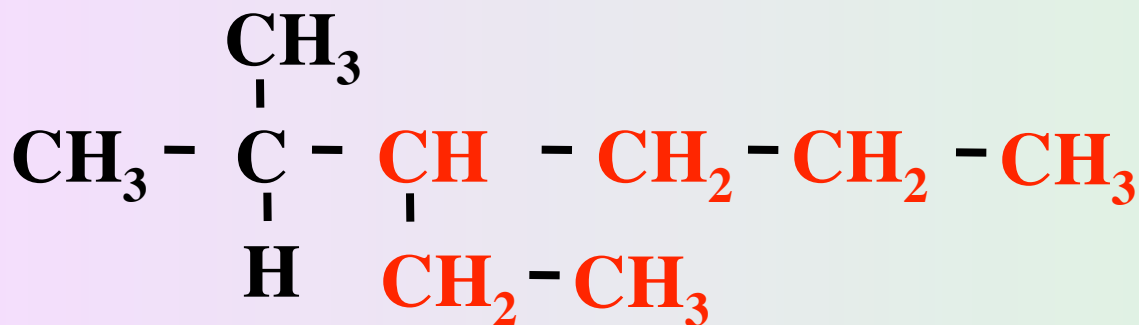


3-ethyl-2-methylhexane

Alkane Nomenclature

If two chains of equal length are present, choose the one with the larger number of branch points as the parent.

Not



3-isopropyl-hexane