



Department of biology



Department of biology
Organic Chemistry
Lecture 2
1 stage

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Alkanes

- Alkanes are the simplest type of organic compounds and member of a larger class of organic compounds called saturated hydrocarbons that contains **only carbon-carbon single bonds**. Alkanes have the general molecular formula **C_nH_{2n+2}** .
- we can determine the number of hydrogen in the molecule and its molecular formula. For example, decane, with ten carbon atoms, must have $(2 \times 10) + 2 = 22$ hydrogen atoms and a molecular formula of $C_{10}H_{22}$.

Nomenclature of Alkanes and the IUPAC System

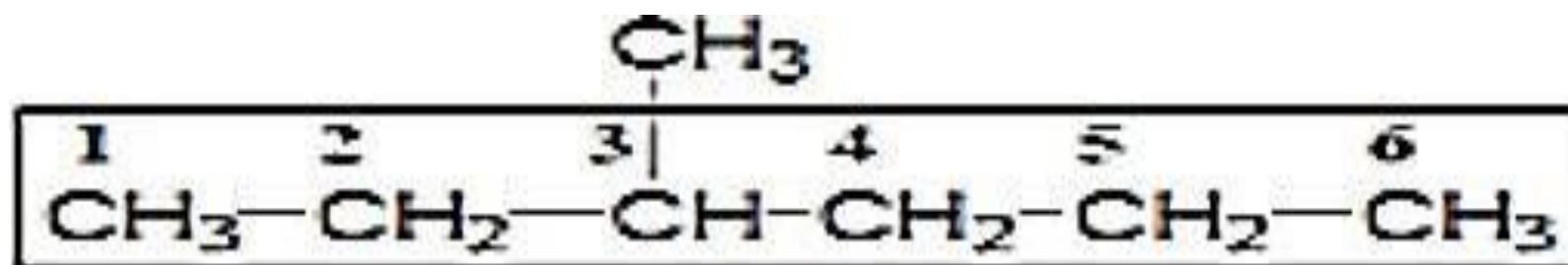
1. The name for an alkane with an un branched chain of carbon atoms consists of a prefix showing the number of carbon atoms in the chain and the ending -ane. The simplest member of Alkane family is methane

Molecular Formula	Structural formula	Name
CH ₄	CH ₄	Methane
C ₂ H ₆	CH ₃ – CH ₃	Ethane
C ₃ H ₈	CH ₃ – CH ₂ –CH ₃	Propane
C ₄ H ₁₀	CH ₃ – CH ₂ –CH ₂ –CH ₃	Butane
C ₅ H ₁₂	CH ₃ – CH ₂ –CH ₂ –CH ₂ –CH ₃	Pentane
C ₆ H ₁₄	CH ₃ – CH ₂ –CH ₂ –CH ₂ –CH ₂ –CH ₃	Hexane
C ₇ H ₁₆	CH ₃ – CH ₂ –CH ₂ –CH ₂ –CH ₂ –CH ₂ –CH ₃	Heptane
C ₈ H ₁₈	CH ₃ – CH ₂ –CH ₂ –CH ₂ –CH ₂ –CH ₂ – CH ₂ –CH ₃	octane

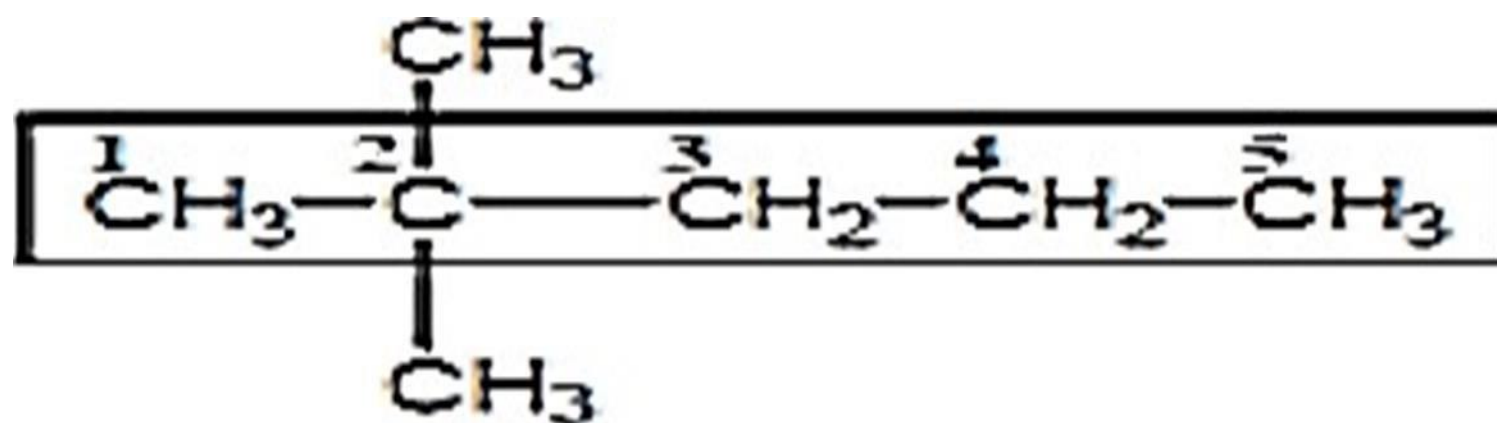
2. For branched-chain alkanes, select the longest chain of carbon atoms as the parent chain; its name becomes the root name. If there is one substituent, number the parent chain from the end that gives the substituent the lower number.

3- Give each substituent on the parent chain a name and a number.

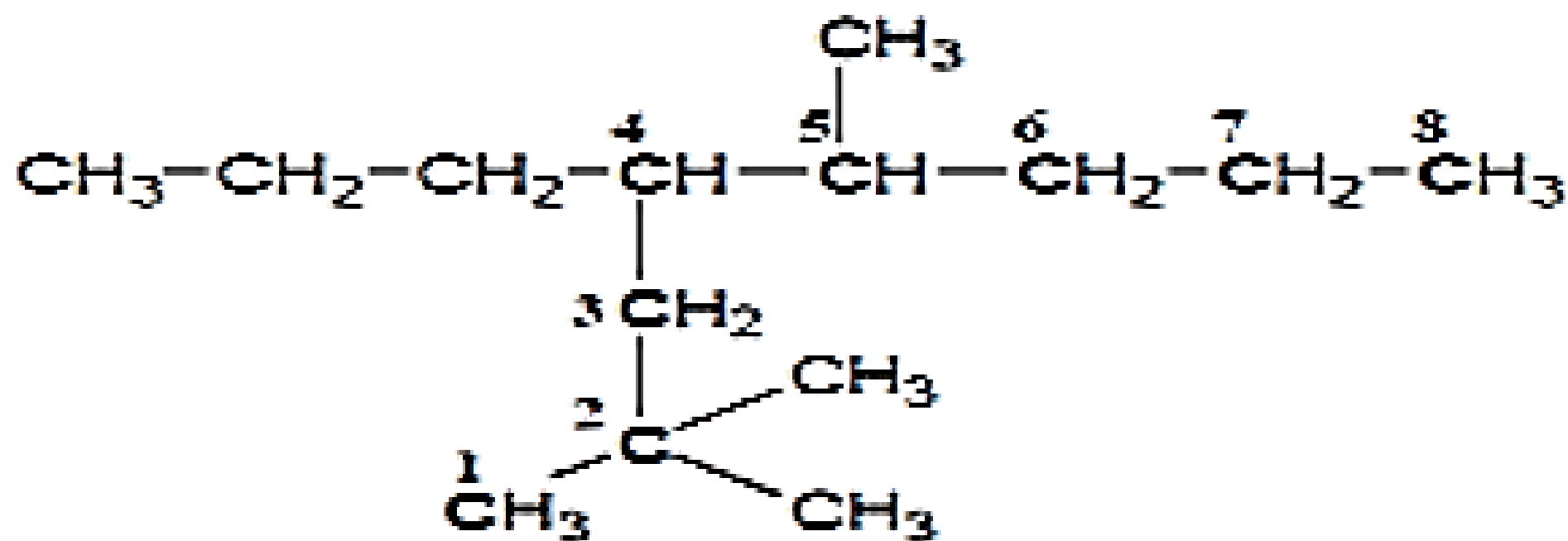
The number shows the carbon atom of the parent chain to which the substituent is bonded. Use a hyphen (-) to connect the number to the name.



3-Methyl hexane

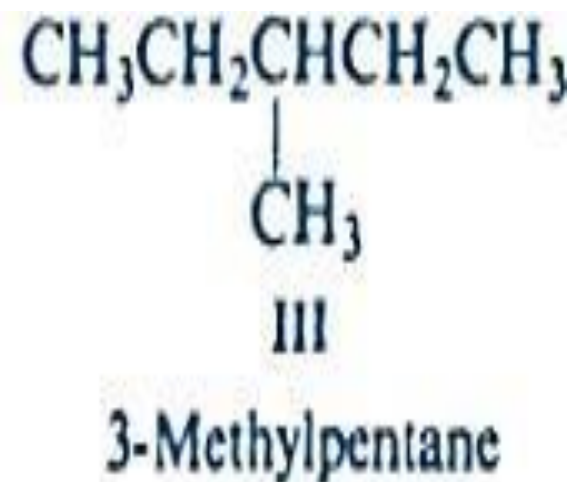
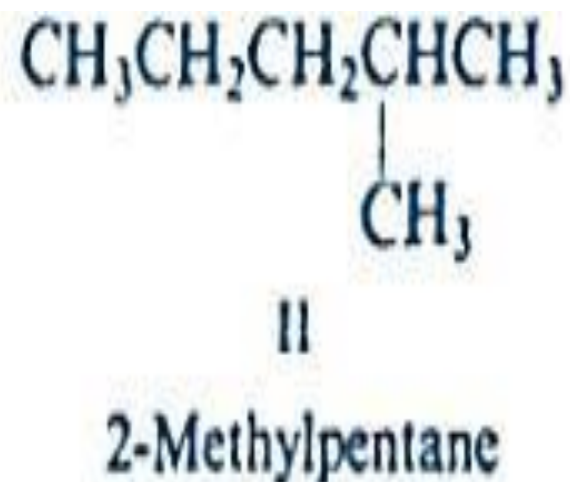
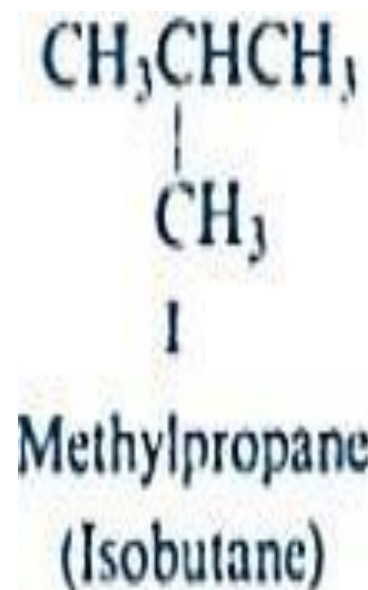


2,2-Dimethyl pentane



2,2,5-Trimethyl-4-propyl octane



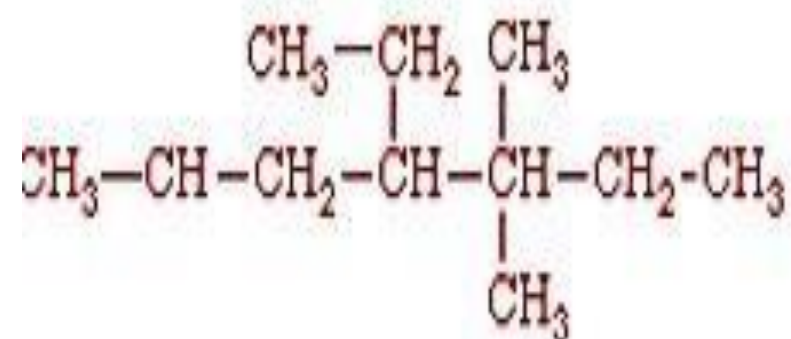


A substituent group derived from an alkane by the removal of a hydrogen atom is called an alkyl group; it is commonly represented by the symbol R. We name alkyl groups by dropping the -ane from the name of the parent alkane and adding the suffix -yl. The substituent derived from methane, for example, is methyl.

CH_3-	Methyl
CH_3-CH_2-	Ethyl
$\text{CH}_3-\text{CH}_2-\text{CH}_2-$	Propyl
$\begin{array}{c} \text{CH}_3-\text{CH}- \\ \\ \text{CH}_3 \end{array}$	iso-propyl
$\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2$	butyl
$\begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}_2- \\ \\ \text{CH}_3 \end{array}$	iso-butyl
$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{C}- \\ \\ \text{CH}_3 \end{array}$	tert - butyl

If there are two or more identical substituents, number the parent chain from the end that gives the lower number to the substituent encountered first. The number of times the substituent occurs is indicated by the prefix di-, tri-, tetra-

A comma is used to separate position numbers.



4-ethyl-3,3-dimethylheptane



2,4-Dimethylhexane (not 3,5-dimethylhexane)

If there are two or more different substituents, list them in alphabetical order and number the chain from the end that gives the lower number to the substituent encountered first.



3-Ethyl-5-methylheptane (not 3-methyl-5-ethylheptane)

F-

Foloro

Br-

Bromo

I-

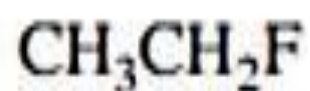
Iodo

NO₂-

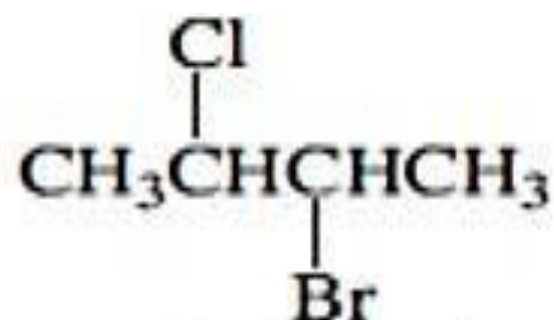
Nitro



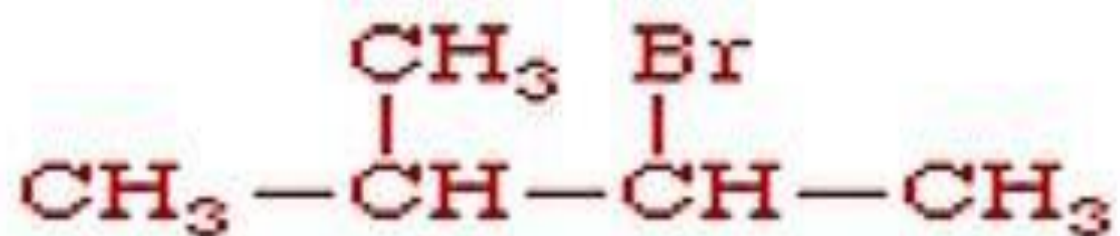
methyl chloride
chloromethane



ethyl fluoride
fluoroethane



2-bromo-3-chlorobutane
not
3-bromo-2-chlorobutane



2-bromo-3-methylbutane

