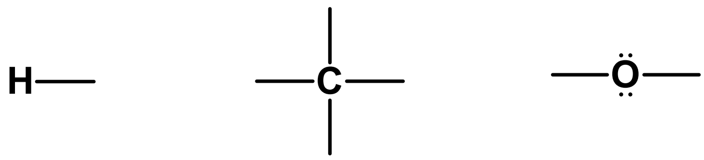
Empirical Formula: Ratio of the different types of atoms in a compound

Molecular Formula: Based on the actual number of atoms a compound has

Compound	Molecular formula	Empirical formula
Water	H_2O	H_2O
Hydrogen peroxide	H_2O_2	HO

Sometimes the empirical and molecular formula of a compound agree (e.g. water) but is not always the case as empirical and molecular formula are different concepts.

Valence: Number of covalent bonds that a particular atom can form. A covalent bond is usually represented as line that connect two atoms.



1 Bond **4 bonds** **2 bonds**

Drawing Chemical Structures

Organic chemist employ a variety of ways to write chemical structures. The most common are:

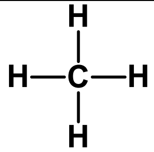
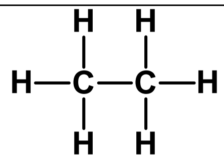
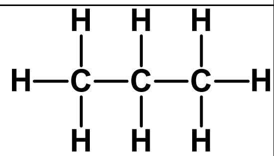
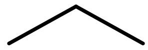
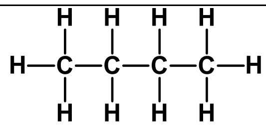
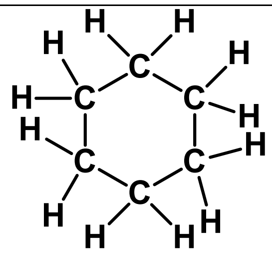
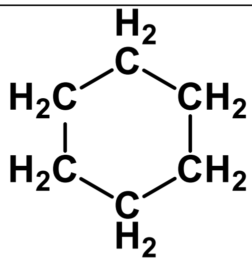
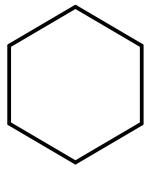
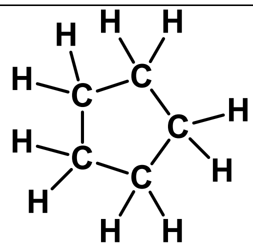
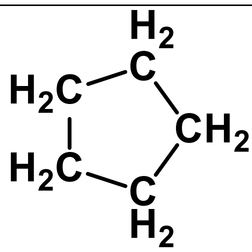
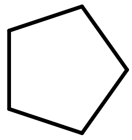
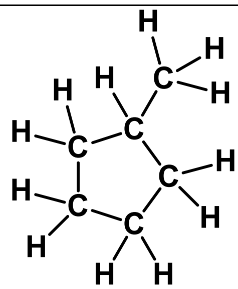
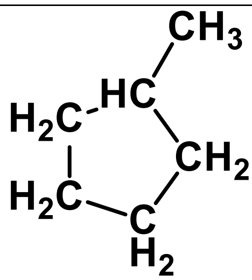
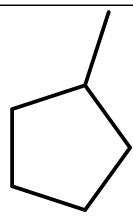
Dash formulas or Kekulé structures:
All the bonds are shown explicitly, including C-H bonds

Condensed formulas:
Hydrogen and other substituents are usually written immediately after the carbon.
$-CH_3$ Methyl group
$-CH_2-$ Methylene group

Bond-line formulas or skeletal formulas:
Fastest way to draw molecular structures, especially useful in big molecules and cyclic structures. Every vertex (where two or more line meet) represents a carbon. It is assumed that there are sufficient hydrogens to satisfy the tetravalency of carbon.

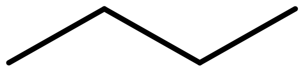
These ways to write structural formulas are two dimensional, flat representations of organic compounds and do not represent the actual shape of molecules. They just give information about the connectivity of the atoms.

Examples:

Compound	**Dash formula**	**Condensed formula**	**Bond-line formula**
Methane (CH_4)		CH_4	
Ethane (C_2H_6)		CH_3CH_3	
Propane (C_3H_8)		$CH_3CH_2CH_3$	
Butane (C_4H_{10})		$CH_3CH_2CH_2CH_3$	
Cyclohexane (C_6H_{12})			
Cyclopentane (C_5H_{10})			
Methylcyclopentane (C_6H_{12})			

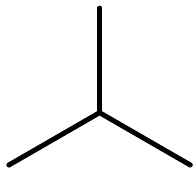
“Straight-chain” vs. “Branched-chain”

Straight-chain hydrocarbon: All carbons are connected in a row.



Butane

Branched-chain hydrocarbon: The carbon chain branches



Isobutane