

Formulae of functional groups

The **general** formula is a formula that represents a homologous series of compounds using letters and numbers.

A **homologous series** is a group of organic compounds that have the same functional group, the same general formula, and the same chemical properties.

The **structural formula** is a formula that shows how the atoms are bonded to each carbon atom in a molecule.

The **displayed formula** is a 2D representation of an organic molecule showing all its atoms (by their symbols) and their bonds (by single, double, or triple bonds).

















The **skeletal formula** is a simplified displayed formula with all the carbon and hydrogen (C-H) bonds removed.







Molecular & Empirical Formulae

The **molecular formula** shows the *number and type* of each atom in a molecule. Eg. the molecular formula of ethanoic acid is C₂H₄O₂






The **empirical formula** shows the *simplest whole number ratio* of the elements present in one molecule of the compound. Eg. the empirical formula of ethanol is CH₂O


Formulae of functional groups

Functional Group	General Formula	Structural Formula	Displayed Formula	Skeletal Formula	Name
Alkane	C _n H _{2n+2}				ethane
Alkene	C _n H _{2n}				ethene
Arene	C _n H _{2n-6} <small>number of C atoms minus 6</small>		N/A		benzene
Halogenoalkane	C _n H _{2n+2} X <small>halogen X</small>				chloroethane
Halogenoarene	C _n H _{2n-6} X		N/A		chlorobenzene
Alcohol	C _n H _{2n+2} OH				ethanol

			propan-2-ol
			2-methylpropan-2-ol













Formulae of functional groups

Phenol	C ₆ H ₅ OH		N/A		phenol
Aldehyde	C _n H _{2n} CHO				ethanal

Ketone	C _n H _{2n} O				propanone
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








Carboxylic Acids	C _n H _{2n} COOH				ethanoic acid
Esters	C _n H _{2n} O ₂				methyl methanoate
Acyl chloride	RCOCl				ethanoyl chloride
Amine	C _n H _{2n+3} N				dimethyl amine

Nomenclature of Aliphatic Compounds

Nomenclature of organic compounds table

Number of C atoms	Molecular formula of straight-chain alkane	Name of alkane	Stem used in naming
1	CH ₄	methane	meth-
2	C ₂ H ₆	ethane	eth-
3	C ₃ H ₈	propane	prop-
4	C ₄ H ₁₀	butane	but-
5	C ₅ H ₁₂	pentane	pent-
6	C ₆ H ₁₄	hexane	hex-
7	C ₇ H ₁₆	heptane	hept-
8	C ₈ H ₁₈	octane	oct-
9	C ₉ H ₂₀	nonane	non-
10	C ₁₀ H ₂₂	decane	dec-

Functional groups & their nomenclature table

Functional Group	Nomenclature	Example	Name
Alkenes	-ene		Ethene
Halogenoalkane	chloro-, fluoro-, bromo-, iodo-		Chloroethane
Alcohol	-ol		Ethanol
Aldehyde	-al		Ethanal
Ketone	-one		Propanone
Carboxylic Acid	-oic acid		Ethanoic acid
Ester	alkyl- +oate		Methyl Ethanoate
Amine	alkyl- +amine		Ethylamine
Nitrile	-nitrile		Ethane nitrile



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