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_nH_{2n+2}				ethane
Alkene	C_nH_{2n}				ethene
Arene	C_nH_{2n-6n} (n = number of C atoms; n = number of rings)		N/A		benzene
Halogenoalkane	$C_nH_{2n+1}X$ (X = halogen)	R–X			chloroethane
Halogenoarene	$C_nH_{2n-7n}X$		N/A		chlorobenzene
Alcohol	$C_nH_{2n+1}OH$	R–CH$_2$–OH primary			ethanol
		R–CH(–OH)–R secondary			propan-2-ol
		R–C(–OH)(–R)–R tertiary			2-methylpropan-2-ol

Formulae of functional groups

Phenol	$C_nH_{2n-7n}OH$		N/A		phenol
Aldehyde	$C_nH_{2n+1}CHO$				ethanal
Ketone	$C_nH_{2n}O$				propanone

Carboxylic Acids	$C_nH_{2n+1}COOH$				ethanoic acid
Esters	$C_nH_{2n}O_2$				methyl methanoate
Acyl chloride	RCOCl				ethanoyl chloride
Amine	$C_nH_{2n+3}N$				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_2H_6	ethane	eth-
3	C_3H_8	propane	prop-
4	C_4H_{10}	butane	but-
5	C_5H_{12}	pentane	pent-
6	C_6H_{14}	hexane	hex-
7	C_7H_{16}	heptane	hept-
8	C_8H_{18}	octane	oct-
9	C_9H_{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- iodo- bromo-		Chloroethane
Alcohol	-ol		Ethanol
Aldehyde	-al		Ethanal
Ketone	-one		Propanone
Carboxylic Acid	-oic acid		Ethanoic acid
Ester	alkyl -oate		Propyl Ethanoate
Amine	alkyl -amine		Ethylamine
Nitrile	-nitrile		Ethane nitrile

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Page 1 of 1.