

1 • Hybridisation of carbon

Type	Shape	Angle	s-char.
sp^3	tetrahedral	109.5°	25%
sp^2	trigonal planar	120°	33%
sp	linear	180°	50%

electronegativity: $C(sp) > C(sp^2) > C(sp^3)$

$$DBE = \frac{2C + 2 + N - H - X}{2}$$

2 • IUPAC naming

$COOH > SO_3H > COOR > COCl > CONH_2 > CN$

$CN > CHO > C=O > OH > NH_2 > C=C > C \equiv C$

Prefix only halogens, nitro, alkoxy, alkyl, phenyl

Numbering lowest locant at the first point of difference; a tie goes to the **alphabetically first** substituent

The longest chain containing the principal group is the parent.

3 • Suffixes & carbon types

Group	Suffix
carboxylic acid	-oic acid
ester	-oate
amide	-amide
nitrile	-nitrile
aldehyde	-al
ketone	-one
alcohol	-ol
amine	-amine

Carbon types 1°, 2°, 3° by carbon neighbours; 4° has four

4 • Isomerism

Type	Example
Chain	pentane, isopentane, neopentane
Position	propan-1-ol, propan-2-ol
Functional	ethanol, methoxymethane
Metamerism	$C_2H_5OC_2H_5$, $CH_3OC_3H_7$
Tautomerism	keto-enol
Stereo	geometrical; optical

5 • Electronic effects

–I order $NO_2 > CN > COOH > F > Cl > Br > I > OH > C_6H_5$

+I order $t\text{-Bu} > i\text{-Pr} > Et > Me$

+R OH, OR, NH_2 , halogens (ortho, para)

–R NO_2 , CHO, C=O, CN, COOH (meta)

Hyperconj. σ_{C-H} delocalised into an adjacent empty p or π ; more α hydrogens, more stable

6 • Reactive intermediates

Carbocation $3^\circ > 2^\circ > 1^\circ > CH_3^+$; allyl and benzyl are resonance-stabilised

Free radical $3^\circ > 2^\circ > 1^\circ > CH_3\cdot$

Carbanion $CH_3^- > 1^\circ > 2^\circ > 3^\circ$; $-I$ and $-M$ groups stabilise

Shape carbocation sp^2 planar; carbanion sp^3 pyramidal

7 • Acidity orders

$HCOOH > CH_3COOH > C_2H_5COOH > (CH_3)_3CCOOH$

$CCl_3COOH > CHCl_2COOH > CH_2ClCOOH > CH_3COOH$

Halo acids $FCH_2COOH > ClCH_2COOH > BrCH_2COOH > ICH_2COOH$

Phenols $p\text{-nitrophenol} > \text{phenol} > p\text{-cresol}$; phenol $>$ alcohol

8 • Reagents & reactions

Homolysis free radicals; Heterolysis: ions

Electrophiles H^+ , NO_2^+ , BF_3 , $AlCl_3$, carbocations

Nucleophiles OH^- , CN^- , NH_3 , H_2O , ROH

Types substitution, addition, elimination, rearrangement

9 • Resonance & aromaticity

Stability more resonance structures, more stable; avoid charge separation

Aromatic planar, cyclic, fully conjugated, $(4n + 2) \pi$ electrons

Examples benzene (6), tropylium cation (6), cyclopentadienyl anion (6)

10 • Stereo basics

Chiral C four different groups

stereoisomers = 2^n (n stereocentres, no symmetry)

Meso internal mirror plane; optically inactive

Racemic 50:50 mixture of enantiomers, no net rotation

Seen in NEET 2026



Seven-carbon chain; the tie in locants (3, 5) goes to **ethyl: 3-ethyl-5-methylheptane**.

Seen in NEET 2026

Metamers: $CH_3OCH_2CH_2CH_3$ (methoxypropane) and $C_2H_5OC_2H_5$ (ethoxyethane).

Seen in NEET 2024

C_6H_{14} with two tertiary carbons: **2,3-dimethylbutane**.

Seen in NEET 2025

Acid strength falls as alkyl groups ($+I$) are added: HCOOH is the strongest.

Six traps to remember

- Electronegativity of carbon rises with s -character: $sp > sp^2 > sp^3$.
- When locant sets tie, the alphabetically first substituent gets the lower number.
- Metamers differ in the alkyl groups on either side of the same functional group.
- Carbocation stability: $3^\circ > 2^\circ > 1^\circ$; carbanion order is the reverse.
- Halogens are $-I$ but $+R$: deactivating, yet ortho/para directing.
- HCOOH is a stronger acid than CH_3COOH ; $+I$ groups weaken acids.