

Carbon & Its Compounds - Cheat Sheet

Characteristics of Carbon

- Valency:** 4 (forms 4 covalent bonds)
- Bond type:** Covalent (shares electrons)
- Catenation:** Ability to form long chains/rings with other carbon atoms
- Tetravalency:** Combines with H, O, N, Cl, etc.

Hydrocarbons

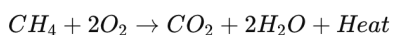
Type	Bond	General Formula	Example
Alkanes	Single	C_nH_{2n+2}	CH_4 (Methane)
Alkenes	Double	C_nH_{2n}	C_2H_4 (Ethene)
Alkynes	Triple	C_nH_{2n-2}	C_2H_2 (Ethyne)

Homologous Series

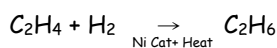
- Series of compounds with same functional group & similar properties.
- Difference: $-CH_2-$ (14 u) in molecular mass.
- Example: CH_4 , C_2H_6 , C_3H_8 ...

Chemical Properties & Key Reactions

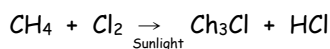
1. Combustion:



2. Addition Reaction (for unsaturated hydrocarbons - also for hydrogenation of oils)

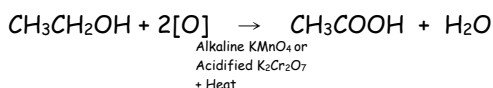


3. Substitution Reaction (for alkanes)



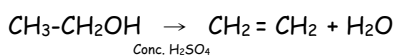
(Chloromethane, Dichloromethane, Trichloromethane (Chloroform), Tetrachloromethane)

4. Oxidation (for ethanol)

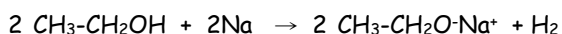


Aq. Solution of Alkaline Potassium Permanganate or Acidified Potassium Dichromate are oxidizing agents that provide nascent Oxygen, $[O]$

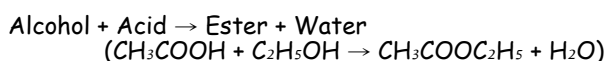
5. Dehydration (for ethanol)



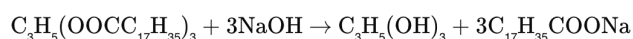
6. Ethanol with Na



7. Esterification:



8. Saponification:



Allotropes of Carbon

Allotrope	Structure	Example/Use
Diamond	3D tetrahedral	Cutting tools
Graphite	Layers of hexagonal carbon	Lubricant, conductor
Fullerene (C_{60})	Spherical	Nanotechnology

Functional Groups

Functional Group	Formula	Example
Alcohol	$-OH$	Ethanol (C_2H_5OH)
Aldehyde	$-CHO$	Ethanal (CH_3CHO)
Ketone	$-CO-$	Propanone (CH_3COCH_3)
Carboxylic Acid	$-COOH$	Ethanoic acid (CH_3COOH)
Ester	$-COO-$	Ethyl acetate ($CH_3COOC_2H_5$)

Important Compounds

Compound	Formula	Use
Ethanol	C_2H_5OH	Alcoholic drinks, fuel
Ethanoic Acid	CH_3COOH	Vinegar, preservative
Soap	Sodium/potassium salt of fatty acid ($R-COONa$)	Cleansing
Detergent	Sulphonate/sulphate salt ($R-SO_3Na$ or $R-OSO_3Na$)	Cleansing in hard water

Soap vs Detergent

Property	Soap	Detergent
Composition	Sodium or potassium salt of a fatty acid	Sodium or ammonium salt of a sulphonate or sulphate
General Formula	$R-COONa$ (where R = long alkyl chain, e.g. $C_{17}H_{35}-$)	$R-SO_3Na$ or $R-OSO_3Na$
Example	Sodium stearate ($C_{17}H_{35}COONa$) - main ingredient in many soaps	Sodium lauryl sulphate ($C_{12}H_{25}OSO_3Na$) or Sodium alkyl benzene sulphonate ($R-C_6H_4-SO_3Na$)
Works in hard water?	✗ Forms scum (with Ca^{2+} / Mg^{2+})	✓ Works well, even in hard water
Type of cleansing agent	Natural / biodegradable	Synthetic / usually non-biodegradable