

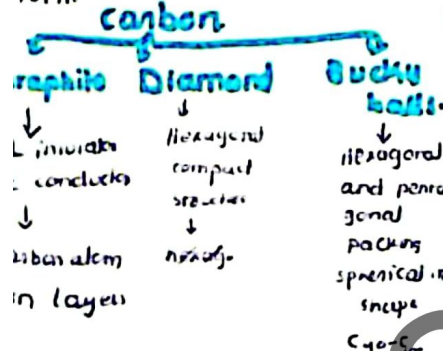
Organic Chemistry

old concept → compounds obtained from living organisms → vital force theory → natural force → vital force → cannot synthesized in laboratory

This theory proved wrong by Friedrich Wohler → prepared urea in laboratory

Modern concept → organic compound contain C, H, N, O, X traces of other elements like P, S, Li, Mg etc.
study of compounds containing C as a major constituent except $CO_2, CO, carbonate, carbides$ and $cyanides$ etc.

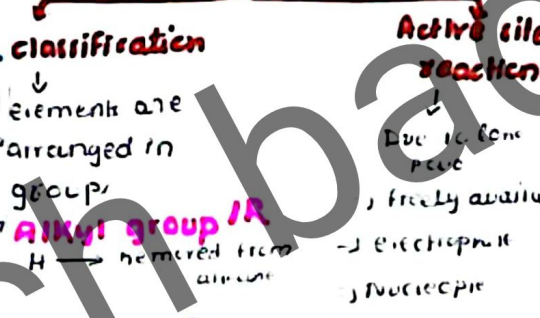
Allotropes of carbon
→ property of an element in which different forms of the element can occur under same conditions



Detection of C and H
Heat small amount of $O.C$ → heat with CuO to produce CO_2 & H_2O
pass through lime water → lime water turns milky → confirm the presence of C .
When pass through anhydrous $CuSO_4$ → copper sulphate turn blue confirm presence of H
 $CuO + 2[H] \rightarrow Cu + H_2O$
 $CuO + H_2 \rightarrow Cu + H_2O$
 $CuSO_4 + 5H_2O \rightarrow CuSO_4 \cdot 5H_2O$
colourless Blue.

Sources of organic compound
→ **Destructive / pyrolysis of coal**
→ **coke** → solid carbon allotrope → Graphite
Coke produce 2 gas → $H_2 + CO$ produces gas → $CO + N_2$
Wood → **peat** → **Lignite** → **sub-bituminous**
Bituminous coal → **Anthracite**.
→ **coal tar** → Black thick liquid mixture of air $O.C$.
→ Benzene
→ Naphthalene
→ Anthracene etc.
→ pitch on road.
→ **coal gas** → H_2, CO, CH_4 → Fuel industries.
→ **Ammonical liquors** → NH_3, NH_4OH
→ water → NH_4Cl .

Functional groups → atom or group of atom when attached to molecule always special properties to that molecule.
Need for functional group



Detection of N and halogen
sodium metal in fusion tube, melt it → small amount of $O.C$ in molten sodium heat → lower end of fusion tube red hot black fusion in china dish → effluve in water
Boil it and filter the solution. Filterate (organic solvent)
 $NaCl + Cl \rightarrow NaCl$
 $NaCl + S + N \rightarrow NaCN$
 $2NaCl \rightarrow Na_2S$
 $2NaCl + X_2 \rightarrow 2NaX$ $X = Cl, Br, I$

Destructive distillation of coal
→ **crude coal gas** → Besides coal gas, cyanide compound of sulphur.
→ **coal gas** → H_2, CO, CH_4
→ **Ammonical liquors** → $NH_4Cl, H_2O, NH_3, NH_4OH$
→ **coal tar** → Fractional distillation
Benzene, creosol, Toluene, Styrene, Naphthalene, Anthracene
→ **Coke** → coke is 99.97% pure carbon, used as fuel & reducing agent in metallurgy

Examples of functional group
Alkene $C=C$, Alkyne $C \equiv C$, Arene Benzene ring , Halide $R-X$
Alcohol $R-OH$, Ether $R-O-R$
Amine $R-NH_2$, Nitriles $-C \equiv N$
Thiol $R-S-H$, carbonyl $R-C(=O)-R$
Aldehyde $R-C(=O)-H$, ketone $R-C(=O)-R$
carboxylic acid $R-C(=O)-OH$
Ester $COOR$, Amide $R-C(=O)-NH_2$
carbonyl chloride $R-C(=O)-Cl$
carboxylic anhydride $CH_3-C(=O)-O-C(=O)-CH_3$

Test for N and S
 $NaSCN + FeSO_4 \rightarrow Na_4[Fe(SCN)_6] + Na_2SO_4$
 $Na_4[Fe(SCN)_6] + FeCl_3 \rightarrow Fe_4[Fe(SCN)_6] + NaCl$
Sulphur test
Lead paper → white → after smell
 $Na_2S + CH_3COOH \rightarrow CH_3COONa + H_2S \uparrow$
 $H_2S + (CH_3COO)_2Pb \rightarrow PbS + 2CH_3COOH$
Lead Acetate Black

Characteristics of organic compound
→ **composition** → C, H, O, N, X
→ **m.p and B.p** → low m.p and B.p due to weak attractive forces among molecules
→ **solubility** → Non-polar also soluble in non-polar solvent
→ less soluble in water
→ **stability** → low thermal stability and decompose into simple molecules
→ **electrical conductivity** → covalent in nature don't have free electrons
→ non-conductor of electricity
→ obtained from plants and animals

Rate of Reaction → slow reaction
Homologous series → two successive members differ by $-CH_2-$ group
Characteristics
• same functional group
• same structure
• same chemical properties different physical properties
• same method of preparation
• represented by same general formula
Alkane → C_nH_{2n+2} , **Alkene** → C_nH_{2n}
Alkyl halide → $C_nH_{2n+1}X$

Test for halogen → Lassaigne's test
 $HNO_3 + \text{boil to expel } CN \rightarrow \text{cool} + AgNO_3$
 $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$ white ppt
 $NaBr + AgNO_3 \rightarrow AgBr + NaNO_3$ pale yellow ppt
 $NaI + AgNO_3 \rightarrow AgI + NaNO_3$ deep yellow ppt

