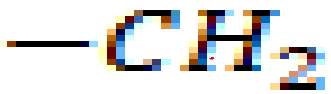
Homologous Series

- A group of compounds of similar structure in which each member differs from the next by the presence of an additional



Properties of compounds in homologous series

- Have same general formula of compounds in series
- Have same functional group
- Their **physical properties** such as melting point, boiling point, density, generally show a gradual change with increase of **molecular formula** in the series

Properties of compounds in homologous series

- Their chemical properties show close similarities due to the presence of the same functional group in them

- Consecutive members of the series differ from each other by -CH_2- group which is known as the methylene group and their molecular weight differs by 14 units.

Physical Properties of Alkanes

- Are Colourless
- Less dense than water
- Low melting and boiling points in shorter chain alkanes and increase as carbon atoms increase

Chemical Properties of Alkanes

- Are relatively unreactive with strong acids and strong bases
- React rapidly with oxygen hence used as fuel
- Combustion reaction
- Substitution reaction

Combustion of alkanes e.g methane

$$\text{Methane} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$$

$$CH_{4(gas)} + 2O_{2(gas)} \rightarrow CO_{2(gas)} + 2H_2O_{(gas)}$$

Incomplete combustion of alkanes e.g methane

$$\mathrm{Methane} + \mathrm{oxygen} \rightarrow \mathrm{carbon\ monoxide} + \mathrm{water}$$

$$2CH_{4(gas)} + 3O_{2(gas)} \rightarrow 2CO_{(gas)} + 4H_2O(l)$$

Substitution reaction of alkanes

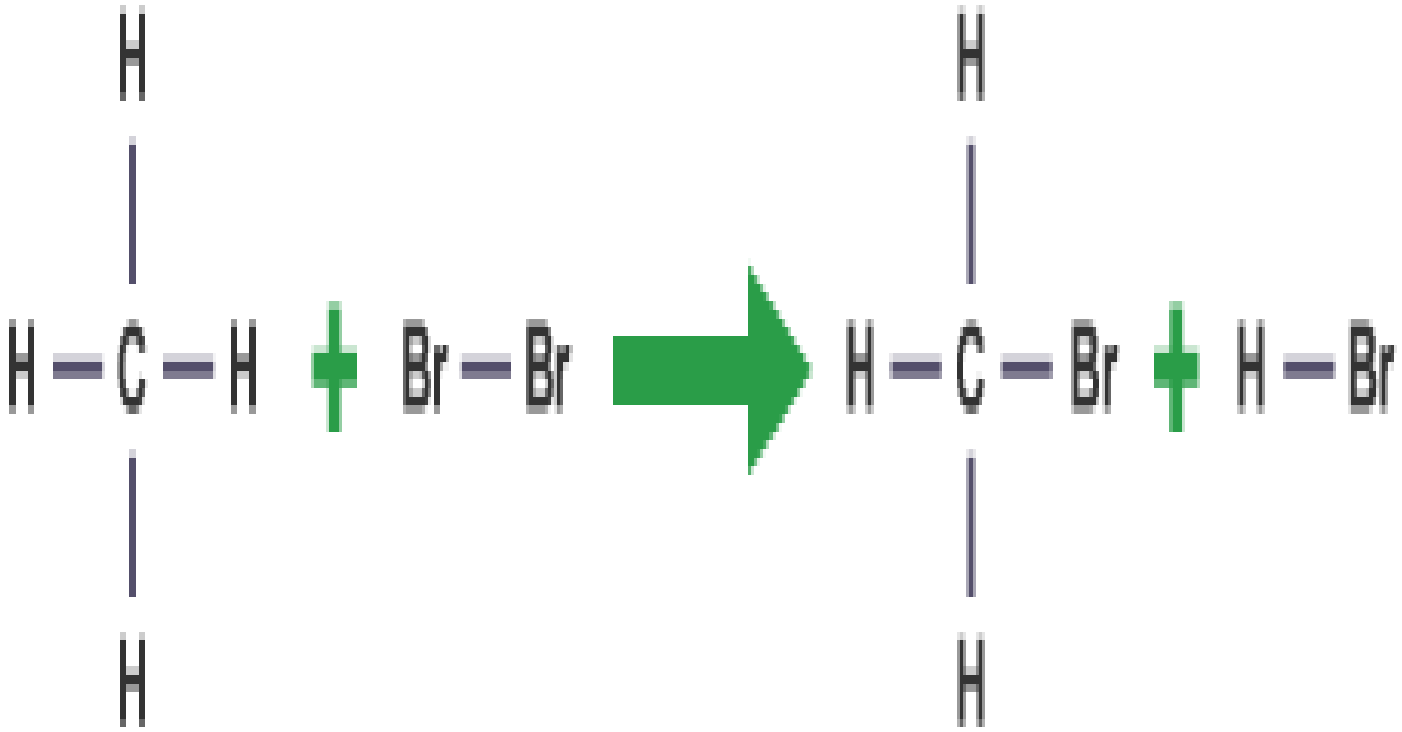
- Substitution reaction with halogens
- One atom is swapped with another atom
- Reaction in ultraviolet light(alkane with halogen)

Substitution reaction

Methane+ Bromine → Methyl Bromide + Hydrogen Bromide

$CH_4 + Br_2 \rightarrow CH_3Br + HBr$

Structural formula reaction



Uses of alkanes

- Manufacture of fertilizers
- Fuel for homes
- Vehicle fuel
- Refrigeration
- Solvent
- Glue