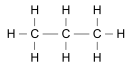
ORGANIC CHEMISTRY

Structural formula and Physical Properties

STRUCTURAL FORMULA

- Shows individual atoms in a molecule and uses dashes for each bond
- E.g. propane



Condensed formula

- Shows the structure but not individual bonds
- E.g. propane

$CH_3CH_2CH_3$

Molecular formula

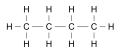
- This is the simplest ratio of atoms
- It does not show any structure
- E.g. propane

C_3H_8

This type of formula is only used in combustion equations for organic molecules

Structural isomers

- Molecular formulae can represent different molecules
- E.g. C_4H_{10}
  Can be butane



Or 2-methyl propane

PHYSICAL PROPERTIES

- Physical properties can include melting and boiling points, solubility in water or different solvents and the appearance of the substance.
- Physical properties of organic molecules are affected by the size of the molecule due to the intermolecular forces.

Physical properties of alkanes

- Alkanes are colourless compounds.
- Alkanes have only dispersion forces as their intermolecular forces.
- All hydrocarbons are non-polar molecules because the carbon-hydrogen bond is considered non-polar.

Boiling points

- Bigger molecules have ***more*** dispersion forces so they have higher boiling points than smaller molecules – it takes more energy to separate the molecules
- The first 4 alkanes are gases at room temperature
- Branched chain hydrocarbons don't fit together as well, so generally have lower boiling points than their non-branched isomers

Solubility

- Alkanes do not dissolve in water because they cannot hydrogen bond to water
- Alkanes can dissolve in organic solvents
- In general for solubility, "like dissolves like", or polar dissolves polar and non-polar dissolves non-polar. Because alkanes are non-polar, they cannot dissolve in polar water.

Flame characteristics

- Alkanes burn completely in oxygen with a hot non-luminous flame (non-luminous means it is hard to see)

Alkene and Alkyne physical properties

- Alkenes combust incompletely so burn with a luminous smokey yellow flame
- Other physical properties are similar to the corresponding alkane
- Physical properties of alkynes are similar to those of the corresponding alkene

Alcohols

- Boiling points for alcohols are unusually high because of the presence of the hydroxyl group and the ability to form hydrogen bonds
- Boiling point increases with increasing molecular weight within the homologous series

Alcohols

- Low molecular weight alcohols are water soluble as they can form hydrogen bonds with water
- High molecular weight alcohols are insoluble in water because as the non-polar hydrocarbon chain gets bigger, it decreases the overall polarity of the molecule

Alcohols

- Alcohols can be more viscous as liquids than other hydrocarbons
- Viscosity is resistance to flow
- Viscosity is influenced by hydrogen bonding
- Alcohols burn completely in oxygen with a hot non-luminous flame