homologous series

alkane, alkene and alkyne- hydrocarbons

haloalkanes, alcohols, aldehydes, ketones, carboxylic acids and esters

alkane

alkane is a saturated hydrocarbon with single covalent bonds

consisting of one C atom and H atom

the suffix ends in "ane"

the general formula is: CnH2n+2

alkenes

general formula: CnH2n

suffix ends in "ene"

1st seven alkenes: ethene, propene, butene, pentene, hexene, heptene, octene

alkyne

general formula is: CnH2n-2

the suffix ends in "yne"

1st seven alkynes: ethyne, propyne, butyne, pentyne, hexyne, heptyne, octyne

structure for alkenes and alkynes

Both are unsaturated hydrocarbons.

Alkenes have the least double bonds and Alkyne have the least triple bonds

The bonds form the functional group. They electron rich so are positioned in the compound where reactions with other substances can take place.

During reaction, bonds break and more atoms attach to form more saturated product

Haloalkanes/ alkyl halides

general formula: CnH2n+1X

They are generally volatile liquids and don't dissolve in water

The structure, these are alkenes in which one or more H atom has been replaced by a halogen (X= Br, F, Cl, I)

Simplest halogens: chloromethane (CH3CL), bromomethane (CH3Br), Iodomethane (CH3I), chloroethane (CH3CH2CL)

Alcohols

group of compounds containing one or more hydroxyl (OH) group

general formula: CnH2n+1OH

suffix is "ol"

they are polar molecules and form intermolecular bonds in water by H bonding so smaller molecules readily dissolve n water

strong H bonds between OH sections, have higher boiling points and melting points than ordinary hydrocarbons

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Alcohols (cont)

1st three: methanol, ethanol and propn-1-ol or propan-2-ol

prepared by the addition of water to alkenes (hydration)

primary, secondary and tertiary alcohols

primary: C atom is bonded to only one other C atom. eg. propn-1-ol

secondary: C atom bonded to two other C atoms. eg. prona-2-ol

tertiary: C atom bonded to three other C atoms. eg. 2-methylpropan-2-ol

Aldehydes

Compounds containing a formyl group (H-C=O)

Formula: CnH2nO

suffix ends in "al"

formed during the oxidation of alcohol

1st three: methanal, ethanal, propanal

Ketones

contain carbonyl group (R-C=O-R)

general formula: CnH2nO

suffix is "one"

formed during oxidation of secondary alcohols

simple ketones: propanone, butan-2-one

Carboxylic acid

functional group is carboxyl group (carbonyl+hydroxly) (COOH)

formula: CnH2nO2

suffix ends in "oic acid"

commonly found in nature and are organic acids

prepared in various ways one way is through oxidation of aldehydes by strong oxidizing agent

not very strong acids

e.g. methanoic acid (causes burning sensation when ant's bites), ethanoic acid (vinegar), butanoic acid

Esters

-C-C=O-O-C-

Functional group is the carbonyl group with an O on the same C

suffix is "oate"

have pleasant smell

formed from carboxylic acid and alcohol

when the acid is heated together with alcohol in the presence of a catalyst (H2SO4- sulphuric acid))

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Esters (cont)

water is formed during the reaction when OH group, is eliminated from the acid, and H atom eliminated from the alcohol, bond with each other

Isomers

isomers Are organic compounds that have the same molecular formulae, but different structural formulae

Chain isomers are molecules with the same molecular formula but different types of chains

E.g. butane (C4H10), methylpropane (C4H10). pentane (C5H12), 2-methylbutanane (C5H12), 2,2-dimethylpropane (C5H12)

similarities and differences: all three compounds have 5 C atoms and 12 H atoms and same molecular formula

all belong to same homologous series **alkanes**, have different structural formulae

A: alkanes; straight chain structure

B and C: alkanes, branched structures, 1 or 2 alkyl groups

different names and different physical properties

Positional isomers

Positional isomer are molecules with the same molecular formula, but with substituents or functional groups and different positions on the parent chain

E.g. 1-chlorobutane (C4H9CL), 2-chlorobutane (C4H9CL) **OR** but-1-ene, but-2-ene

similarities and differences: same molecular formula, same functional group and homologous series (haloalkanes)

names and physical properties differ

Functional isomer

Functional isomer are molecules with the same molecular formula, but different functional groups and therefore belong to different homologous series

E.g. propanoic acid, methyl ethanoate

similarities and differences: same molecular formula C3H6O

Have different structural formulae and belong to different homologous series

Aldehydes and Ketones (CnH2nO) same number of C atoms and functional isomers

Acids and esters (CnH2nO2) same number of C atoms and functional isomers

general properties and uses for alkanes
occur in nature as crude oil or natural gases
they are generally use as fuels
consist of symmetrical non-polar molecules and don't readily mix with polar molecules in water, acids, ect
they are less reactive; single bonds more stable than double or triple bond are harder to breaks
due to the symmetry, they do not have areas with excess or shortage of electrons
increase in length of chains, thus increase in molecular mass, physical properties (melting and boiling points and vapor pressure change)

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