

WJEC (Wales) Chemistry

A-level

Topic 2.4 - Organic Compounds

Flashcards

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What is a homologous series?



What is a homologous series?

A series of organic compounds with the same functional group and where each successive member differs by CH_2 . The compounds have the same general formula.



What is a functional group?



What is a functional group?

An atom or group of atoms responsible for the characteristic reactions of that compound.



What is a structural formula?



What is a structural formula?

A structural formula shows the number, type and arrangement of atoms in the molecule.

- Butane: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
- Propan-2-ol: $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$



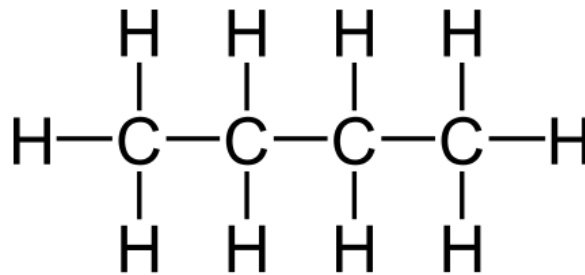
What is a displayed formula?



What is a displayed formula?

A displayed formula shows the relative positions of all atoms in the molecule and every bond between them.

Butane:



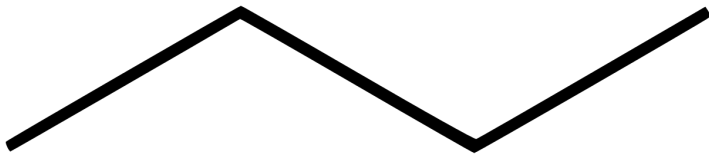
What is a skeletal formula?



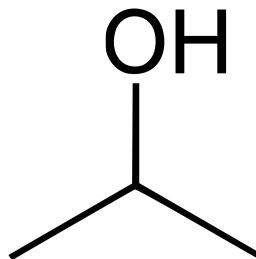
What is a skeletal formula?

A simplified organic formula whereby alkyl groups are drawn as lines and only functional groups are written as symbols.

Butane:



Propan-2-ol:



What is the general formula of alkanes?



What is the general formula of alkanes?



Give the name and molecular formula of
the first four alkanes



Give the name and molecular formula of the first four alkanes

Methane - CH_4

Ethane - C_2H_6

Propane - C_3H_8

Butane - C_4H_{10}



What is the functional group and general formula of alkenes?



What is the functional group and general formula of alkenes?

Functional group: $C=C$

General formula: C_nH_{2n}



Give the name and molecular formula of
the first four alkenes



Give the name and molecular formula of the first four alkenes

Ethene - C_2H_4

Propene - C_3H_6

Butene - C_4H_8

Pentene - C_5H_{10}



What are halogenoalkanes?



What are halogenoalkanes?

Halogenoalkanes are compounds in which at least one hydrogen atom of an alkane has been replaced by a halogen atom.



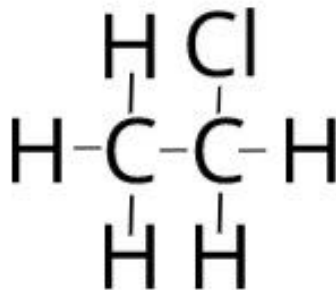
How are halogenoalkanes named?



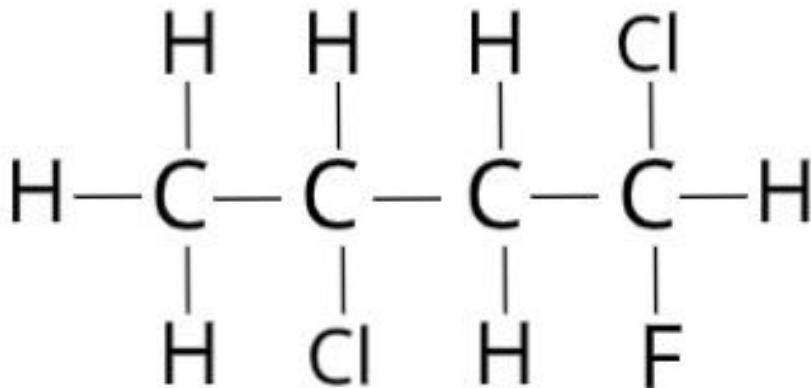
How are halogenoalkanes named?

Halogenoalkanes have the suffix of the relevant halogen: Fluoro- / Chloro- / Bromo- / Iodo-

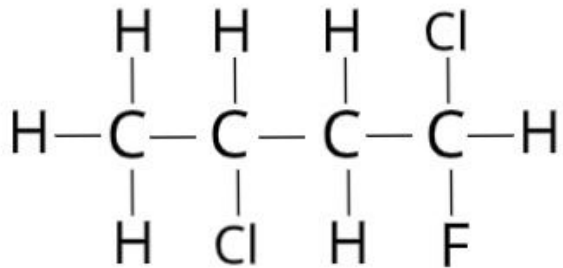
E.g. chloroethane



Name the halogenoalkane below



Name the halogenoalkane below



1,3-dichloro-1-fluorobutane



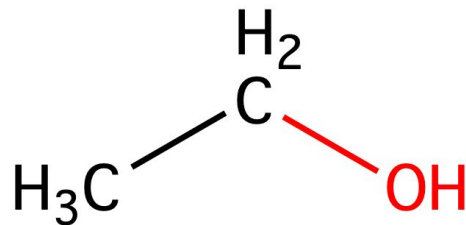
What is an alcohol?



What is an alcohol?

An alcohol is an organic compound that contains an OH functional group.

General formula: $C_n H_{2n+1} OH$

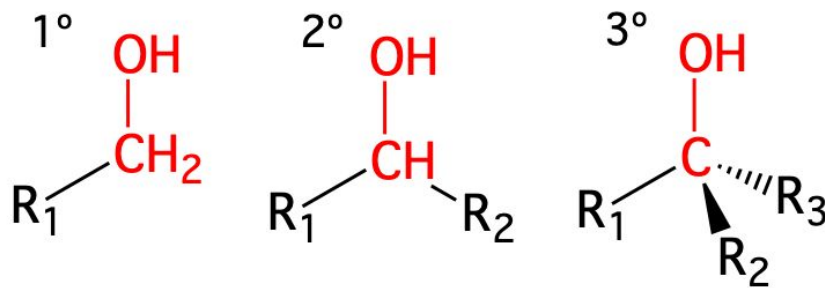


What is the difference between primary, secondary and tertiary alcohols?



What is the difference between primary, secondary and tertiary alcohols?

Primary alcohols have only one alkyl group attached to the carbon to which the hydroxyl group is bonded, secondary alcohols have two and tertiary alcohols have three.



How are alcohols named?



How are alcohols named?

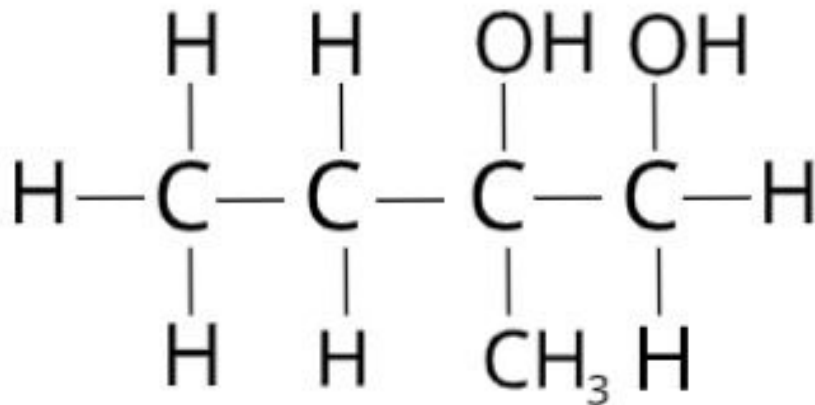
Alcohols generally have the suffix -ol.

E.g. Ethanol, Propan-2-ol, butan-1,3-diol

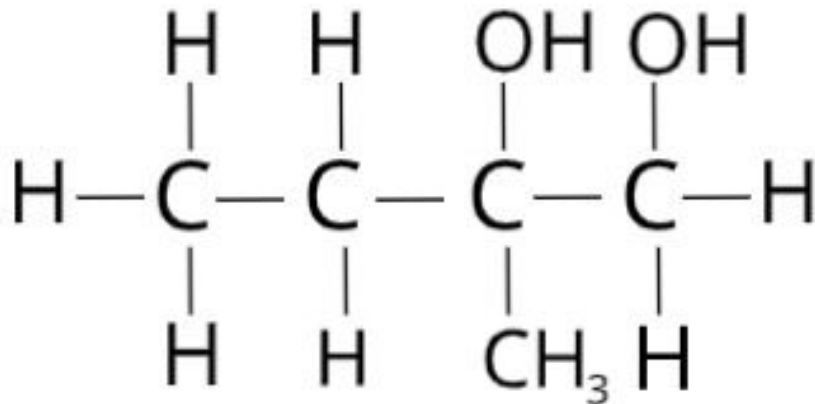
They sometimes have the prefix hydroxy- if the suffix of the compound is taken by a different functional group.



Name the alcohol below



Name the alcohol below



2-methylbutane-1,2-diol



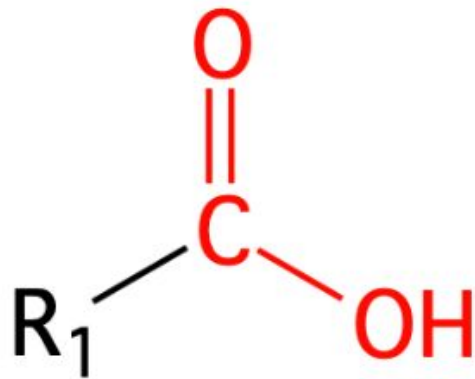
What is a carboxylic acid?



What is a carboxylic acid?

A carboxylic acid is an organic compound that contains a COOH functional group.

General formula: $C_n H_{2n+1} COOH$



How are carboxylic acids named?



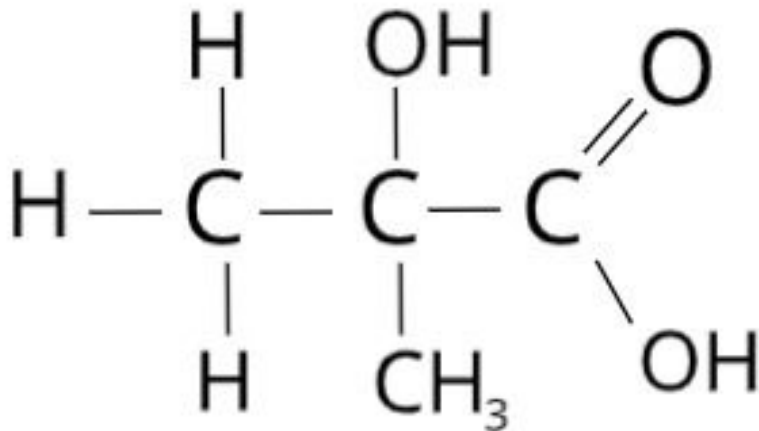
How are carboxylic acids named?

Carboxylic acids have the suffix -oic acid.

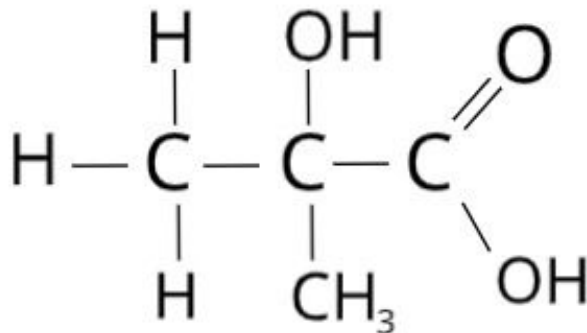
E.g. Ethanoic acid, Propanedioic acid



Name the compound below



Name the compound below



2-hydroxy-2-methylpropanoic acid



How does the chain length affect the melting/boiling point of an organic compound?



How does the chain length affect the melting/boiling point of an organic compound?

The longer the chain length, the higher the melting/boiling point.

This is because the longer the carbon chain, the more points of contact there are between molecules. This means there are stronger temporary dipoles between the molecules so more energy is required to overcome the intermolecular forces.



How does the chain length affect the solubility of an alcohol?



How does the chain length affect the solubility of an alcohol?

As chain length increases, alcohols become less soluble in water. In water, the alcohol OH group forms a hydrogen bond with water which replaces hydrogen bonds between water molecules. Only the OH group in alcohols can form H bonds, so longer alcohols disrupt the hydrogen bonding between water molecules but don't replace them with additional H bonds, as the CH₂ groups do not form these.



Why are alcohols and carboxylic acids soluble in water?



Why are alcohols and carboxylic acids soluble in water?

Carboxylic acids and alcohols can form hydrogen bonds with water molecules and therefore they are soluble in water.



Compare the boiling points of alcohols, alkanes and carboxylic acids



Compare the boiling points of alcohols, alkanes and carboxylic acids

Alkanes < alcohols < carboxylic acids

Alkanes have the lowest boiling points because they only have temporary dipole forces between molecules, which are relatively easily overcome.

Alcohols and carboxylic acids both form hydrogen bonds which require a lot of energy to overcome and therefore they have higher boiling points.

Carboxylic acids have the highest boiling points because two possible hydrogen bonds can be formed per carboxylic acid molecule.



What is structural isomerism?



What is structural isomerism?

Structural isomerism is when compounds have the same molecular formula but a different arrangement of atoms (different structural formula).



What are the three types of structural isomerism?



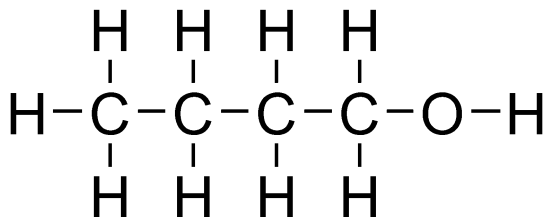
What are the three types of structural isomerism?

- Chain isomerism
- Functional group isomerism
- Position isomerism

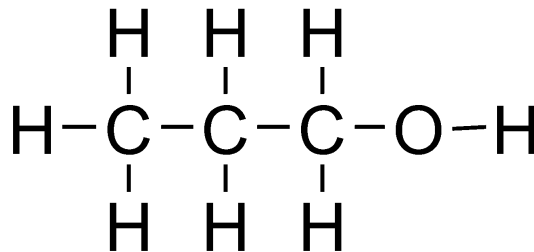


Which of the following compounds show structural isomerism?

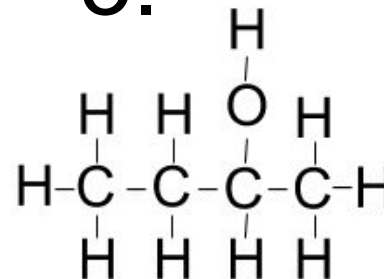
1.



2.

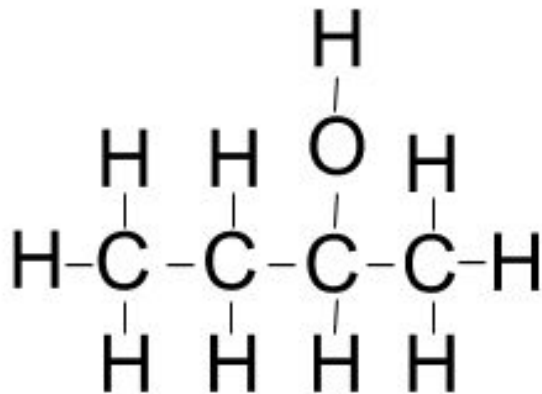
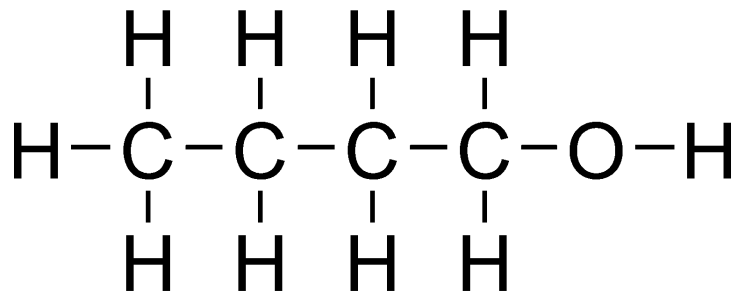


3.



Which of the following compounds show structural isomerism?

1 and 3 are structural isomers. Moreover, they are position isomers.

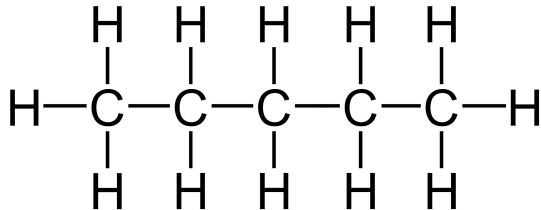


What are the different structural isomers
of C_5H_{12} ?

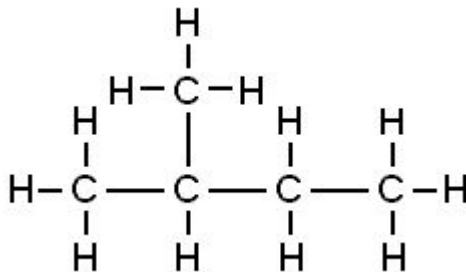


What are the different structural isomers of C_5H_{12} ?

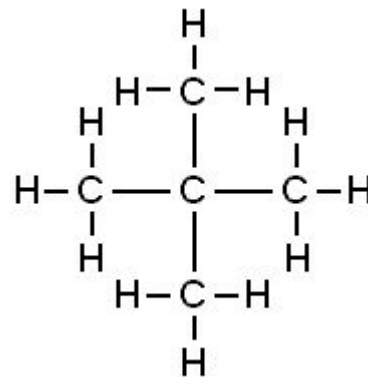
Pentane



2-methylbutane



2,2-dimethylpropane



What is a nucleophile?



What is a nucleophile?

A nucleophile is a species that donates a lone pair of electrons in a reaction.



What is an electrophile?



What is an electrophile?

An electrophile is a species that accepts a lone pair of electrons in a reaction.



What is heterolytic bond fission?



What is heterolytic bond fission?

Heterolytic bond fission is the breaking of a covalent bond where one of the bonded atoms gets both electrons. This produces one nucleophile and one electrophile.



What is homolytic bond fission?



What is homolytic bond fission?

Homolytic bond fission is the breaking of a covalent bond where both bonded atoms get one electron, producing free radicals.



What is a free radical?



What is a free radical?

A free radical is a neutral molecule that has an unpaired electron.

