D1-Structural Isomers Theory Sheet

Structural isomerism is when the molecular formula is the same but the structural arrangement of the atoms is different. The shape of the carbon chain, functional groups and the position of atoms and groups within the molecule may be different. Structural isomers will display different chemical and physical properties.

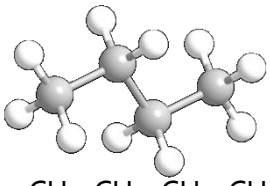
TOP TIP! If you have a model of an atom, you can easily determine if it has an isomer! If you have to break at least two relevant bonds and swap them with each other then it has an isomer. The new form must be different from the original molecule and have the same number of atoms. Don't just twist the bonds to change its appearance, making it look like an isomer!

Types of structural isomerism;

Chain isomerism- Branching of the carbon chain .

Butane, C4H10 has two chain isomers.

One is a straight chain and the other branched.



CH_3-CH_2-CH_2-CH_3

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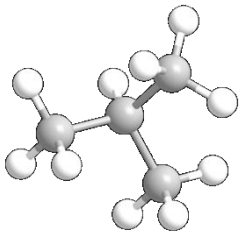

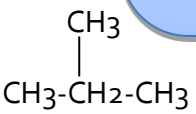

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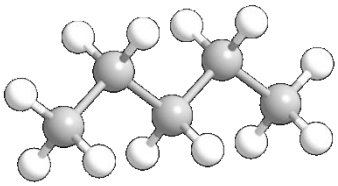
As the molecular size increases the number of isomers also increases! C_4- has 2 isomers, C_5 has 3 isomers and has C_{30}- 4.11×10^9 isomers!

Pentane,C5H12, has three structural isomers.



CH_3-CH_2-CH_2-CH_2-CH_3

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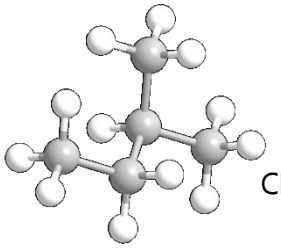
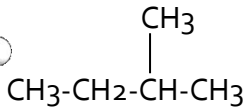
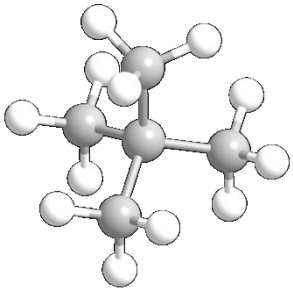
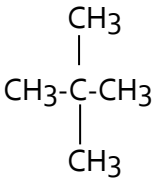


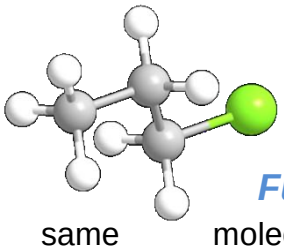






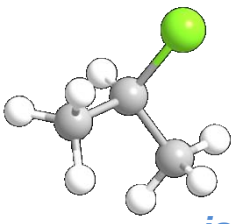
Position isomerism- These occur from the basic carbon chain staying constant with the overall molecular formula staying the same, but the important groups (halogens, alcohol group, benzene ring) move around on that carbon skeleton.

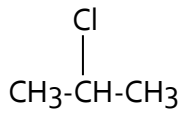
C_3H_7Cl has positional isomers; occurring when the chlorine atom is attached to either the middle carbon or the end carbons.



CH_3-CH_2-CH_2-Cl

1-chloropropane





2-chloropropane

TOP TIP If an alkane contains more than 4 carbon atoms, then you know that there is more than one structural isomer.

Functional group isomerism- Is isomerism that has the same molecular formula but has different functional groups (see functional groups sheet). C_3H_6O can be either propanal or propanone. They still have the same molecular formula but different functional groups so they are isomers. Another example is carboxylic acids and esters, these will both have the COO group in a different form with all other atoms being the same making them functional group isomers.

Produced by Emma Burnett at Newcastle University as part of a Nuffield Bursary Project. Edited by Steven Carman as part of a MChem project