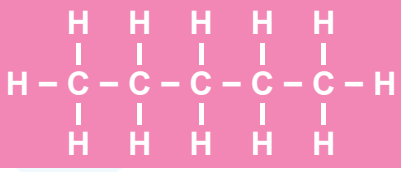
Isomers

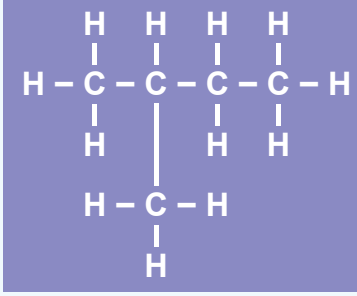
Sometimes a chemical formula isn't as straightforward as it seems. Pentane is a compound that has the formula C_5H_{12} which seems simple enough and if you drew it out it looks nice and simple like in the diagram opposite.

BUT 2-methylbutane and 2,2-dimethylpropane also have the formula C_5H_{12} but they look nothing like pentane as you can see in the diagrams opposite. That is because they are **isomers**. **Isomers** have the **same molecular formulae** but have **different atom arrangements**. This is a specific example of a structural isomer because the structures are different. There are three types of structural isomers, these are shown in the table below.

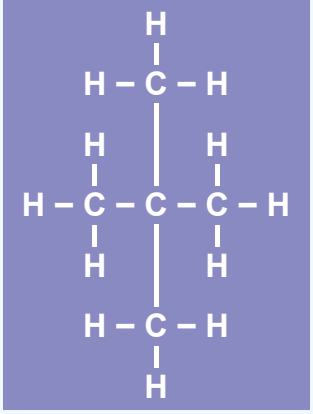
pentane



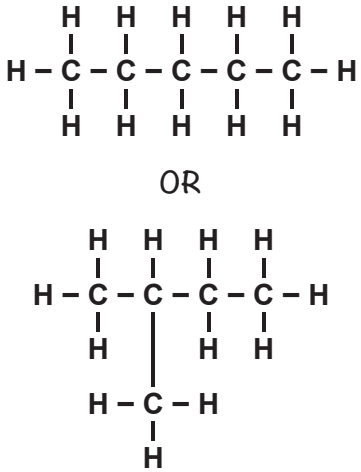
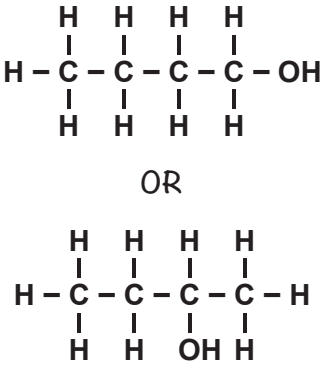
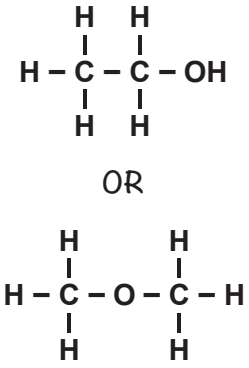
2-methylbutane



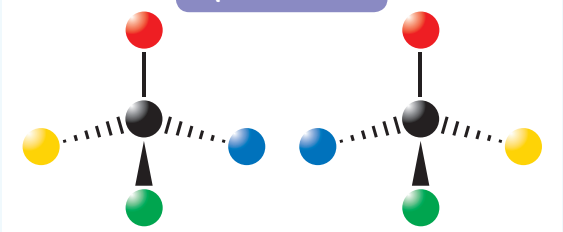
2,2-dimethylpropane



Structural Isomers

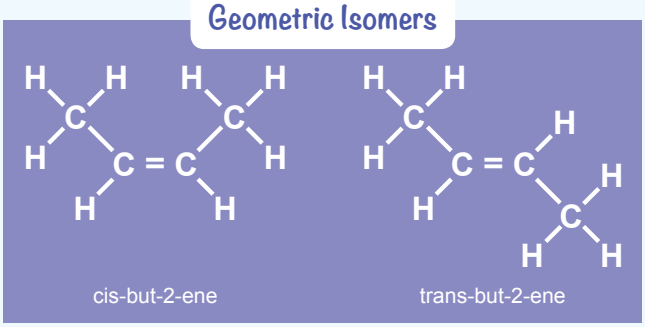
Chain	Positional	Functional
The way the carbon atoms are linked differs.	The groups attached to the carbons are in different places.	Some form different functional groups.
		
both C_5H_{12}	both $C_4H_{10}O$	both C_2H_6O
The first compound has all carbons in a chain. The second compound has carbons in a branch.	The first compound has an OH off the first carbon. The second compound has the OH off the second carbon.	The first compound contains an OH (hydroxyl group). The second compound has a R-O-R group.

Optical Isomer



The other main type of isomerism is **stereoisomerism** and is where they are arranged differently in space. This means the angles that the groups are positioned at are different. In **optical stereoisomers** they are mirror images of each other. The other type are **geometrical stereoisomers** which have a different arrangement or angle of the parts. ***Cis*** means they are one the same side and ***trans*** on different sides. These differences in layout and structure cause them to have different properties, such as melting and boiling point, reactivity and strength.

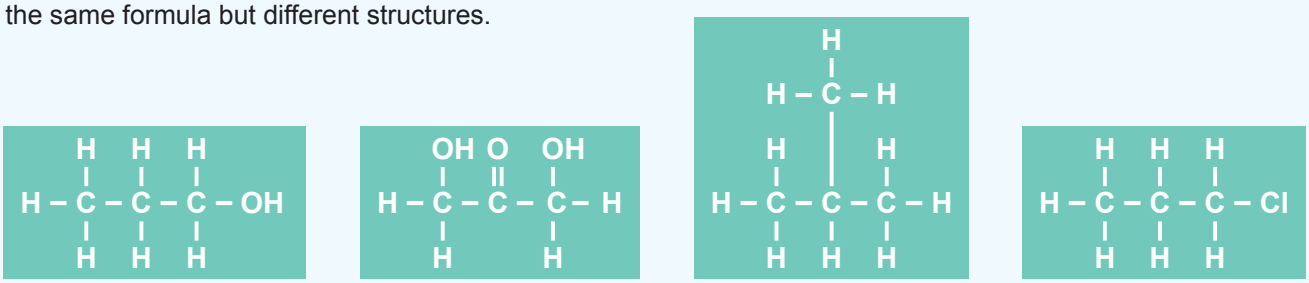
Geometric Isomers

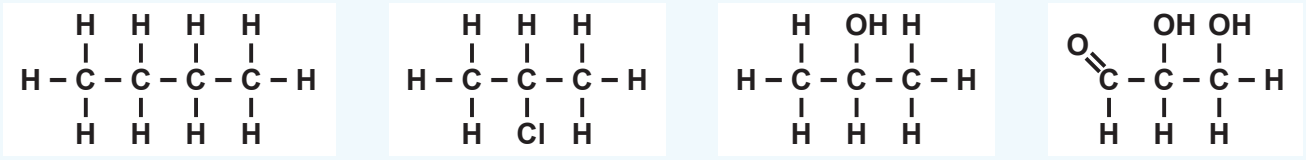


cis-but-2-ene

trans-but-2-ene

1. Match the following structural isomers together by drawing a line between them. Look for matching pairs with the same formula but different structures.

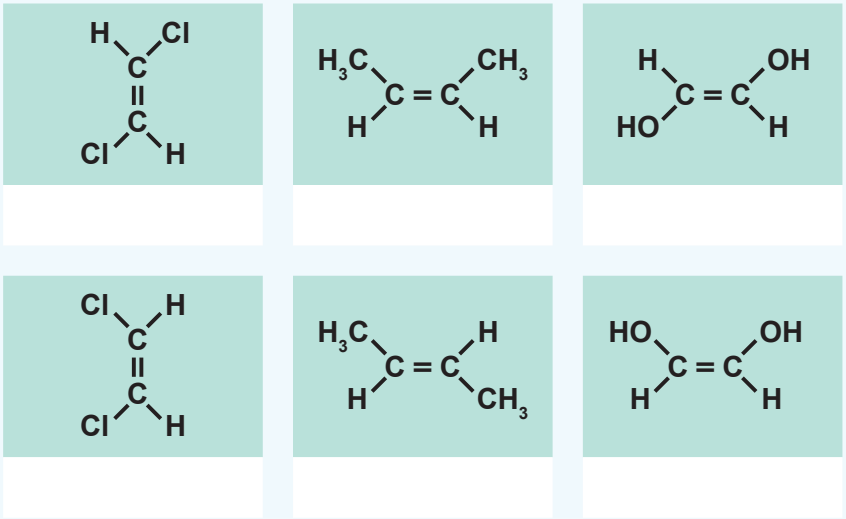




2. Write the formula for each of the pairs above along the line that you have drawn. The formulae are given below.

C_3H_8O C_3H_7Cl C_4H_{10} $C_3H_6O_3$

3. Label each of the following geometrical stereoisomers as either **cis** or **trans**.



4. Draw an optical stereoisomer of the following compound.