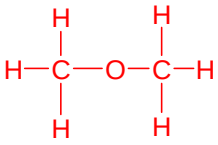
Constitutional Isomers (structural isomers)

Different compounds have the same molecular formula are called isomers and because they have different connectivity (which atom is bonded to which) we call them constitutional isomer or structural isomers.

Example 1

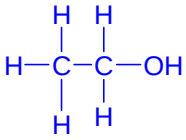
$$C_2H_6O$$

This compound has a molecular formula of C_2H_6O. Now we can draw two structures **1** & **2** for this molecular formula



1

Dimethylether



2

Methanol

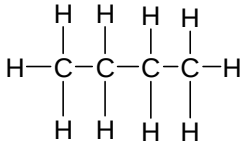
Dimethyl ether **1** and Methanol **2** are constitutional isomers (or structural isomers) that because both of them have the same molecular formula C_2H_6O but they have different structures due to the differing in the bond connectivity of atoms to each other. In **1** the bonds are **C-O-C** and each C atom has 3 H atoms. In structure **2** the bonds are **C-C-O** and each carbon has 2H and there is a one H bonded to O atom.

Example 2

The molecular formula of butane is C_4H_{10}. How many structure we can draw for butane in order to obtain a saturated hydrocarbon with molecular formula C_4H_{10}?

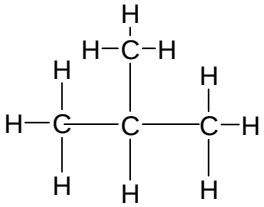
There are only two different structures you can draw for C_4H_{10} which are:

$$C_4H_{10}$$



n-Butane

3



isoButane

4

Again

The two structures have the same molecular formula but they have different connectivity (which atom is bonded to which) so they are constitutional isomers.

Please note that **1** & **2** are completely two different compounds, they have different physical (b.p, mp, .etc.) and chemical properties. For example **2** is chemically active and it can reacts with carboxylic acid to form ester while **1** will not react.

Now if I gave you modules for both **1** & **2**, and ask you to convert **1** to **2** or *vies versa*

You will never be able to do so without breaking the bonds and then re-build the molecules. The same thing is applicable in the case of structures **3**& **4**.

We will never be able to interconvert from one structural isomer to another by rotation about bonds. We only can do that *via* only breaking bonds.

Which type of isomers that can interconvert to another isomer *via* rotation about bonds?

If you do not know the answer, please go back to page 20 in the previous lecture notes and you will be able to answer this simple question.

In summary

Constitutional Isomers have the same molecular formula but have different bonds connectivity

Is that clear? If yes go to the next section if not try to revise the subject again and

Please do not hesitate to ask me if you have any question