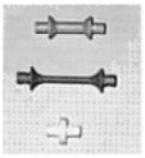
Organic Student Set
Cat. No. 2021008

Distributed by
Serrata Pty. Limited

Contents

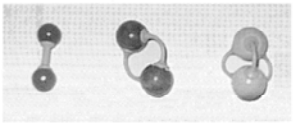
Qty	Element	colour	holes / type	Dia mm
12	Carbon **C**	black	4 tetrahedral.	23
20	Hydrogen **H**	white	1	17
6	Oxygen **O**	red	2 angular(bent)	23
2	Nitrogen **N**	blue	4 tetrahedral	23
2	Nitrogen **N**	blue	3 pyramidal	23
1	Sulphur **S**	yellow	4 tetrahedral	23
1	Sulphur **S**	yellow	6 octahedral	23
4	Halogen **Cl**	green	1	17
1	Phosphorus **P**	purple	4 tetrahedral	23
1	Metal **Na**	grey	1	17
26	Link	grey	medium	19 / 31 *
12	Link	grey	long flexible	32 / 43 *
26	Link	white	short	2 / 10 *
1	tool			* total

Links, Bond types and Use

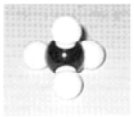


Medium grey links are used for single covalent bonds.
Long grey links are used for double or triple covalent bonds .
Short white links can be used instead of the standard medium link to make compact models.

Open models are made using medium or long links. Examples of single, double and triple bonds are shown in the photo.



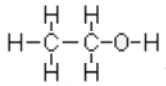
Compact models are made using short white links. e.g methane which is made from four hydrogen atoms (white) connected to a central carbon atom using short links.



Molecular, and Structural Formulae

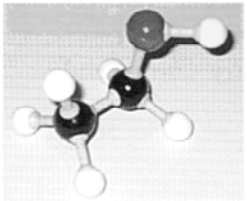
The Molecular formula shows the exact number of atoms of each element which are present in one molecule, e.g. ethanol C_2H_6O 2 carbon, 6 hydrogen, 1 oxygen

The Structural formula is a plan view of the arrangement of the atoms in a molecule showing symbols for atoms and lines for the bonds between the atoms in the molecule.



ethanol

A Molecular model of ethanol

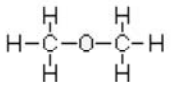


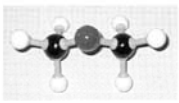
The structural formula is only a 2-dimensional representation of the molecule, and does not show the true bond angles.
The bond angles in a carbon atom are arranged in a tetrahedral formation and are at 109.5 ° to each other.
A molecular model gives a more accurate idea of the bond angles and orientation of the atoms.

The Constitutional formula is an abbreviated version of a molecule and shows groups of atoms. For example, $CH_3.CH_2.OH$ is an abbreviated version for the formula of ethanol.

Isomerism

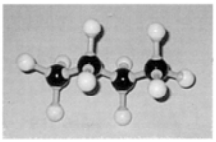
It is possible to make a different structure using the same number of atoms as in C_2H_6O
Arrange the atoms as shown across.





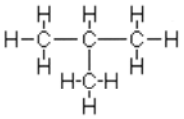
See how the oxygen atom is between the two carbon atoms. This structure is a completely different substance known as an ether. When two or more substances have the same number and kind of atoms but different structures they are called **Isomers**.
Ether is an **Isomer** of Ethanol

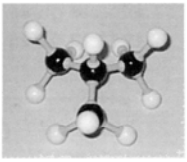
Another example of Isomerism



Butane has the molecular formula C_4H_{10} Its structural formula is $CH_3.CH_2.CH_2.CH_3$

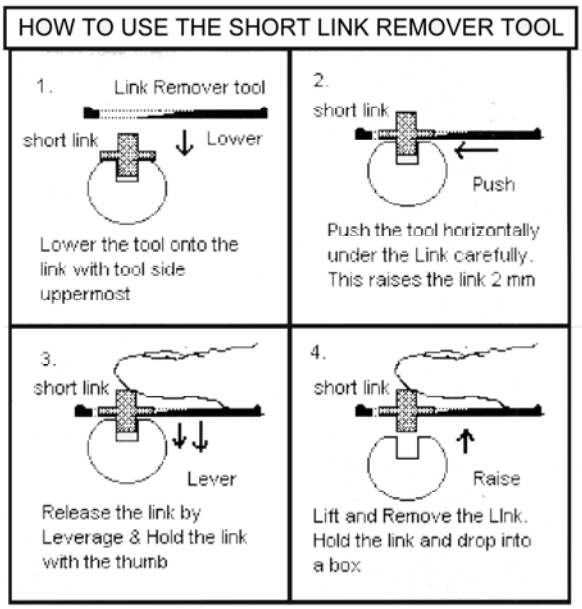
The same atoms can be rearranged to make a different structure named iso-butane which is shown in the image across. The structural formula of iso-butane is:





Disassembly of Compact Models

Please read the following instructions for the recommended use of the Link Remover tool.



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ORGANIC COMPOUNDS

Alkanes General formula C_nH_{2n+2}

Note: for example If n = 6 then
2n+2 = (2 x 6) + 2 = 14
and the formula is therefore C_6H_{14}

Methane CH_4 Ethane C_2H_6

Propane C_3H_8 Butane C_4H_{10}

Pentane C_5H_{12} Hexane C_6H_{14}

Heptane C_7H_{16} Octane C_8H_{18}

Alkyl radicals An alkyl radical is an alkane molecule less one hydrogen. e.g methane CH_4 gives CH_3- *methyl,* ethane gives *ethyl*, propane gives *propyl*, butane gives *butyl*, etc

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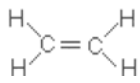
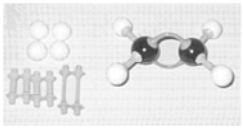
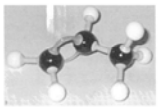
Alkenes General formula C_nH_{2n}

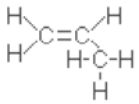
Ethene C_2H_4



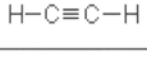


Propene C_3H_6

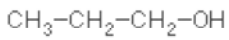


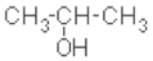


Alkynes General formula C_nH_{2n-2}

Ethyne 

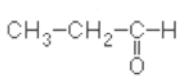
Alcohols
General formula $C_nH_{2n+1}.OH$

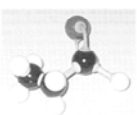
n-propanol 

iso-propanol (an isomer) 

Aldehydes General formula $C_nH_{2n+1}.CHO$

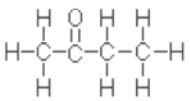
e.g propanal



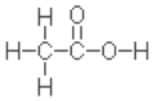


Ketones General formula $C_nH_{2n+1}.O.C_nH_{2n+1}$

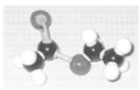
e.g. butanone

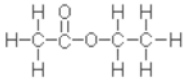


Carboxylic acids
General formula $C_nH_{2n+1}.COOH$
e.g. ethanoic acid

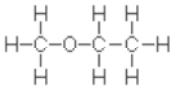


Esters General formula $C_nH_{2n+1}.COO.C_nH_{2n+1}$
e.g. ethyl ethanoate



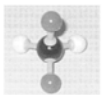


Ethers General Formula $C_nH_{2n+1}.O.C_nH_{2n+1}$
e.g. methyl ethyl ether



Halogen Compounds
Monochloromethane CH_3Cl

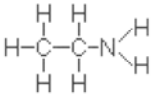
Dichloromethane CH_2Cl_2



Trichloromethane $CHCl_3$
Tetrachloromethane CCl_4

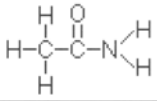
Dichloroethane $C_2H_4Cl_2$ two isomers are possible. Check by making two models.

Amines
General formula $C_nH_{2n+1}.NH_2$
e.g ethylamine



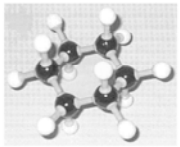
Amides
General formula $C_nH_{2n+1}.CO.NH_2$

e.g. acetamide



Cycloalkanes
These are ring compounds
e.g. cyclohexane C_6H_{12}

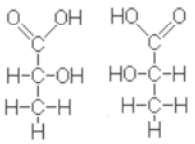
This molecule is capable of existing in one of two arrangements, known as either the "boat" and "chair".



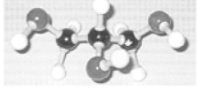
The photo shows the "chair" See if you can change it to the "boat".

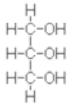
Some Biochemistry Compounds

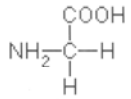
Lactic acid
Contains an asymmetric carbon atom and can form structures that are mirror images of each other. They are known as optical isomers.



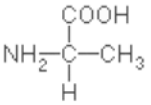
Glycerol
This compound can be made from animal fat (glyceryl tristearate) which is a very large molecule having 173 atoms

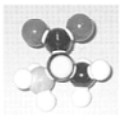




Amino-acids
e.g. glycine 

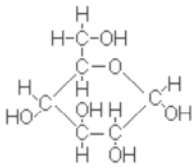
Alanine

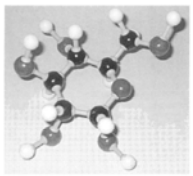




Amino-acids combine to form proteins

Glucose $C_6H_{12}O_6$



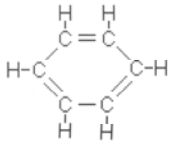


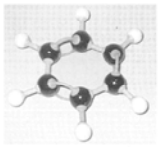
Glucose is the simplest of the monosaccharides.

Some Aromatic Compounds

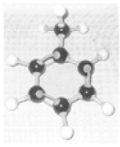
Benzene is the first of the Aromatic family of compounds containing the same type of ring structure.

Benzene C_6H_6

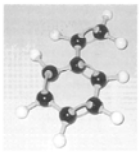




Toluene $C_6H_5.CH_3$
The structure consists of a methyl group joined to a benzene ring in place of a hydrogen.

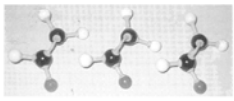


Styrene $C_6H_5.CH=CH_2$
Many molecules of Styrene can combine to form a polymer called polystyrene.

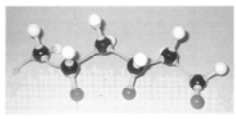


A Polymer
e.g. Polyvinyl chloride PVC

The Photo shows 3 models of vinyl chloride each with a double bond.



These can polymerise To form a chain known as PolyVinyl chloride (PVC)



Polymerisation involves the opening of the alkene bond to create the connections for chain to form.

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