Manual de instrucciones

Kit modelucar química orgánica, profesor (QBR004)

Descripción:

Los modelos de moléculas orgánicas proporcionan una representación física de la disposición tridimensional de los átomos en el espacio. El uso de un kit de modelos moleculares para los estudios de química orgánica permitirá comprender mejor las propiedades químicas y físicas de las moléculas. El kit consta de:

Contenido	
Átomos	Enlaces
32 Carbono (Negro) 40 Hidrógeno (Blanco) 22 Oxígeno (Rojo) 8 Halógeno (Verde) 7 Fósforo (Morado) 10 Nitrógeno (Azul) 13 Azufre (Naranja) 14 Metal (Gris)	50 cortos (Blanco) 36 largos flexibles (Gris)

- Los enlaces medios de color gris se usan para enlaces covalentes individuales, como los del agua.
- Los enlaces largos de color gris son flexibles y se usan para enlaces dobles o triples.
- Los enlaces medios de color púrpura se usan para contraste en los siguientes casos:
- Enlaces covalentes coordinados/dativos, por ejemplo, NH_3, BF_3, o iones metálicos complejos.
- Representación de enlaces iónicos en la formulación empírica de compuestos iónicos como Na+ ... Cl- .
- Las partes del átomo se pueden usar para hacer modelos de moléculas de agua, amoníaco, metano, dióxido de carbono, alcohol y muchas otras sustancias.

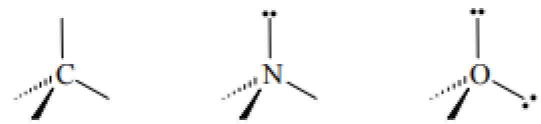
Compuestos orgánicos

Estructura tetraédrica

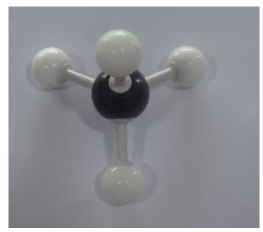
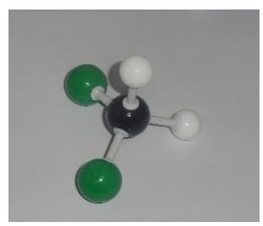
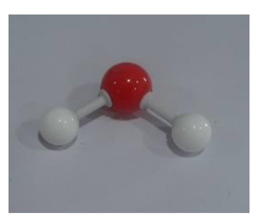
¡Las piezas tetraédricas no deben confundirse con las piezas finales grises de doble enlace! Hay piezas tetraédricas negras, rojas y azules, que son los colores estándar (o CPK) para carbono, oxígeno y nitrógeno, respectivamente. Para ensamblar un centro tetraédrico, tome dos piezas tetraédricas (generalmente del mismo color) y júntelas. Un centro tetraédrico representa un átomo con cuatro grupos unidos. Recuerde de VSEPR2 que un grupo puede ser un enlace o un par solitario de pares de electrones.

Ensamble centros tetraédricos a partir de piezas tetraédricas de cada color. Observe que los cuatro brazos o "enlaces" están dispuestos en ángulos de 109.5º. El centro negro representa un átomo de carbono, con cuatro enlaces. El centro azul representa un átomo de nitrógeno, con tres enlaces y un par solitario de electrones. El centro rojo representa un átomo de oxígeno, con dos enlaces y dos pares solitarios.

Para representar el metano (CH_4), puede usar cuatro bolas blancas (que representan átomos de hidrógeno) unidas al centro tetraédrico negro. El amoníaco (NH_3) y el agua (H_2O) se pueden representar usando tres y dos bolas blancas, respectivamente. Sin embargo, las moléculas más grandes tendrán demasiados hidrógeno para que este método sea práctico, dado el limitado suministro de bolas blancas. ¡Una alternativa es representar un par solitario de electrones con una bola de color y dejar que los extremos en blanco representen átomos de hidrógeno! Además, el oxígeno divalente (como en el agua) puede ser representado por una sola pieza tetraédrica roja.



black blue red

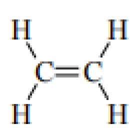
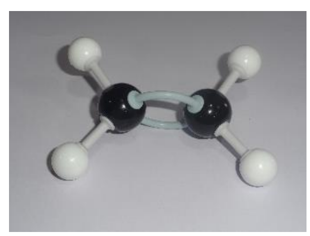
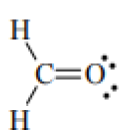
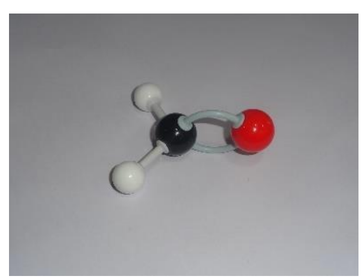
CH_4	
CH_2Cl_2	
NH_3	
H_2O	

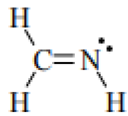
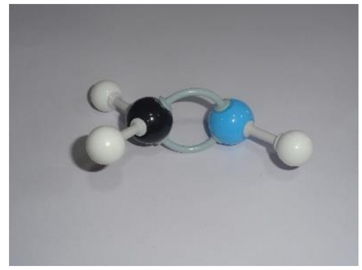
Doble enlace

Las piezas de doble enlace son de varios tipos: piezas finales, que son grises; dobles enlaces grises; y medios enlaces que son grises o rojos. Las piezas grises se utilizan para representar átomos de carbono y dobles enlaces carbono-carbono; para representar un doble enlace carbono-carbono, coloque un extremo gris en cada extremo de uno de los dobles enlaces grises.

Los dobles enlaces carbono-oxígeno (grupos carbonilo) pueden representarse usando los medios enlaces grises y rojos. Para representar un grupo carbonilo, primero junte un medio enlace rojo y uno gris; luego encaje una pieza gris en el extremo gris del doble enlace.

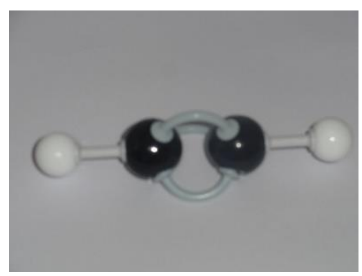
Los dobles enlaces carbono-nitrógeno son más raros en química orgánica, y el hecho de que la valencia del nitrógeno no esté llena significa que un grupo puede estar unido al nitrógeno. Para representar un doble enlace carbono-nitrógeno, tome una pieza gris de doble enlace. Encaje una pieza final gris en un extremo para representar carbono, y una pieza tetraédrica azul en el otro extremo para el nitrógeno.

 ethene	
 methanal	

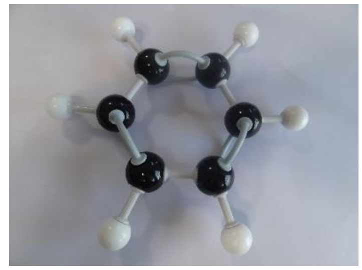
Triple enlace

Los enlaces triples se representan usando las piezas grises de enlace triple. Cada pieza representa DOS átomos de carbono con un triple enlace entre ellos y una valencia abierta para cada átomo. Observe que los enlaces triples tienen un ángulo de enlace normal de 180º. También son posibles los triples enlaces carbono-nitrógeno (dichos enlaces se denominan grupos ciano o nitrilo), pero no hay una forma distinta de representarlos con este kit modelo.

$H-C\equiv C-H$ ethyne	

Hidrocarburo cíclico

Un hidrocarburo cíclico es un compuesto formado solo por carbono e hidrógeno, que forma un anillo. Un cicloalcano es un hidrocarburo cíclico que contiene solo enlaces simples carbono-carbono. Los cicloalquenos y cicloalquinos son hidrocarburos cíclicos que contienen enlaces dobles y triples carbono - carbono, respectivamente.

Más abajo se brinda información de algunas moléculas; haga los modelos según la estructura de las moléculas.

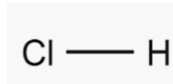
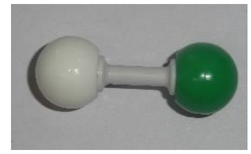
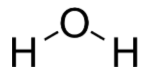
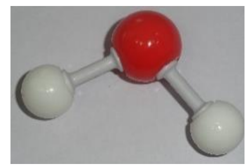
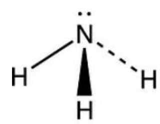
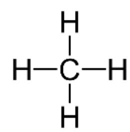
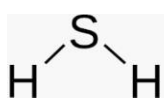
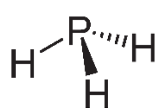
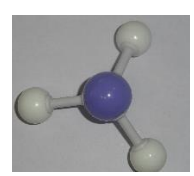
Compuesto inorgánico

Elemento

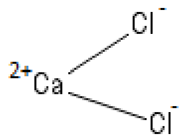
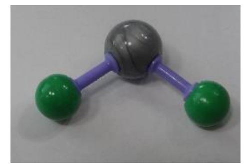
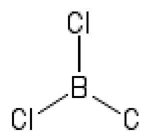
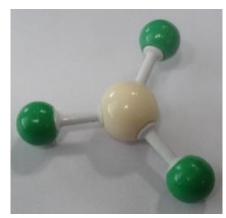
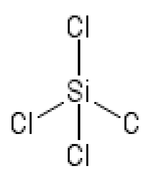
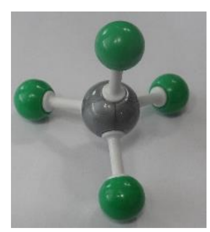
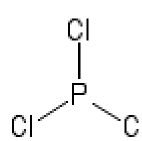
Hidrógeno	H-H	
Oxígeno	O=O	
Nitrógeno	N≡N	

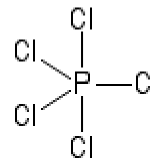
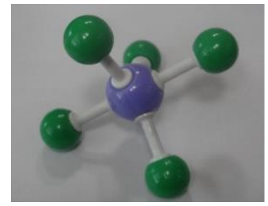
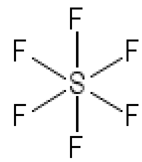
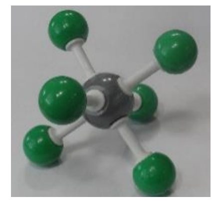
Hidrógeno (H-H), Cloro (Cl-Cl), Oxígeno (O=O), Nitrógeno (N≡N)

Los hidruros son compuestos de hidrógeno con otro elemento

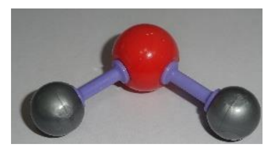
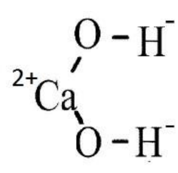
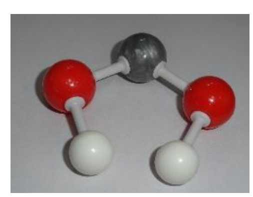
Cloruro de Hidrógeno		
Agua angular (oxígeno con ángulo de enlace 105°)		
Amoníaco piramidal (nitrógeno de 107°)		
Metano tetraédrico		
Sulfuro de Hidrógeno (azufre con 2 orificios)		
Fosfina piramidal (3 orificios)		

Haluros, cloruros y fluoruros

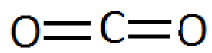
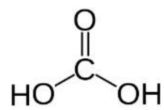
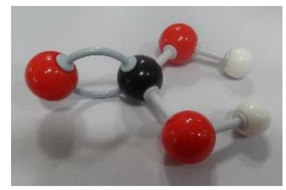
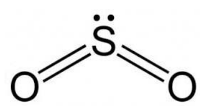
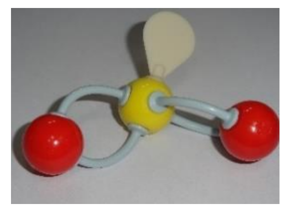
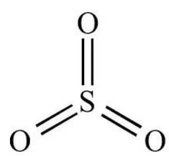
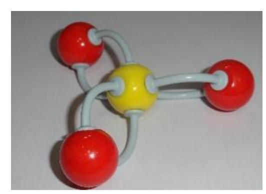
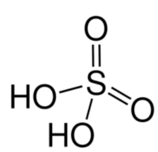
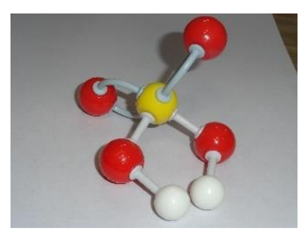
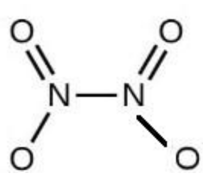
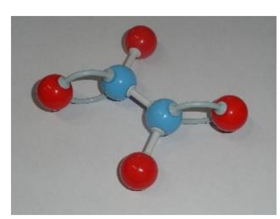
Cloruro de Sodio	$Na^{+} \cdots Cl^{-}$	
Cloruro de Calcio iónico		
Cloruro de Berilio (2 orificios, lineal metálico)	Cl—Be—Cl	
Tricloruro de Boro		
Tetracloruro de Silicio (4 orificios)		
Tricloruro de Fósforo (Trigonal plana, 5 orificios)		

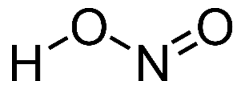
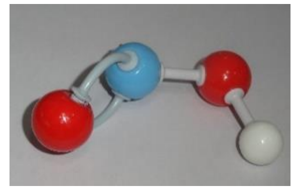
Pentacloruro de Fósforo (Trigonal Bipirámide, 5 orificios)		
Hexafluoruro de Azufre (6 orificios metal)		

Óxidos metálicos e hidróxidos

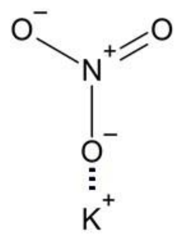
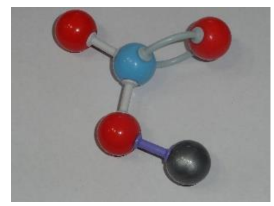
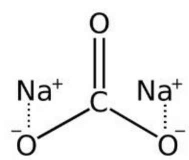
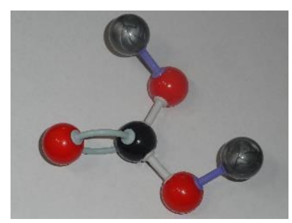
Monóxido de Sodio	$Na - - O - - Na$	
Hidróxido de Sodio	$Na^{2+} \cdots\cdots O — H^{-}$	
Óxido de Calcio	$Ca^{2+} = O^{2-}$	
Hidróxido de Calcio		

Óxidos no metálicos y ácidos

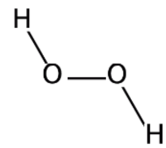
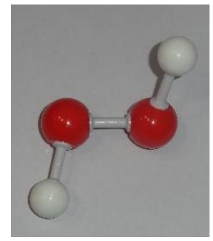
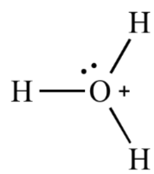
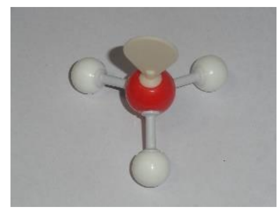
Dióxido de Carbono lineal		
Ácido Carbónico		
Dióxido de Azufre (6 orificios)		
Trióxido de Azufre (Trigonal plana 6 orificios)		
Ácido Sulfúrico (6 orificios)		
Tetróxido de dinitrógeno molécula plana (Nitrógeno 4 orificios, Oxígeno 3 orificios)		

Ácido nitroso molécula plana (Nitrógeno 4 orificios)		

Sales

Nitrato de Potasio		
Carbonato de Sodio		

Otros

Peróxido de Hidrógeno (molécula no plana)		
Ion hidroxonio (Oxígeno 4 orificios)		

Instruction Manual

Molecular model kit, organic chemistry, teacher; code QBR004

Description:

Models of organic molecules provide a physical representation of the three-dimensional arrangement of atoms in space. Using a molecular model kit throughout your study of organic chemistry will enable you to better understand both the chemical and physical properties of the molecules you encounter. The kit consists of:

Contents	
Atomic parts	Links
32 Carbon (Black) 40 Hydrogen (White) 22 Oxigen (REd) 8 Halogen (Green) 7 Phosphorus (Purple) 10 Nitrogen (Blue) 13 Sulphur (Orange) 14 Metal (Grey)	50 short (White) 36 Long flexible (Grey)

- Medium grey links are used for single covalent bonds as in water.
- Long grey links are flexible and are used for double or triple bonds.
- Purple medium links are used for contrast in the following cases:
- Co-ordinate/dative covalent bonds, e.g. NH_3, BF_3, or metal complex ions.
- Representation of ionic bonds in the empirical formulae of ionic compounds such as Na+ ... Cl-
- Molecular model atom parts can be used to make molecules models of water, ammonia, methane, carbon dioxide, alcohol and many other substances.

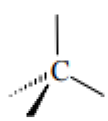
Organic Compound

Tetrahedral structure

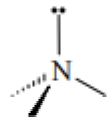
Tetrahedral pieces should not be confused with the gray double-bond end-pieces! There are black, red and blue tetrahedral pieces, which are the standard (or CPK) colors for carbon, oxygen and nitrogen respectively. To assemble a tetrahedral center, take two tetrahedral pieces (usually of the same color) and snap them together. A tetrahedral center represents an atom with four groups attached. Remember from VSEPR2 that a group can be either a bond or a lone pair of electrons pairs.

Assemble tetrahedral centers from tetrahedral pieces of each color. Notice that the four arms or “bonds” are arranged at angles of 109.5º. The black center represents a carbon atom, with four bonds. The blue center represents a nitrogen atom, with three bonds and a lone pair of electrons. The red center represents an oxygen atom, with two bonds and two lone pairs.

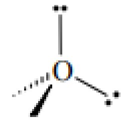
To represent methane (CH_4), you may use four white balls (representing hydrogen atoms) attached to the black tetrahedral center; ammonia (NH_3) and water (H_2O) can be represented by using three and two white balls, respectively. However, larger molecules will have too many hydrogen’s for this method to be practical, given your limited supply of white balls. One alternative is to represent a lone pair of electrons by a colored ball, and let blank ends represent hydrogen atoms! Also, divalent oxygen (as in water) can be represented by a single red tetrahedral piece.



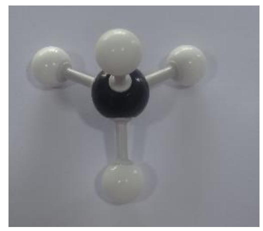
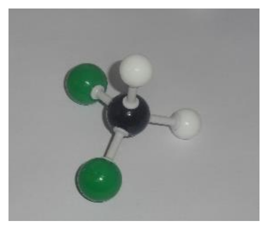
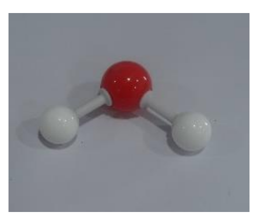
black



blue



red

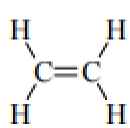
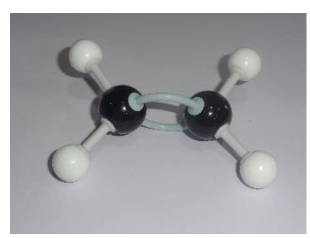
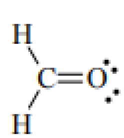
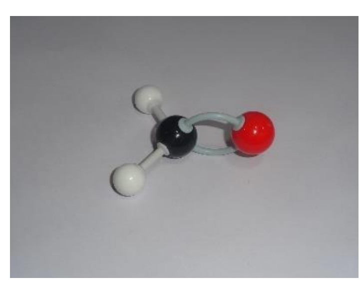
CH_4	
CH_2Cl_2	
NH_3	
H_2O	

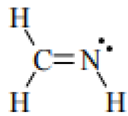
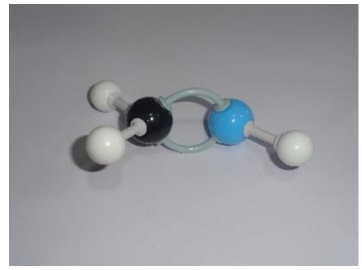
Double Bond

Double-bond pieces include several types: end-pieces, which are gray; gray double bonds; and half-bonds which are either gray or red. The gray pieces are used to represent carbon atoms and carbon-carbon double bonds; in order to represent a carbon-carbon double bond, snap a gray end-piece into each end of one of the gray double bonds.

Carbon-oxygen double bonds - carbonyl groups - may be represented using the gray and red half-bonds. To represent a carbonyl group, first snap together one red and one gray half-bond; then snap a gray end piece into the gray end of the double bond.

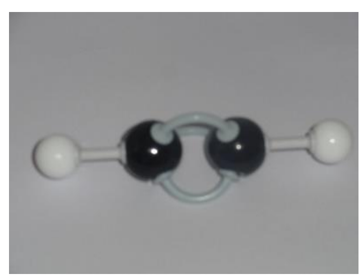
Carbon-nitrogen double bonds are rarer in organic chemistry, and the fact that the nitrogen's valence is not filled means that a group may be bonded to nitrogen. To represent a carbon-nitrogen double bond, take a gray double bond piece. Snap a gray end-piece into one end to represent carbon, and a blue tetrahedral piece into the other end for nitrogen.

 ethene	
 methanal	

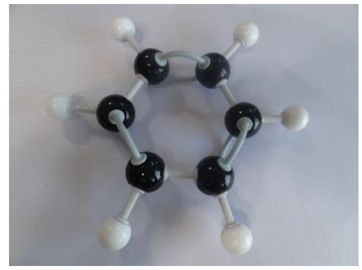
Triple Bond

Triple bonds are represented using the gray triple-bond pieces. Each piece represents TWO carbon atoms with a triple bond between them and one open valence for each atom. Notice that triple bonds have a normal bond angle of 180º. Carbon-nitrogen triple bonds are also possible (such bonds are referred to as cyano or nitrile groups), but there is no distinct way to represent them with this model kit.

H—C≡C—H ethyne	

Cyclic hydrocarbon

A cyclic hydrocarbon is a compound composed only of carbon and hydrogen that forms a ring. A cycloalkane is a cyclic hydrocarbon that contains only carbon - carbon single bonds. A cycloalkene and cycloalkyne are cyclic hydrocarbons that contain carbon - carbon double and triple bonds respectively.

Below is the information of some molecules; make the model according to the structure of the molecules.

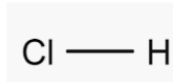
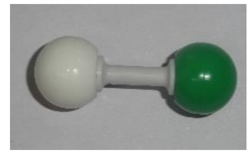
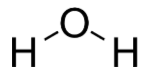
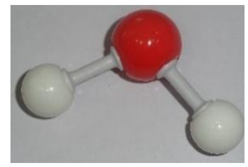
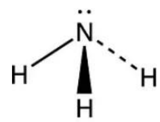
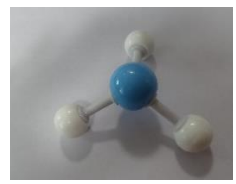
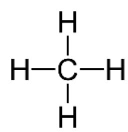
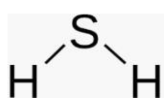
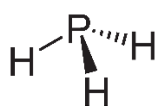
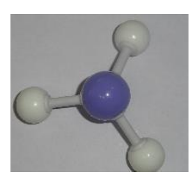
Inorganic Compound

Element

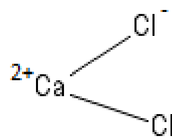
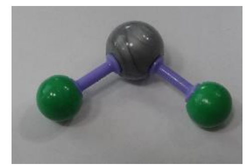
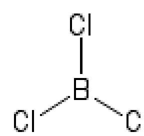
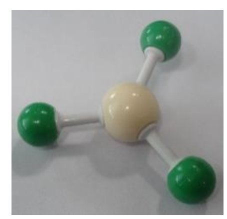
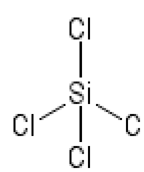
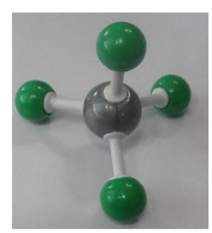
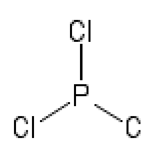
Hydrogen	H-H	
Oxygen	O=O	
Nitrogen	N≡N	

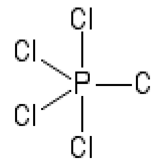
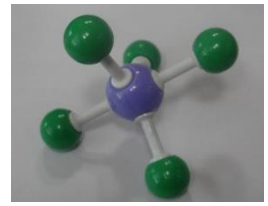
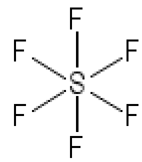
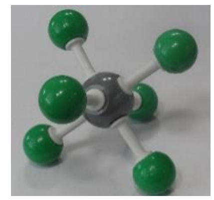
Hydrogen (H-H), Chlorine (Cl-Cl), Oxygen (O=O), Nitrogen (N≡N)

Hydrides are compounds of hydrogen with another element

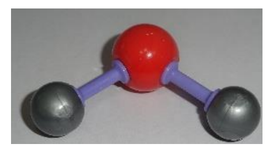
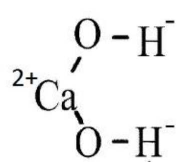
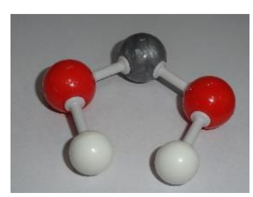
Hydrogen chloride		
Water angular (oxygen with bond angle 105°)		
Ammonia pyramidal (nitrogen of 107°)		
Methane tetrahedral		
Hydrogen sulphide (sulphur 2 hole)		
Phosphine pyramidal (3 hole)		

Halides, chlorides & fluorides

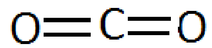
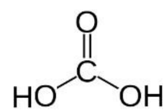
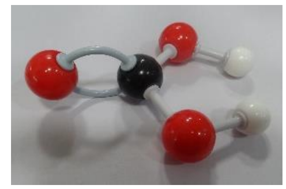
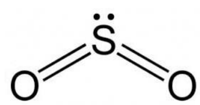
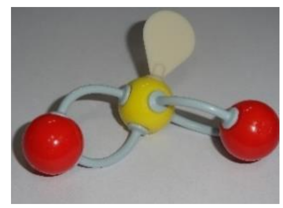
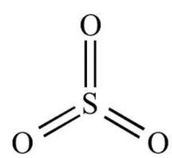
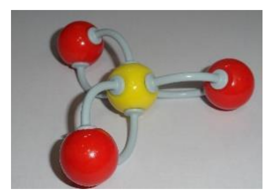
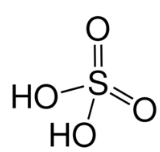
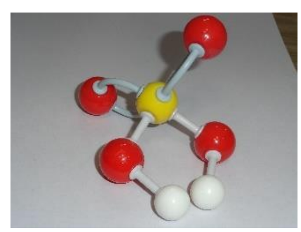
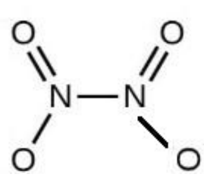
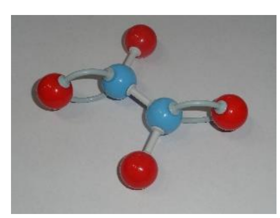
Sodium chloride	$Na^{+} \cdots Cl^{-}$	
Calcium chloride ionic		
Beryllium chloride (2 hole metal linear)	Cl—Be—Cl	
Boron trichloride		
Silicon tetrachloride (4 hole grey)		
Phosphorus trichloride (Trigonal planar, 5 hole)		

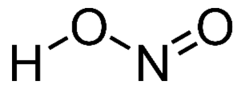
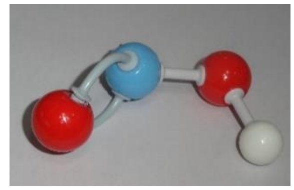
Phosphorus pentachloride (Trigonal Bipyramid, 5 hole)		
Sulphur hexafluoride (6 hole metal)		

Metal Oxides & hydroxides

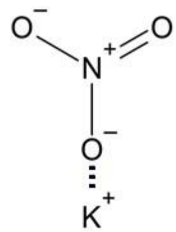
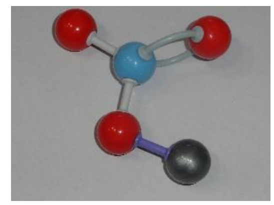
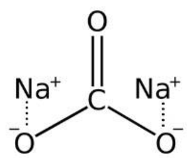
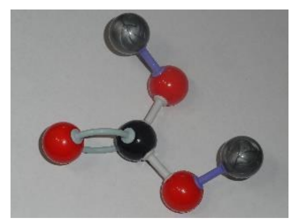
Sodium monoxide	Na - - O - - Na	
Sodium hydroxide	Na^{2+}……$O - H^{-}$	
Calcium oxide	$Ca^{2+} = O^{2-}$	
Calcium hydroxide		

Non-metal oxides & Acids

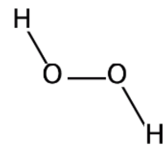
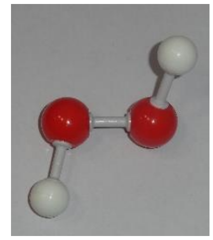
Carbon dioxide linear		
Carbonic acid		
Sulphur dioxide (6 hole)		
Sulphur trioxide (Trigonal planar 6 hole)		
Sulphuric Acid (6 Hole)		
Dinitrogen tetroxide planar molecule (nitrogen 4 hole, 3 hole oxygen)		

Nitrous acid planar molecule (4 hole nitrogen)		

Salts

Potassium Nitrate		
Sodium carbonate		

Miscellaneous

Hydrogen peroxide (non-planar molecule)		
Hydroxonium ion (4 hole oxygen)