

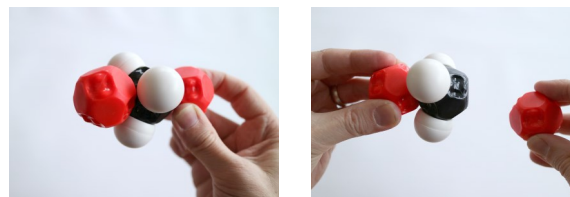
7. Chemical Reactions

1. Walden inversion in S_N2 reactions:

Label atoms before the nucleophilic attack, in clock-wise fashion.



Nucleophile attacks:

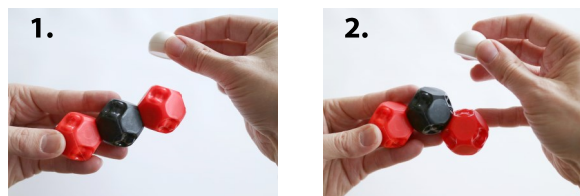


Carefully move the three axial substituents away from the nucleophile:



Now the labels read in a counter-clock-wise fashion!

2: Carbon dioxide gets attacked by hydride:



The linear CO_2 reacts and becomes the three coordinate and flat formate ion:



8. Metals

Cisplatin®, $cis-(H_3N)_2PtCl_2$, is an important anti-tumor drug. While the colour red is normally used for oxygen, we can use two red atoms to stand for the two chloride molecules and two black atoms to stand for the two ammonia molecules.



The trans-isomer is a different compound (would this be true if platinum were tetrahedral?)



With more atoms (meet up with friends who also have a kit, in order to build larger molecules), you can make a model of the sodium chloride structure:



Use the wavy surfaces to make cyclobutane:



6. Some Important Molecules:

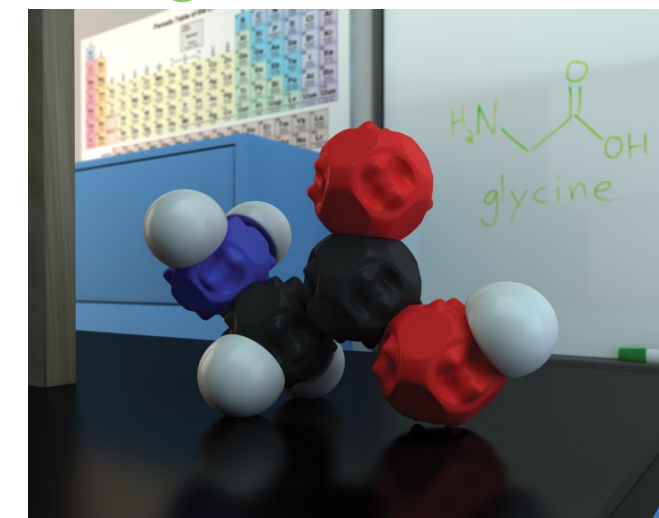
Can you make acetone?



Allene?



Pyridine?



Dynamic
Molecular Model Kits

Instruction Booklet

1. Getting Started

Unlike with conventional model kits, with RealAtoms you can change the geometry of each atom! An atom can be used in tetrahedral, 3-coordinate and flat or linear geometry, or it can be square and flat (some metals do that). The geometry can always switch, so you can model chemical reactions!

Bring two atoms in contact with two of their flat surfaces touching. If the first attempt leads to repulsion, pick a different flat surface until the atoms stick at their flat surfaces (not the wavy ones, we get to them later):



Now, for each atom, skip the flats surface directly next to the bonded one but attach three H atoms to those flat surfaces that are separated by a wavy surface from where you already have a bond:



Congratulations. You made ethane!

2. Longer Hydrocarbon Chains

Take the hydrogens off from ethane. Then, at one of the positions where you had a hydrogen, attach a new carbon atom. Just pick any flat surface on the third atom that sticks:



Using the same procedure, add another carbon and then add hydrogens (across a wavy surface from an existing bond):



You just made n-butane!

3. Making Alkenes

Take the first and the second carbon and rotate the bond such that two hydrogens are exactly aligned (chemists say 'syn'):



Take the two aligned hydrogens off:



You will notice that the two wavy surface highlighted are close to each other. Flip the first atom over such that the wavy surfaces touch:



You made 1-butene!

4. Making Alkynes

Take two hydrogen atoms on carbon atom 1 and carbon atom 2 off, on the same side:



Bend the existing bond, towards where the hydrogens were removed:



You made 1-butyne!

5. Rings

Can you make benzene? This is C_6H_6 . You will use alternating single bonds (flat-surface-to-flat-surface) and double bonds (wavy-surface-to-wavy-surface). It should look like this:



Cyclohexane, C_6H_{12} is quite a different compound: it has only single bonds:

