How to Use The makeitmolecular Cards

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Science Shows Hands on Molly Cool Mega Molecules

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Introduction

Make it molecular cards give people the opportunity to make models of everyday molecules and have their pictures taken with them. It is suitable for all ages from 5 – 100 and is great to use on open days, public events and in the class room. All you need are the make it molecular cards, some molecular models and a digital camera and away you go.

These cards have been tried and tested and have received a very favourable response from the public teachers and pupils. We use recommend the use of Molymod models. Molymod is part of Spiring Enterprises and can be found on the web at www.Molymod.com.

Molymod models used

The cards are designed to be used the Molymod models using the following atoms. Those atoms marked with a * are slightly unusual and will require special order from Molymod. We recommend that you buy atoms by the bag rather than buying kits.

Piece	Colour	Number of holes	Shape/angle
Carbon	Black	4	Tetrahedral 109 ^{o}
Oxygen	Red	2	109^{o}
Nitrogen	Light Blue	3	Pyramidal 109 ^{o}
Nitrogen*	Dark Blue	3	Trigonal 120 ^{o}
Fluorine	Light Green	1	
Chlorine	Dark Green	1	
Phosphorous	Light Purple	4	Tetrahedral 109 ^{o}
Metals	Grey	4	Tetrahedral 109 ^{o}
Sulphur	Yellow	6	Octahedral
Hydrogen	White	Integral bond	
Single bond	Short grey stiff stick		
Double bond	Long grey flexible stick		

Using the Instructions

What is on an instruction sheet?
On each instruction sheet there is a colour coded drawing of the molecule, the name of the molecule and a caption about the molecule. On the left hand side of the sheet is a parts box which specifies the type and number of atoms and bonds that are required to make the molecule shown. All the atoms are colour coded (see above).

What happens if people want to make their own molecule
Great, this should be encouraged. You can say things like when scientists make a new molecule they give it a name. Once completed discuss with them their molecule, would it be stable? could it be made more stable by replacing atoms? is it a known molecule?. If you can suggest that they follow some simple chemical principals of molecules.

Problems encountered

- Double bond geometry - for example people sometimes try to put an E trans double bond inside a ring. Use it as a point of discussion to show them cis and trans double bonds.

Working with the Public

Things you can talk to people about

- Everything is made of atoms.
- Atoms are often found bonded together in molecules.
- If you bond different atoms together in different ways you make different molecules.
- Chemists make molecules from atoms and, more usually, by joining molecules together
- Different molecules have different properties eg smell or taste or drug activity etc. This is related to their structure
- Most molecules are too small for us to see individually and that is why chemists make scale models of them so they can see how they look like in 3D.
- Try to move people on from saying black ball, red ball, stick etc to saying carbon atom, oxygen atom, single bond, double bond etc
- Fundamentally you want people to leave feeling more at home with molecules, understanding that everything around them is made up of molecules and that chemicals are natural as well synthetic. Without Chemistry there is no life.

A typical encounter with a member of the public

- Entice the member of the public into making a model of a molecule, some might be reluctant, some are just wanting to be asked others won't wait to be asked. Use the lead in line "Would you like to make a model of a molecule and have your picture taken with it?"
- In choosing a molecule to make ask them what sort of things they are interested in – health, mobile phones, nature and hence come up with some suggestions of the molecules to make.
- Start them off by giving them a tray and suggesting they collect the atoms and bonds that they need to make the molecule. This is written out in the box on the left hand side of the instruction sheet. For young children it is good to get them to count out the atoms that they need.
- If necessary show them how to make a double bond using two long flexible bonds.
- If the person looks unsure what to do next suggest that they choose a specific position on the molecule to start at and work their way around from there.
- It is easiest to build up the carbon and heteroatom framework of the molecule first and then to add the hydrogens.
- While they are making the molecule attempt to change them from saying things such as black ball, red ball, stick etc to saying carbon atom, oxygen atom, single bond, double bond etc, get them to use technical terms and say things like 'you sound like a real scientist/chemist.
- Get the person to have their picture taken with their molecule.

- Ask the person to break up their molecule back into atoms and bonds after they have had their picture taken. If you don't do this then you will have lots of molecules to break-up and you will end up with very sore hands.

Security

- Included in your pack are signs that say – Please dismantle your model before leaving. This should be placed in a prominent position close to where the pictures are being taken
- Molecular Mechanics need to keep an eye out for people trying to steal the molecules. Normally it is the adults who take the models.

Things to think about in a Risk Assessment

Molecular models are safe to use if used responsibly and model makers are supervised. Here are some things to think about for a Risk Assessment of the activity

Risk	Actions taken to minimize risk
Choking Hazard The atoms and bonds are small in size and could become stuck in the windpipe if put in the mouth.	Make sure choking Hazard signage is prominently displayed on top of the table. Do not allow young children below the age of three to use the models kits. Molecular mechanics should warn people of the risk. Discourage people placing the models and atoms in their mouth
Trip Hazard Standing on stray atoms on the floor could lead to people falling over.	Model makers and molecular mechanics should be vigilant about not dropping atoms on the floor. Any stray atoms on the floor should be picked up immediately
Computer, Printer, Camera	Electrical equipment must be PAT tested and lose wires stuck down. If taking pictures of children ensure that parental permission has been given.