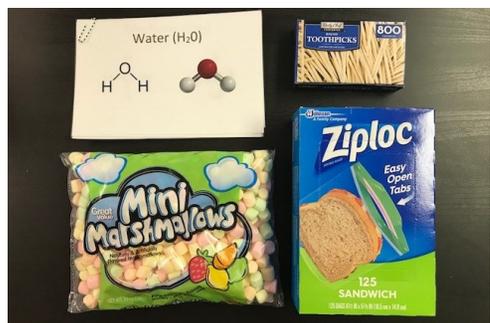


Making Marshmallow Molecules

Why is it important to understand the structure of molecules?

MATERIALS



- ❖ Multicolored Marshmallows
- ❖ Plastic Bowls
- ❖ Toothpicks
- ❖ Sandwich Bag
- ❖ Molecule Cards

Do the Experiment!

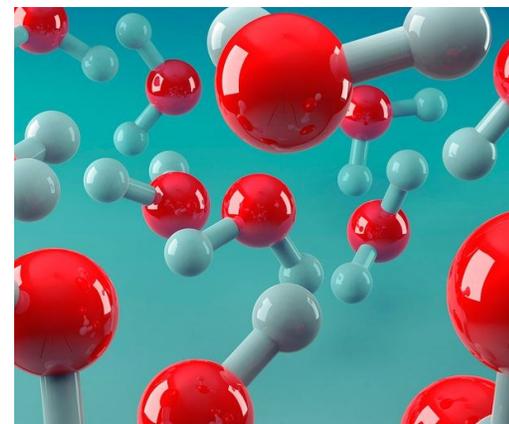
1. You will need marshmallows and toothpicks. Do **NOT** eat the marshmallows.
2. Download or print the molecule cards.
3. Marshmallows represent different elements based on their colors: **Orange** = Oxygen (O), **Yellow** = Carbon (C), **Green** = Hydrogen (H) and **Pink** = Nitrogen (N). If you don't have colored marshmallows, you can color them yourself using markers. Use only four colors.
4. The toothpicks represent the single and double covalent bonds needed to bond different elements together into a molecule. On your molecule cards a single line represents a single bond and a double line represents a double bond. Use one toothpick for a single bond and two toothpicks for a double bond.

DID YOU KNOW...

Simply put, chemistry is the science of changes in matter. **Matter** is anything that has mass and takes up space. The smallest unit of matter that we know of is the atom. **Atoms** are the smallest component of all the known elements, share common characteristics with the elements that they are a part of and have a nucleus made of protons and neutrons and expanding levels of electrons. **Elements** are substances that cannot be broken down into simpler substances. The most common element in the universe, hydrogen, makes up almost 75 percent of all matter. Helium accounts for 24 percent of matter. That means all the other 116 known elements only make up 1 percent of the universe. **Molecules** are a group of elements (atoms) bonded together which represent the smallest fundamental unit of a chemical compound that can take place in a chemical reaction. So **chemistry** is the interaction between different elements and molecules and the changes they cause. One of the simplest molecules is water (H₂O). Water is two hydrogen atoms covalently bonded to a single oxygen atom. A **covalent bond** involves the sharing of electron pairs between different atoms. Water goes through changes that no other molecule on Earth goes through. It can be found in liquid, solid and gaseous states. These changes of state is the simplest example of chemistry. As you make your molecules, try to find patterns between bonds to better understand how certain elements interact with one another. Pay attention to the names of molecules too.

PERIODIC TABLE OF THE ELEMENTS

H																	He	
Li	Be											B	C	N	O	F	Ne	
Na	Mg											Al	Si	P	S	Cl	Ar	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba	57-71	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra	89-103	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Fl	Uup	Lv	Uus	Uuo	
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		



CHALLENGE

1. What are the differences between atoms, elements and molecules?
2. What other materials can you use to make more complex, longer lasting molecules?
3. There are six elements essential to make biomolecules (living things). They are abbreviated as **CHNOPS**. What element does each word stand for?

STEAM CHALLENGE: Of the 118 known elements 28 are scientifically created. How many naturally occurring elements are there? In 80 years we might have twice as many scientifically created elements. How many would that be? What if we create 4 times as many? 16 times as many?