



MOLECULE MODELS

OVERVIEW

Campers will learn about some different common molecules and will be able to model them using materials from home!

TOPIC AREA(S)

Chemistry

GRADE LEVEL

Grades 5-6

QUESTIONS PRIOR TO THE LESSON/GETTING EXCITED

- What is chemistry?
- What are elements?
- What are molecules?
- What are some chemicals we see in our everyday lives?
- Has anyone ever seen a model of a molecule before?

BACKGROUND INFORMATION FOR INSTRUCTORS (INCLUDE QUESTIONS W/ ANSWERS)

What is chemistry?

- Chemistry is the study of matter, its properties, how and why substances combine or separate to form other substances, and how substances interact with energy. Many people think of chemists as being white-coated scientists mixing strange liquids in a laboratory, but the truth is we are all chemists. Chemistry is part of everything in our lives.

What are elements?

- An element is a substance that **cannot** be broken down into any other substance. Every element is made up of its **own type of atom**. This is why the chemical elements are all very different from each other.
- Everything in the universe contains the atoms of at least **one or more elements**.
- The **periodic table** lists all the known elements and groups together those with **similar properties**.
- Some examples - gold, hydrogen, potassium, chlorine, etc.

What are molecules?

- a molecule is the smallest particle of a substance that retains the chemical and physical properties of that substance. They are composed of two or more atoms, a group of like or different atoms held together by chemical forces.
- It may consist of atoms of a single chemical element, as with oxygen (O₂), or of different elements, as with water (H₂O). As components of matter, molecules are



common in organic substances (and therefore biochemistry) and are what allow for life-giving elements, like liquid water and breathable atmospheres.

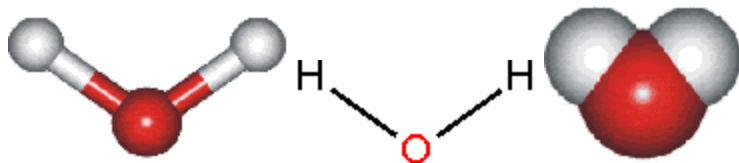
- you will learn all about these types of bonds when you get into high school!

What are some chemicals we see in our everyday lives?

- campers can name whatever they would like but I usually mention water because they are always SHOOK
- examples: water, nail polish, our blood, window cleaner
- anything is a chemical - everything we see is made up of “chemicals”

Has anyone ever seen a model of a molecule before?

- can show these to the class:
- they are all water!
- we're not going to get into the names of the models - they are quite advanced for this age!!



Note: they all show water in its chemical form - H₂O!

- they have a central oxygen atom connected by chemical bonds to two hydrogen atoms
- every type of atom is represented by a different colour/size and bonds can be shown by toothpicks (1 = 1 bond, 2 = double bond, etc.)
- These are like what we will be making today!



RELEVANCE TO THE CURRICULUM			
Grade 1 and 2	Grade 3 and 4	Grade 5 and 6	Grade 7 and 8
<ul style="list-style-type: none"> € Needs & Characteristics of Living Things € Growth and Changes in Animals € Materials, Objects and Everyday Structures € Movement € Energy in Our Lives € Properties of Liquids and Solids € Daily and Seasonal Changes € Air and Water in the Environment 	<ul style="list-style-type: none"> € Growth and Changes in Plants € Habitats and Communities € Strong and Stable Structures € Pulleys and Gears € Forces Causing Movement € Light and Sound € Soils in the Environment € Rocks and Minerals 	<ul style="list-style-type: none"> € Human Organ Systems € Biodiversity € Forces Acting on Structures and Mechanisms € Flight € Properties of and Changes in Matter € Electricity and Electrical Devices € Conservation of Energy and Resources € Space 	<ul style="list-style-type: none"> € Interactions in the Environment € Cells € Form and Function € Systems in Action € Pure Substances and Mixtures € Fluids € Heat in the Environment € Water Systems

MATERIALS (SPECIFY WHETHER PER CAMPER, GROUP OR CLASS)

Per Camper:

- a variety of different soft/squishy materials of different sizes and colours (this can include marshmallows, gummy candies, fruit snacks, berries, etc.)
- toothpicks

SAFETY CONSIDERATIONS

Be careful with the toothpicks and do not use anything that may cause an allergic reaction in the camper!!

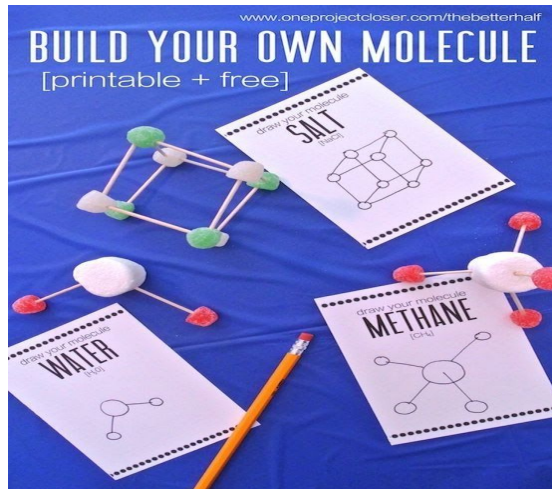
PROCEDURE

Step 1: Gather all of the materials and have them prepared and set nearby! The camper will be following along with the instructor as they walk through the chemical structure of some common molecular compounds!

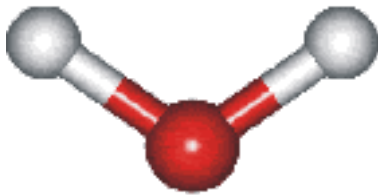
Step 2: The instructor will go through the following molecular structures (time permitting) and will indicate the atoms present in each. They can show the class the models - making sure that each atom is represented by a different colour/size of materials as this is realistic to the different properties of atoms in real life!

Step 3: Some compounds are listed below! Get the campers to guess some properties of each compound and then they can eat their models at the end of the lesson :)

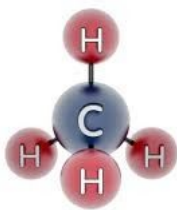
Here is some good sample molecules:



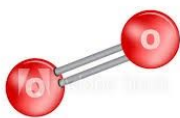
Water - H_2O , makes up a large portion of our bodies, made of one central oxygen and 2 hydrogens, is fluid at room temperature



Methane - CH_4 , a very common greenhouse gas, made of one central carbon and 4 surrounding hydrogens, gas at room temperature

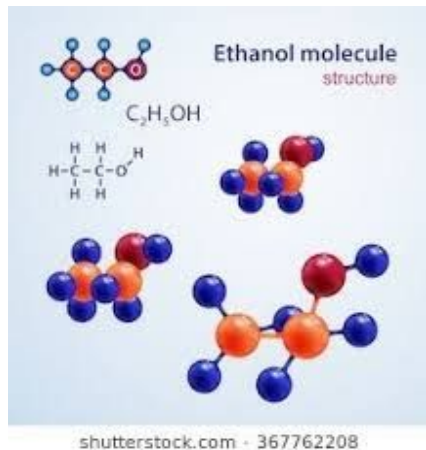


Oxygen gas - O_2 , gas at room temperature, two oxygen atoms connected by a double bond!

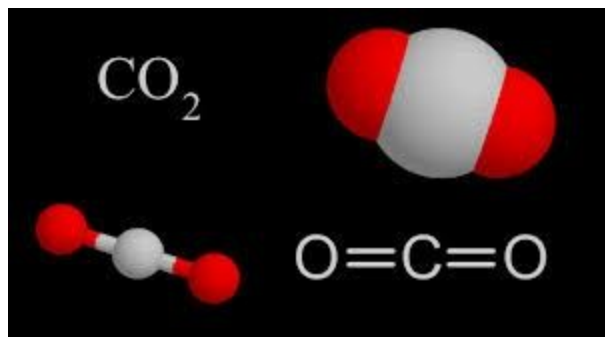


Oxygen | O_2

Ethanol - C_2H_5OH , this is an alcohol, a liquid at room temperature, 2 central carbons following the structure below:



Carbon dioxide - CO_2 , gas at room temperature, a central carbon atom connected to two oxygen atoms by double bonds



Note: it is really important that campers use something different for each “atom” so that they understand that these are all different elements in real life!! As well, it is important that 1 toothpick is a single bond, 2 toothpicks are a double bond, etc.

REFERENCES

- <https://www.universetoday.com/77516/molecules/>
- <https://www.bbc.co.uk/bitesize/topics/zstp34j/articles/zqr4tv4>
- <http://pirems.siskolata.com/image.php?id=12263>
- <https://www.livescience.com/45986-what-is-chemistry.html>