

Name _____ Pd ____ Date _____

Water, water everywhere and why is it so cool?

Whenever we talk about life and what we need for life, everyone says, "Water, without it we would die," or "We need it to survive!" And that's certainly true—although we repeat those things without knowing why water is so important, and what it actually does. So, in order to know what you're doing with lab 10, Water: A Unique Substance, let's get into water.

The Chemical Composition and Structure of Water

Materials: Clay and straws

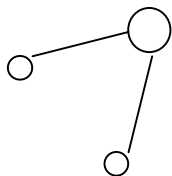
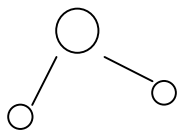
Introduction

Many of you know the chemical composition of water: H_2O . Although, it's clear that you don't know what that means. And, you often write it incorrectly when you copy it: H^2O . That's wrong, and I'll explain why later. Okay—what do the H and O stand for? They stand for 2 chemical elements—the simplest substances we know which retain distinct properties. H is hydrogen, the O is oxygen. How many of each? " H_2 " means two hydrogen atoms. "O" means that it is understood that there is only one oxygen atom. The way we do it in chemistry is to use a subscript (a number below the line) inside a molecule when we want to indicate that there is more than one atom of an element. Therefore, H_2O means there are two hydrogens and one oxygen in one molecule.

Procedure

Now you're going to build a water molecule together. But, how will you put the atoms together?

1. Choose one color of clay to represent hydrogen, and another to represent oxygen.
2. Make 4 hydrogen balls about inch in diameter. Make 2 oxygen balls about inch in diameter.
3. Using straw pieces put the atoms together, something like this:



Key:

Small balls are hydrogen
Larger balls are oxygen

The angle between the straws is about 105°.

4. Now, because of the properties of oxygen and hydrogen the water molecule ends up having poles, like a magnet. What are the poles of a magnet? _____
5. Which poles of the magnet attract each other? _____
Which poles of the magnet repel each other? _____

We can state this as a law:

Like charges _____ each other; unlike charges _____ each other.

6. The same is true of water molecules. The oxygen ends of the molecules are negatively charged (-). The hydrogen ends of the molecules are positively charged (+).
Which will attract each other? _____ Which will repel each other? _____
7. Now bring the water molecules together—showing the ends of the molecules which should attract each other next to each other. Draw your molecules here, labeling the atoms, and showing the charges.

You've learned about surface tension—this attraction of the molecules is why water has surface tension, why it takes a lot of energy to heat it up, why so many things dissolve in it, why it sticks to other molecules. If water wasn't like that, it wouldn't be the useful, unique substance it is.

A cool demonstration: (and yes, you can try this at home)

Up front there is a cup of water. How many pennies can I slide into it without the water spilling over? _____