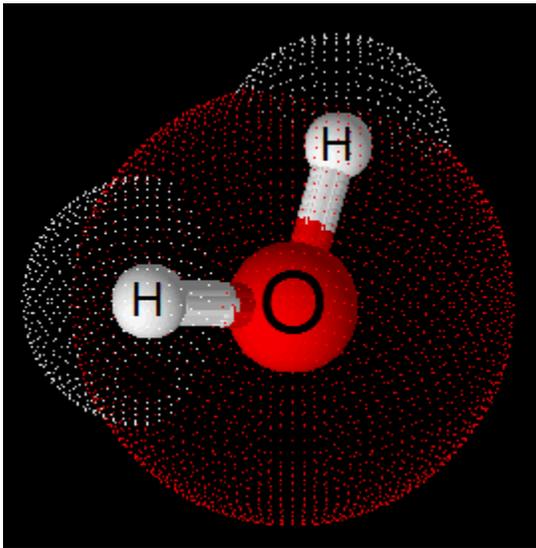


POLAR COVALENT BOND: WATER

Elements share electrons to form covalent bonds. We assume that they both have equal possession of shared pair of electrons. But it isn't the case every time. You know each element is different to others and every element has its unique qualities, strengths and weaknesses.

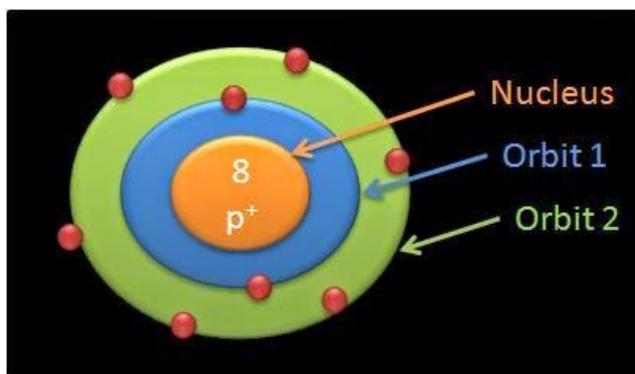


Water Molecule 3D view

As you know electrons continuously move around, they look like a cloud hanging around the nucleus. When you look on the picture of water molecule, you will see the cloud is a little denser near the Oxygen atom. It means the shared electron pairs are pulled by Oxygen atom to get a greater share of it. How does Oxygen manage to do it? What makes Oxygen more powerful than Hydrogen?

The subatomic particles build an element's strength/ weakness. You remember protons are positively charged and stay inside the nucleus. Because of these protons nucleus behaves like a magnet for electrons. Nucleus attracts electrons to bind them closer to it. Magnetic power of nucleus doesn't work effectively on the electrons of distant orbits.

Let's have a close look on Oxygen atom (${}^8\text{O}$). Its electronic configuration is $1s^2, 2s^2, 2p^4$. It has 2 orbits and 8 protons in its nucleus. So it wouldn't be difficult for nucleus to bind electrons and even to attract electrons of bonding pair.



Oxygen Atom

When you see Hydrogen atom, it has only one proton. Its nucleus is not strong enough to withstand in the competition with Oxygen.

The capability of element to pull bonding electrons is called “electro negativity”. In water molecule Oxygen is more electro negative than Hydrogen. You don't have to work out every time that which element is more electro negative than other. You can find this type of information about any element in the periodic table. You will be amazed to know that elements are arranged in the order of strengths and weaknesses in the periodic table. I will elaborate it in my next post.

When one element in a covalent bond is stronger than the other one, the shared electron cloud shifts towards stronger element (more electro negative) and that element develops partial negative charge. The weaker element (less electro negative) on the other hand, loses some of the cloud and develops partial positive charge. That's how two different poles (“+” and “-“) are developed in the same molecule. Thus, covalent

bond develops a bit of ionic characteristic, and such molecules are called polar molecules.

This type of polar covalent bond is the reason behind the wonderful properties of water. That's why water is a liquid and remains liquid up to large range of temperature. It boils at quite higher temperature (100°C). Its solid form Ice is lighter than its liquid form is also due to its polar nature. It can dissolve a number of chemical substances, ions and gases. These are a few qualities of water I have mentioned. Water is the unique creation of the nature that supports life in the earth.

Source : <http://chemistrynotmystery.blogspot.in/2014/07/polar-covalent-bond-water.html>