

Gummy Pre-Lab

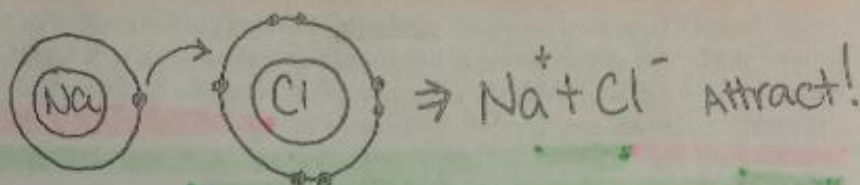
Atoms are the building blocks for all matter. All matter, therefore, is made up of atoms. Scientists have discovered that all atoms are made of material created in stars, either when stars form or when stars die. Since you are made of matter, you are made of star parts!

Atoms of one kind are called **elements**. Elements are organized onto the periodic table by their similarities so we can easily find them and make predictions about any new elements we might discover later. With the exception of the Noble Gases family, all of the elements on the periodic table are not "happy". This means that **they do not have 8 electrons in their valence shell/ring**. **The valence shell is the electron ring furthest from the nucleus of an atom. The electrons in this shell are called the valence electrons.**

In order to become happy, atoms need to gain, lose or share valence electrons. For example, sodium (Na) needs to lose one valence electron and chlorine (Cl) needs to gain one valence electron in order to become happy (have 8 valence electrons). When sodium and chlorine come in contact with each other, a reaction happens so that sodium gives a valence electron to chlorine. Both atoms are now happy since they both have 8 valence electrons in their valence shell.

1. **What is an atom?**
2. **Why are you made of star parts?**
3. **Why are most of the elements on the periodic table not "happy"?**
4. **Where are the valence electrons found?**
5. **How do atoms become "happy"?**

When atoms hook up with other atoms to gain, lose or share valence electrons, a bond is formed. There are two types of bonds that form when atoms gain, lose or share valence electrons. When atoms gain or lose electrons, they form ionic bonds. An ion is an atom that has a positive or negative charge. When sodium bonds with chlorine, sodium loses a valence electron and becomes positive. When chlorine gains that valence electron from sodium, chlorine becomes negative. As you know, opposites attract and this is no exception! The positive sodium is attracted to the negative chlorine, bonding them together to make table salt (NaCl). See the diagram below.

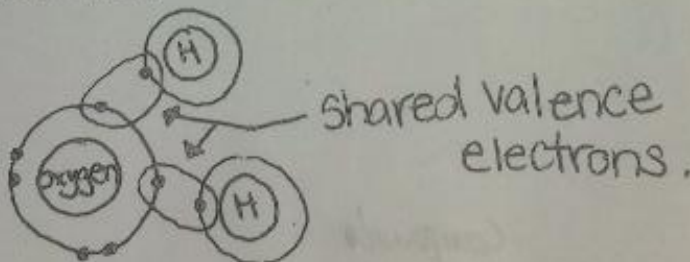


* only valence electrons are showing

An ionic bond, therefore, happens when one atom gives up a valence electron and becomes a positive ion and another atom gains that electron, becoming a negative ion, and the two ions attract. This is the second-strongest bond in chemistry because one atom is attached to the other, similar to someone carrying your books for you to your next class.

1. How is a bond formed?
2. Why do atoms become ions?
3. Describe what an ionic bond is.

When atoms share electrons, ions are not formed. This is because the valence electrons are not given up, but shared between the atoms involved. These valence electrons spend some of their time around one atom, and some of their time around another atom. Water is a great example of atoms sharing valence electrons. Oxygen needs two atoms in order to have 8 valence electrons, and the 2 hydrogen atoms need one more valence electron each. Oxygen will share one of its valence electrons with each hydrogen atom, and the 2 hydrogen atoms will share their valence electron with oxygen. See the diagram below.



* only valence electrons showing!

When atoms share electrons with other atoms, a covalent bond is formed. You can remember this because "co-" means to share (like in cooperation) and "valent" refers to the valence electrons. Covalent bonds are the strongest bond in chemistry because the two atoms are sharing the electrons, just like two people might share the same rope.

1. Why aren't ions formed when atoms make covalent bonds?
2. What do the parts of the word "covalent" mean?
3. Why is a covalent bond stronger than an ionic bond?

Compounds are formed by atoms using both ionic and covalent bonds. The atoms in compounds cannot be easily separated. This means that you cannot pull apart, cut, filter, throw against a wall or sift compounds to separate their atoms. You can only separate them using a chemical reaction. Table salt and sugar are examples of compounds. Chemical reactions rearrange the atoms of elements or compounds to form new elements or compounds. Mixtures are like a tossed salad: the parts of a mixture are simply thrown together, and so are not bonded to each other. The lettuce can be separated from the carrots and onions simply by picking it out with your hands. Therefore, mixtures can be easily separated. Saltwater is another example of a mixture. By boiling the water (a physical change), the salt is left behind. Pasta that was just cooked is a mixture of pasta and water. By using a strainer, the water and pasta can be separated from each other.

1. What is one difference between a compound and a mixture?
2. What do chemical reactions do?
3. Give an example of a compound that was not mentioned in the paragraph above. Give an example of a mixture that was not mentioned above.