

The Periodic Table of Elements

Chemical Bonding - The Nobles' "Royal" Garden Party

In order to help students understand how different families of atoms form bonds with each other I use the following analogy; think fashion and "Royal" watching!

Tell them to think of the **Periodic Table** as a "Royal" gathering (a garden party) where all of the atoms come to be "seen" and show off their wealth. They all want to be royal so they try and take on the appearance (fashion) that the members of the **Noble Gases**, the chemical Royal family, are wearing. And what is in this season; a full outer shell of **electrons**!

The Noble gases represent the "Royal" family. Their outer shells/orbitals hold the perfect number of electrons, so the Noble Gases set the fashion trend. They appear covered in jewels. They are so confident with their **stability** that they are the envy of all of the other elements in court. Each element is trying to find a way to become noble (or at least look noble). They can never gain **protons** and become a true "Royal", so they collect/discard electrons instead.

The non-metals realize that the easiest way to look like a Noble is to gain or take electrons from other elements. The **Halogens** are only need one electron to appear "Royal". They are desperate to get there. This explains why atoms like Fluorine and Chlorine are so aggressive (**reactive**) when it comes to taking electrons from other atoms.

The **metals** realize that in order to look like the nobles all they have to do is lose their outer electrons/orbitals and then they too will have a full outer shell, thus they will be covered in jewelry (electrons). Since the **Alkali Metals** only need to lose one electron to appear "Royal" they are very reactive, giving away the electrons as fast as they can!

Since the metals really want to get rid of electrons the greedy non-metals will take their electrons any chance they get – thus the **ionic bond**!

However, **non-metals**, being so greedy, would not consent to give up electrons to other non-metals. Instead they would agree to share electrons and hang out together. That way, their collective wealth of electrons can be displayed to make them look like the Nobles – thus the **covalent bond**!

These bonds signal alliances between elements form **compounds**. Each element is helping the other element(s) to become more "Noble". Each element is trying to gain or lose enough electrons to look fashionably like the Nobles. However, they can never be truly "Royal" because they had to gain or lose their electrons; they were not born into the "Royal" family with naturally, perfectly full outer orbitals. Forming ions is not the way the Royals. They would never consider carrying a charge, or share electrons with another atom.

Subatomic Particles

In order to help students understand the roles of the basic subatomic particles I often use this analogy. It helps them visualize the particles and their roles in the atom.

Protons have lively and outgoing personalities. They are always very positive about things. As a result the number of protons in an atomic nucleus decides the characteristics of an atom.

Neutrons are very relaxed and non-judgmental. They do not have a charge and therefore do not take sides. This is important because they help the protons get along. All protons are positively charged so they do not like to be too close to each other or they begin to push and shove. As a result the nucleus becomes unstable. The neutrons step in and separate the protons like referees in a fight. They calm them down and help them get along.

Electrons are the social secretaries of the atom. They are the ones that decide which atoms their nucleus will interact with. They decide whether the nucleus will give, take or share electrons with other atoms. Sometimes electrons act as ambassadors and go to other atoms to arrange marriages (**ionic bonds**). Sometimes electrons act as negotiators and meet with other electrons to negotiate trade agreements (**covalent bonds**).