

Sources That Taught Me Scimatics Better Than Our Teachers Ever Did

Source: Chemical Bonds: Ionic and Covalent (Ysci)

- Atoms want to reach the most stable or lowest energy state they can
- Electrically neutral - same # of protons and electrons, however this is usually not their most stable arrangement
- Octet Rule: Atoms are stable when their valence shell is completely filled with electrons (oftentimes 8, though if they have one shell, it's 2)
- Exceptions to Octet Rule is Hydrogen & Helium (they need 2)
- If atoms don't have a full valence shell, they'll get one through losing, gaining, or sharing valence electrons through chemical bonds
- Ionic Bond: There is a transfer of electrons from a metal to a non-metal, which then creates oppositely charged ions
- The electrostatic attraction that occurs between these oppositely charged ions is called an ionic bond.
- Salt/Sodium Chloride/NaCl is held together by ionic bonds...
- Sodium (Metal) has 1 valence electron, Chlorine (Non-metal) has 7.
- Non-metals have higher electronegativity values, meaning they pull away the valence electrons of metals... in this circumstance, since Chlorine is a non-metal and therefore stronger, it pulls away a valence electron from Sodium for its own valence shell
- The Sodium atom then becomes a positively charged ion called the cation
- The Chlorine atom then becomes a negatively charged ion called an anion
- Then, since opposite charges attract, the atoms bond together and form the ionic compound known as Salt/Sodium Chloride/NaCl
- Unlike covalent molecules, ionic compounds don't exist as individual units... they form repeating three-dimensional structures called crystal lattices
- Covalent Bonds: These are formed when atoms share electrons.
- The pair of shared electrons forms a new orbital which extends around the nuclei of both atoms, which produces a molecule
- Covalent bonds occur between non-metals since they have the same or similar electronegativity values
- In an H_2 molecule, both atoms have the same electronegativity values
- The valence electrons split their time evenly between the valence shell of each hydrogen atom, giving both atoms a valence shell that's complete
- When electrons are shared evenly, it is called a Nonpolar Covalent Bond
- In an HCl molecule, chlorine has the higher electronegativity value, which makes its pull stronger
- Chlorine isn't strong enough to fully pull the electron over to its side, but the electron pair spends more of its time on Chlorine's side
- This uneven/unequal sharing of the electron pair causes chlorine to carry a partial negative charge, and hydrogen to carry a partial positive charge
- When electrons are shared unevenly, it's called a Polar Covalent Bond

- Different types of atoms can form different numbers of covalent bonds.
- Hydrogen can form one oxygen 2, nitrogen 3, and carbon 4!
- The # of bonds a single atom can form is fairly small, though they can link together with other atoms to form more complex molecules... caffeine
- Due to this, many different compounds can be formed from approximately 90 naturally occurring elements... these chemical bonds make up everything found on our planet and beyond!