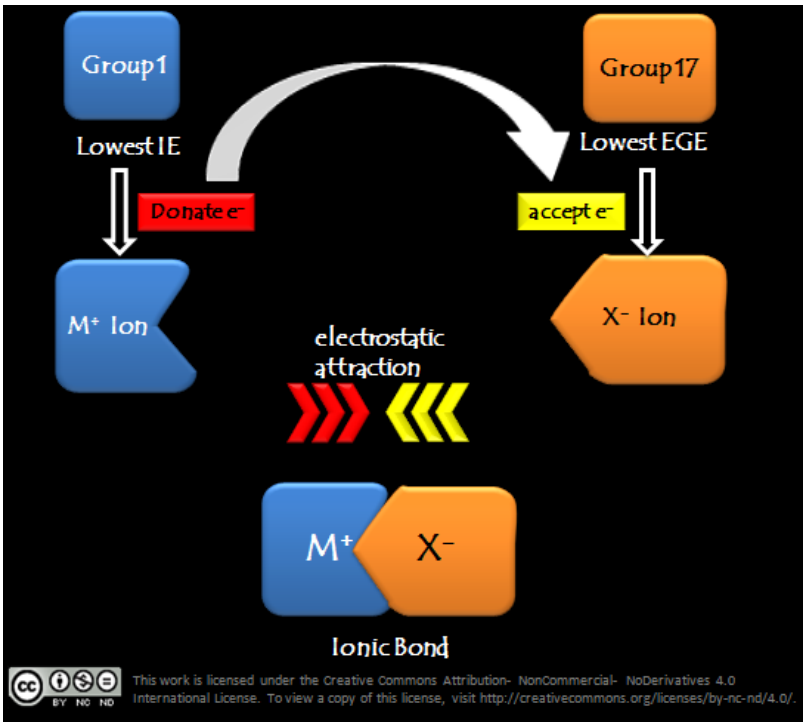
COVALENT BOND VS IONIC BOND

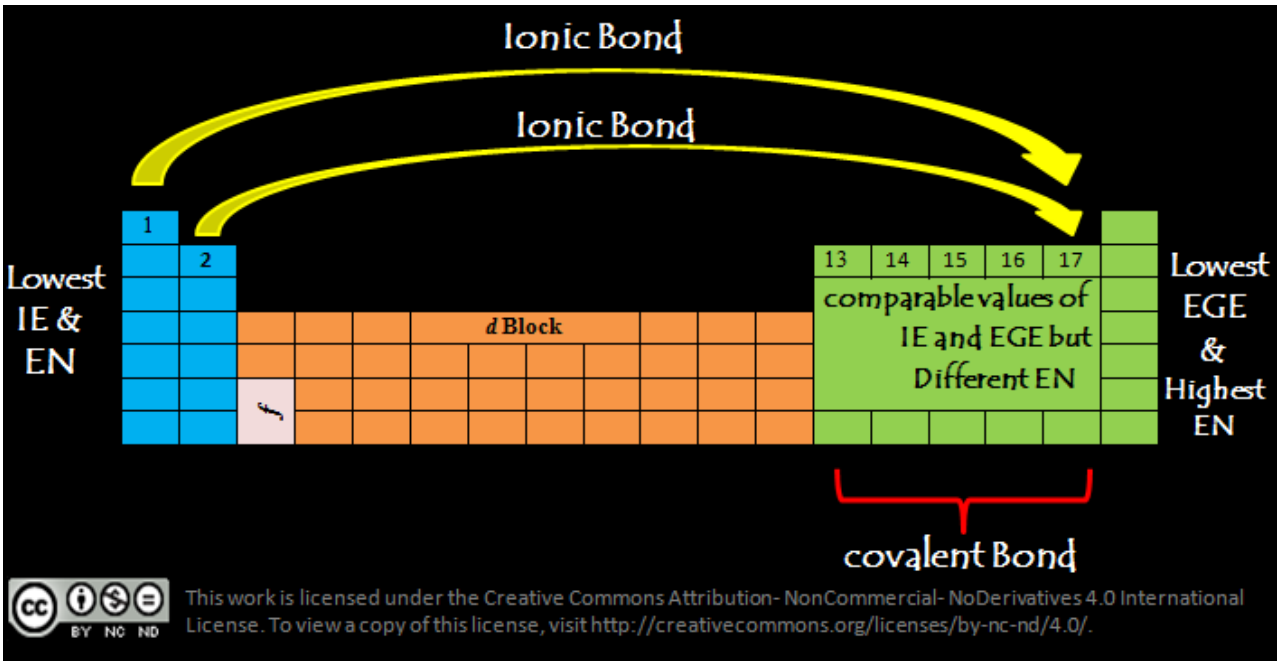
You have seen how elements are similar to us and as you know them closely you will find some more similarities to our behaviour. You must have experienced the law of attraction in your life. We tend to get attracted towards someone opposite to us. Elements too experience this law of attraction. They are likely to bond with the element quite opposite to their characteristics. You can see, this phenomenon working on the elements placed on two opposite sides of the periodic table (group 1 and group 17).



Group 1 and group 17 have opposite qualities. Group 1 has least Ionization enthalpy (easy to remove electron from valence shell) while group 17 has least Electron gain enthalpy (easy to add electron to valence shell). Group 1 is least electronegative and group 17 is the most electronegative. That's why group 1 elements easily donate one of their valence electron to group 17 elements. Thus group 1 elements form M^+ ion and

group 17 elements form X^- ion. And these two oppositely charged ions attract each other and make ionic bond. The force they experience is called as electrostatic attraction.

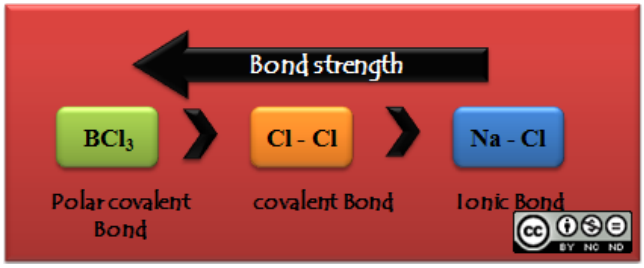
Group 2 and group 17 also make ionic bonds for the same reasons.



Now, I want you think of your friends. For a moment, go in the past and think, why did you make him/her your friend? You must have found them quite similar to you. People with common interest like to unite together. Elements also make bonds with elements which have similar qualities.

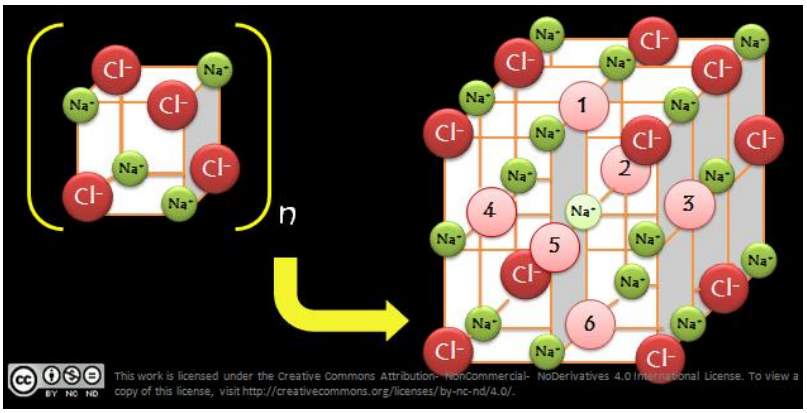
Group 13, 14, 15, 16 and 17 all are p block elements. They all have a few similarities. They have almost similar values of IE and EGE. They are all on the same ground; no one is capable of donating/ accepting electrons, that's why they share electrons between them and form covalent bonds.

In covalent bond, two bonded atoms not only share their electrons but also share the same orbital (molecular orbital), so that the shared pair of electrons can revolve around both of the bonded atoms. This unique sharing makes covalent bond the strongest among all the types of bonds. To understand it you have to look at the orbital picture of covalent bond and we orbital picture of covalent bond and we will discuss it in the coming posts.



These p block elements are dissimilar in one aspect. In electronegativity scale they are on different positions. This dissimilarity adds strength in their bonding. You didn't understand why? Ok, I'll explain it to you; the electronegativity difference develops polarity in their covalent bond. This way in a covalent bond two oppositely charged poles are developed, and between them electrostatic attraction starts working, which adds some more strength to the existing covalent bond. So you can conclude that polar covalent bond is stronger than non polar covalent bond.

Covalent bond is the strongest bond. The energy needed to break a single covalent bond is 80kcal/mol while only 8kcal/mol energy is required to break an ionic bond. Ionic bonds are weak bonds even though most of the solid substances are made up of ionic bonds. As you see in above example that BCl3 and Cl2 both are gases and NaCl (common salt) is a solid substance.



Now this may contradict your logic, you might have thought that the ionic bonds must be tougher and stronger than covalent bonds. Ionic bond is undoubtedly weaker than covalent bond but electrostatic attraction between ions and the strategy of ionic molecules to arrange them in a network (lattice) give extraordinary strength to the ionic compounds. “Unity in Strength”, this quote is also true in the world of atoms and it is the reason behind the strength of NaCl. NaCl molecules are bound together by electrostatic force to form a cubic structure and a number of such cubes form a network structure (where each Na+ issurrounded by 6 Cl- and each Cl- is surrounded by 6 Na+) which gives strength to the common salt. The electrostatic force is the strongest force working between ions and molecules of ionic substances which gives them extraordinary strength in spite of their weaker bond.

In covalent compounds, forces operating between molecules are not as stronger as electrostatic force. But it doesn’t mean that all covalent compounds are liquids or gases, some are solids too.

At this point, when you have learnt about bonds and their nature, you would like to try different combinations of elements. And you must be curious to know whether it exists or not and what would be the name of that compound? In the next post we will learn

how to make a compound? How to work out the formula of the compound and also how to name it?

Source : http://chemistrynotmystery.blogspot.in/2014/07/covalent-bond-vs-ionic-bond.html?view=sidebar