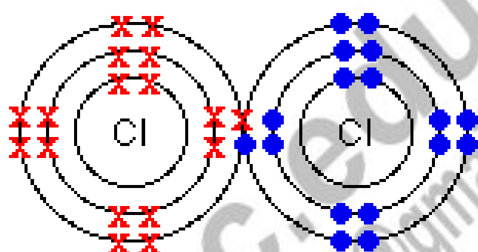
COVALENT BONDING - SINGLE BONDS

Covalent molecules

Chlorine Molecule: (Non- Polar Covalent Bond).

A covalent bond which is formed between two similar atoms or elements is called as non-polar covalent bond.

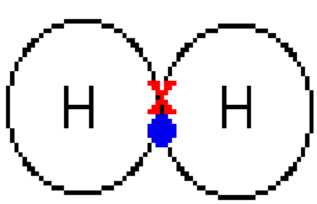
For example, two chlorine atoms could both achieve stable structures by sharing their single unpaired electron as in the diagram.



One chlorine atom has been drawn with electrons marked as crosses and the other as dots is simply to show where all the electrons come from. In reality there is no difference between them.

The two chlorine atoms are said to be joined by a covalent bond. The reason that the two chlorine atoms stick together is that the shared pair of electrons is attracted to the nucleus of both chlorine atoms.

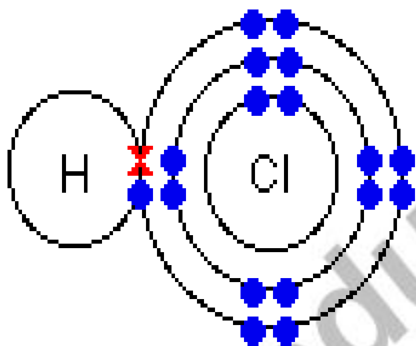
Hydrogen Molecule: (Non- Polar Covalent Bond).



Hydrogen atoms only need two electrons in their outer level to reach the noble gas structure of helium. Once again, the covalent bond holds the two atoms together because the pair of electrons is attracted to both nuclei.

Hydrogen chloride:

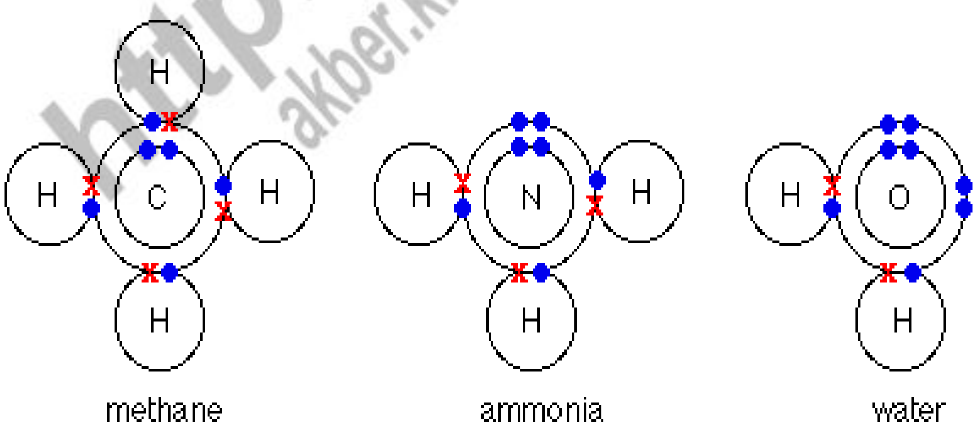
Formation of Polar covalent bond:



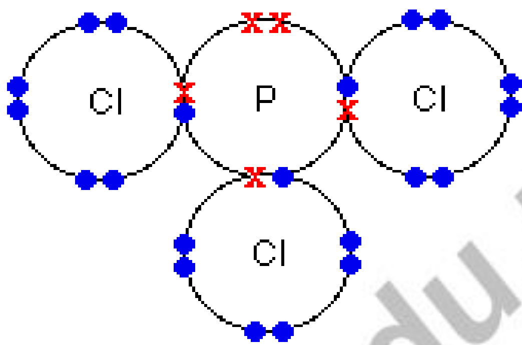
After sharing of electrons or the formation of covalent bond the hydrogen has a helium structure, and the chlorine an argon structure. This type of covalent bond is called as Polar covalent bond.

Here are some common examples of Polar covalent bonds are shown.

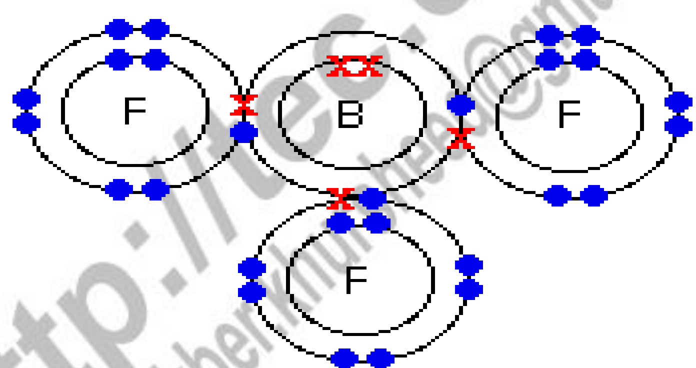
For example:



In this case, only the outer electrons are shown for simplicity. Each atom in this structure has inner layers of electrons of 2,8. Again, everything present has a noble gas structure.



Boron tri-fluoride, BF_3

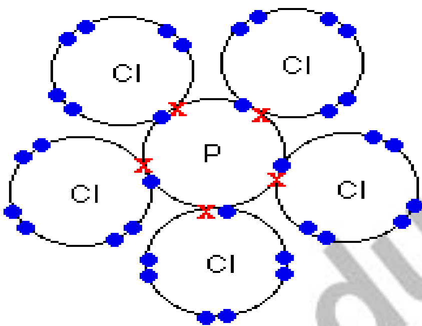


A boron atom only has 3 electrons in its outer level, and there is no possibility of it reaching a noble gas structure by simple sharing of electrons. Energy is released whenever a covalent bond is formed. Because energy is being lost from the system, it becomes more stable after every covalent bond is made. It follows, therefore, that an atom will tend to make as many covalent bonds as possible. In the case of boron in BF_3, three bonds is the maximum possible because boron only has 3 electrons to share.

Phosphorus(V) chloride, PCl_5

In the case of phosphorus 5 covalent bonds are possible - as in PCl_5.

The diagram of PCl_5 shows only the outer electrons.



Notice that the phosphorus now has 5 pairs of electrons in the outer level - certainly not a noble gas structure.

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