Electron affinity decreases down the group because the number of shells increases i.e., the atomic size increases and the effective nuclear charge decreases. This causes the incoming electron not to experience much attraction of the nucleus thus giving a lower electron affinity.

The electron affinity of completely filled atoms is almost zero. An atom does not accept an electron in its outermost shell if it already has a stable configuration i.e. a duplet or octet, as in the case of inert gases.

Electronegativity

Electronegativity is the tendency of an atom to attract electrons towards itself in a molecule of a compound. The value of electronegativity of an element describes the ability of its atom to compete for electrons with the other atom to which it is bonded. Electronegativity is however not the property of an isolated atom.

Electronegativity increases from left to right in each period ending at group VII. In the 3rd period, electronegativity increases from sodium to chlorine i.e., chlorine can accept electrons most easily in that period followed backwards by sulphur, phosphorus, silicon, aluminium, magnesium and sodium. All the atoms of the above mentioned elements have three shells but chlorine has the smallest atomic radii. Hence chlorine experiences more positive charge from the nucleus than all other atoms in that period. So, if one electron is available, chlorine can attract it most easily.

Types of Electronegativity

- When the molecule is formed by transfer of electrons (ionic bonding) the transfer takes place from electropositive atom to electronegative atom (Fig. 2.4). In the example below, Na is electropositive and Cl is electronegative.

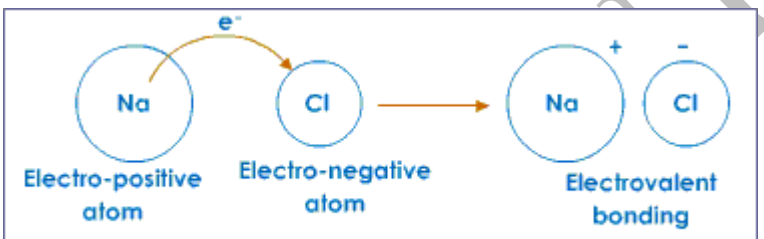

Fig. 2.4. Electrovalent bonding

- If the molecule is formed by sharing of electrons (covalent bond) the bonded pair of electrons shift towards more electronegative atom resulting in the formation of polar molecule. In the example below, chlorine atom is more electronegative as compared to hydrogen atom, resulting in a covalent bond where the shared pair of electron shifts towards the more electronegative atom. This results in polar molecules (Fig. 2.5).

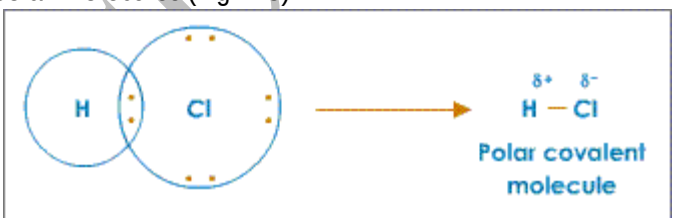

Fig. 2.5. Transfer of electron pair towards more electronegative chlorine

The electron pair is more closer to the chlorine atom and so the molecule gets polarized i.e., the chlorine atom gets a negative charge while the hydrogen atom gets a positive charge.

Remember!

- Fluorine is the most electronegative element.

- A summary of periodic properties and their variation in groups and periods is given below