Prof. Kumud Kumari

H. D. JAIN COLLEGE. ARA

PERIODIC TABLE AND PERIODICITY OF AN ELEMENTS (contd.)

Electron Affinity:

The electron affinity of an element may be defined as amount of energy which is released when an electron is added to an isolated gaseous atom to form a negative ion.

$$X_{(g)} + e^{-} \rightarrow X^{-}_{(g)}$$

The greater the energy released in the of taking of taking up the extra electron, the greater will be the electron affinity. Usually only one atom is added, forming a negative ion. Since energy is evolved have a negative sign. Electron affinity depends on the size and effective nuclear charge. They cannot be determined directly. Negative electron affinity value indicate that energy is given out when the atom accepts an electron The above value show that the halogen all evolve a large amount of energy on forming negative halide ions so these ions form large number of compounds

Energy is evolved when one electron is added to an oxygen (O) atom forming O^{-} ,but a substantial amount of energy absorbed when two electrons are added to O^{2-}ions. Thus the electron affinity for O -→ O^{2-}have a positive sign.

On moving **down a group,** the size of atom increases and therefore the effective nuclear attraction for the electron decreases. Consequently the atom will possess less tendency to attract additional electrons towards the itself, so electron affinity decreases as we move down the group. In case of halogens the decrease in electron affinity from chlorine to iodine is due to steady increase in ionic radii from chlorine to iodine. But the electron affinity of fluorine is lower than chlorine instead of high. This is due to the small size of fluorine. The reason for this is probably due to the small size of the fluorine atom. The addition of an extra electron produces high electron density which increases strong electron-electron repulsion. The repulsive force between result in low electron affinity.

Electron affinity of a noble gases are zero, because their valence have ns^2np^6 configuration so there are no chance for addition of any electron.

Electron affinity of beryllium and nitrogen are very-very low due to the extra stability of fully filled 2s orbital in beryllium and of the half-filled p-orbital in nitrogen.

CHANGE OF ELECTRON AFFINITY ALONG A PERIOD:

On moving across a period, the size of atoms decreases and nuclear charge increases, therefore an increase in force of attraction between electron and nucleus. Consequently, the atom will possess a greater tendency to attract an additional electron so electron affinity increases as we move left to right. Electron affinity of non-metals are high whereas those of metals are low.

FACTORS ON WHICH ELECTRON AFFINITY DEPENDS:

1.Size of the atom.

2.Magnitude of the nuclear charge.

3.Electronic configuration