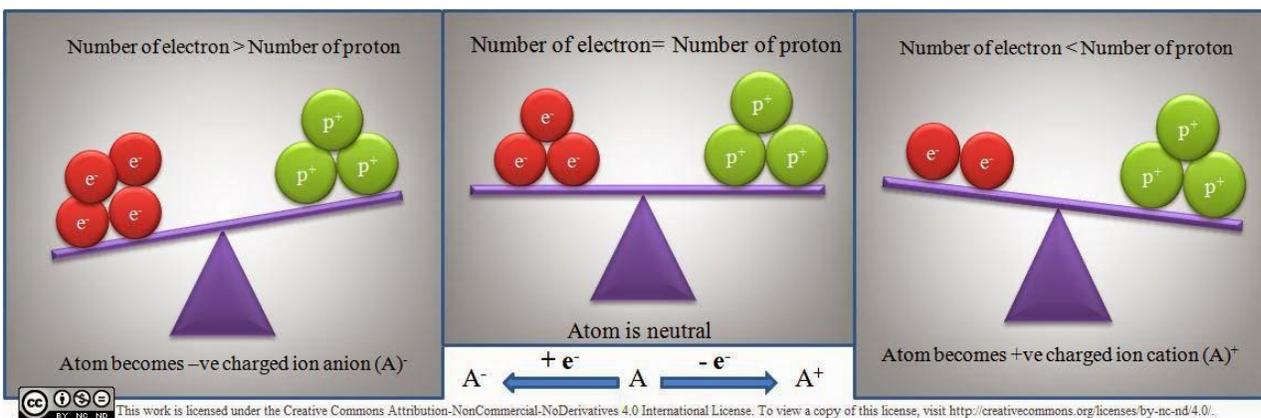


# PERIODIC PROPERTY: IONIZATION ENERGY

Now you are quite familiar with the atom and you know very well that the atom is neutral because it has equal number of electrons and protons. If we remove one of the electrons or add an extra electron to it, this disturbs the balance of charge and the atom no longer remains neutral. It becomes a charged species and is now called as “ion”. It either develops an excess of positive charge or negative charge.



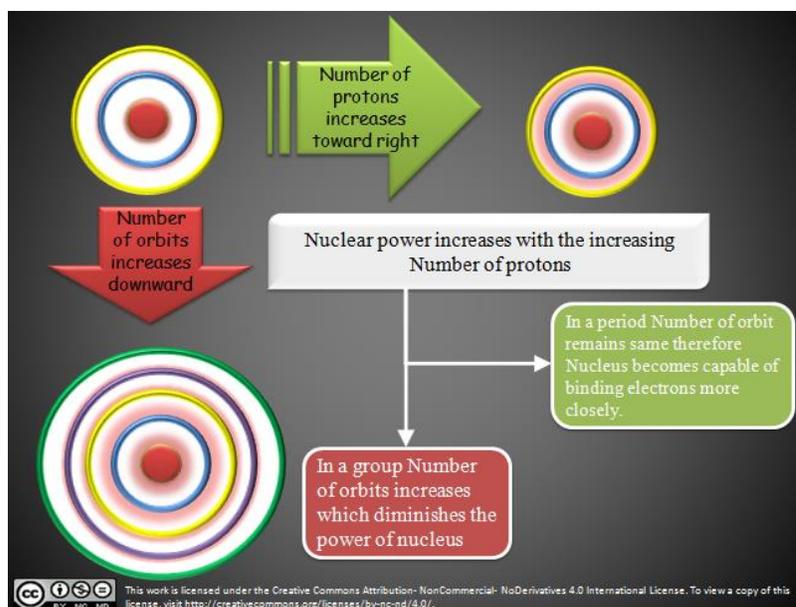
You also know that electrons are arranged in orbits and sub-shells and every electron has an address. What makes an electron different from other? Energy! Yes, it creates all the difference. Energy of an electron of 1st orbit is lower than the electron of 2<sup>nd</sup> orbit. If certain amount of energy is supplied to 1st orbit electron it can jump to 2<sup>nd</sup> orbit. Similarly, on supplying large amount of energy (sufficient energy to overcome the nuclear attraction) to the outer most electron, it can be removed from the

atom. This process is called ionization and the energy required to remove an outer most electron is called the ionization energy.

It is possible to remove more than one electrons from an atom but you have to proceed step by step.

- Energy required to remove an electron from neutral atom is called “First Ionization Energy”.
- Energy required to remove an electron from  $A^+$  is called “Second Ionization Energy”.
- Energy required to remove an electron from  $A^{+2}$  is called “Third Ionization Energy”.

Removal of successive electrons from an ion becomes more difficult because of increased nuclear charge. That’s why 2<sup>nd</sup> IE is always larger than the 1<sup>st</sup> IE, because in  $A^+$  ion electrons are bound more tightly due to increased nuclear charge. And for the similar reason 3<sup>rd</sup> IE is larger than the 2<sup>nd</sup> IE.



When you go downwards in a group (column), ionization energy decreases. Though the nuclear charge increases when you go downwards in a group, but it is easier to remove an electron from a larger atom (Remember! number of orbits increases, it means the size of atom or the **atomic radius** increases.)

When you go towards right in a row (period), ionization energy increases, because atomic size decreases in that direction. And it would be difficult to remove an electron from a smaller atom than from a larger atom, because electrons in a smaller atom are bound tightly as compared to the larger one.

In general IE decreases down the group and increases in a period. You will find that group 1 elements have lowest IE in their respective period. Noble gases have highest IE in their respective period. There are few deviations in the trend though, like

- ⌞  ${}^4\text{Be}$  has higher IE than  ${}^5\text{B}$ .
- ⌞  ${}^{12}\text{Mg}$  has higher IE than  ${}^{13}\text{Al}$
- ⌞ Group 13 shows irregular trend of IE
- ⌞ Elements of group 15 have higher IE than expected.

In the next post we will find out the reasons behind their remarkable behaviour.

Source :

<http://chemistrynotmystery.blogspot.in/2014/07/periodic-property-ionization-energy.html>