

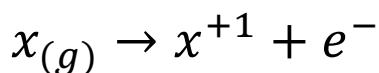
Ionization energy

Successive ionization energies

- Definition – The energy required to take away one mole of electron to infinity from one mole of gaseous ions to form one mole of gaseous positive ions
- Definition for second ionization energy – The energy required to remove one mole of electrons to infinity from one mole of gaseous unipositive ions to form one mole of gaseous dipositive ions (and so forth for 3rd ionization energy etc.)
- Trends – The successive ionization energies is **always greater than the previous one** since the electron is being pulled away from a more positive species
- Trends – There are also **large increases** when there is a **change of shell** since there is a big decrease in shielding. The large increases can also be used to predict the group of an unknown element

First ionization energy

- Definition – The energy required to take away one mole of electrons to infinity from one mole of gaseous atoms to form one mole of gaseous positive ions



- The ionization energy depends on the distance, charge, and the shielding. Both the group and the period are also considered for the first ionization energy
 - ➔ **Size of the positive nuclear charge** – As the positive nuclear charge increases, its **attraction for outermost electrons increases**, this increases ionization energy
 - ➔ **Distance** of the outermost electron from the nucleus – As the distance increases, the **attraction between the outermost electrons and the nucleus decreases** which reduces ionization energy
 - ➔ The **shielding effect** of electrons – Electrons in inner shells exert a **repelling effect** on electrons in the outer shells of an atom. This **reduces the attraction** between the nucleus and the electrons in the outer shell. Due to shielding, the 'effective nuclear charge' attracting electrons in the outer shell is much less than the full positive charge of the nucleus. **The shielding effect increases as the number of inner shell increases** which **increases the distance** of the outermost electron from the nucleus which **reduces the attraction** between the nucleus and the outermost electrons which therefore **reduces ionization energy (if shielding increases)**.