Octet Rule, Losers and Gainers

Octet Rule: when elements react to form compounds, they will **lose**, **gain** or **share** electrons in such a way as to obtain an octet of electrons in their valence shell (duet in the case of helium like elements)

Stable Octet (or duet): full valence shells of $8e^-$ (or $2e^-$) are particular stable.

Eight is good!

Analogy of the square dance – takes eight people.

Lower energy therefore more stable. Good wavefunctions for the electrons involved gives lower more stable energy configurations. Quantum Mechanics makes this work!

When following the octet rule an element will achieve the same electron configuration as the **nearest noble gas**. Every element wants to be like a noble gas. A full valence shell will do this. An empty valence shell will do this just as well.

eg: Cl will gain one electron to become like argon ∴ Cl^{1-}

eg: Al will lose three electrons to become like neon ∴ Al^{3+}

eg: Si could go either way ∴ Si^{4+} or Si^{4-}

Element	Loses or Gains	How Many	Resulting Ion
N	gain	3	N^{3-}
S	gain	2	S^{2-}
B	lose	3	B^{3+}
Sr	lose	2	Sr^{2+}
C	lose/gain	4/4	C^{4+} / C^{4-}
Kr	☺	☺	Kr^{0} or ☺
I	gain	1	I^{1-}
In	lose	3	In^{3+}
Ca	lose	2	Ca^{2+}
Bi	gain	3	Bi^{3-}

In the case of elements such as In, the d or f block electrons can be entirely ignored. This means that In should be treated the same way as Al. The reason that d and f electrons can be ignored is because they are in fact closer to the nucleus than the corresponding s and p electrons.

Isoelectronic: means same electron configuration

eg Al $(1s^2 2s^2 2p^6 3s^2 3p^1)$ ➜ Al^{3+} $(1s^2 2s^2 2p^6)$ + $3e^{1-}$

is isoelectronic to Ne $(1s^2 2s^2 2p^6)$

eg Cl $(1s^2 2s^2 2p^6 3s^2 3p^5)$ + $1e^{1-}$ ➜ Cl^{1-} $(1s^2 2s^2 2p^6 3s^2 3p^6)$

is isoelectronic to Ar $(1s^2 2s^2 2p^6 3s^2 3p^6)$