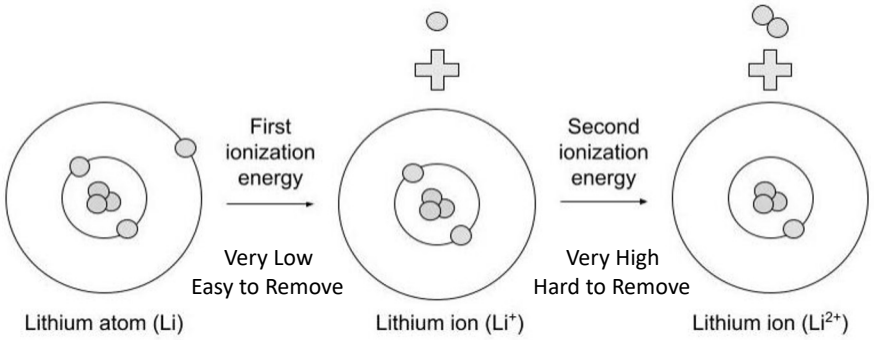
Formation of Ions

Ionization Energy

Energy required to remove an electron from atom to form an ion



Neutral Atom Li^{1+} (0 val e^-) Li^{2+} (-1 val e^-)

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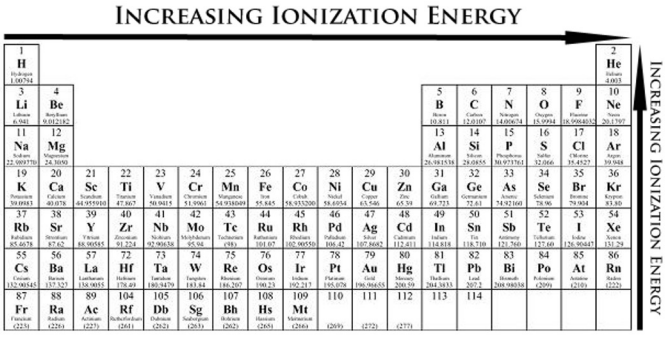
Formation of Ions

Ionization Energy Trends



Not every element always falls the IE trend, for example noble gases (8A/18) don't form ions (*full octet*)

Ionization Energy

Group Trend (*left to right*)
Increases Across Table

More val e^- make it harder to remove val e^- from atom

Period Trend (*up and down*)
Decreases Down Table

Electrons in higher Energy Levels are pushed away from nucleus by inner e^-

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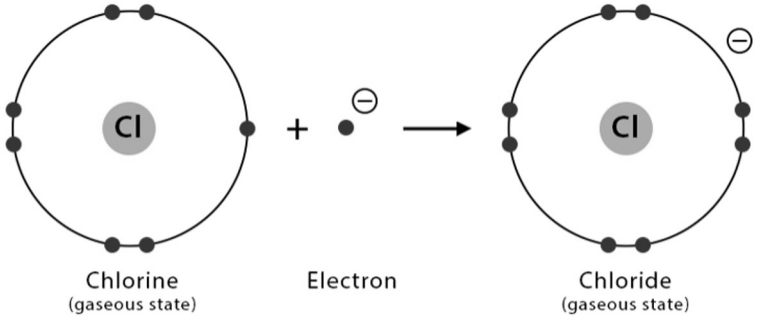
Formation of Ions

Electron Affinity

Energy lost or gained when an atom gains an electron



Energy released: EA = -349 kJ/mol

Chloride Anion (-1 anion) Chlorine Atom (Neutral)

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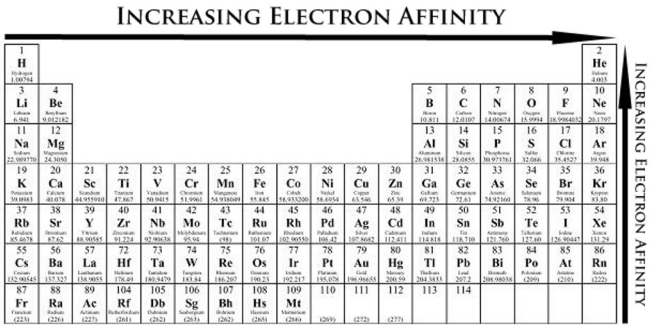
Formation of Ions

Electron Affinity Trends



Metals (*groups 1A – 3A + transition elements*) do not lose electrons, so the electron affinity values are much higher than expected

Electron Affinity

Group Trend (*left to right*)
Increases Across Table

Atoms closer to an octet of e^- lose more energy when forming ions

Period Trend (*up and down*)
Decreases Down Table

Lower atoms are pulled less by p^+ and lose less energy

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Formation of Ions

Comparing Ionization Energy and Electron Affinity

Energy required to remove an electron from atom to form an ion

Element Type	Ionization Energy	Electron Affinity
Metals (0 – 4 Valence Electrons)	Low IE (*easy to lose* e^-) Atoms want to lose e^-	Low EA (*Low desire to gain* e^-) Atoms don't want e^-
Non-Metals (5 – 8 Valence Electrons)	High IE (*hard to lose* e^-) Atoms don't want to lose e^-	High EA (*High desire to gain* e^-) Atoms want to gain e^-

In general: Atoms always want to lose heat (q), - to become more stable

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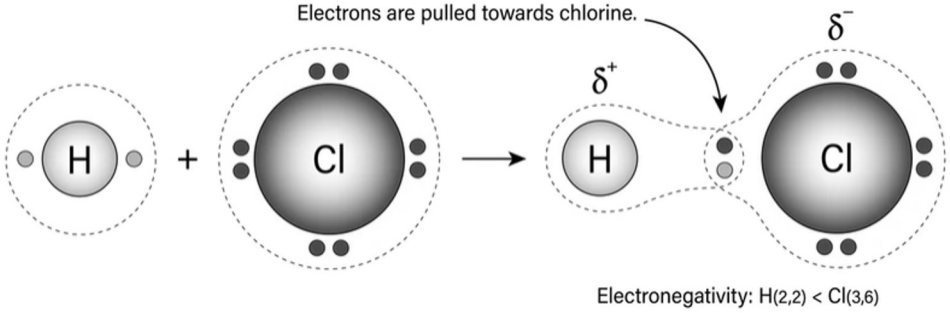
Formation of Ions

Electronegativity

Atoms ability to attract electrons towards itself



Metals/Hydrogen – Low Electroneg. Non-Metals – High Electroneg.

Higher Electronegativity = More pull on electrons towards itself in bond

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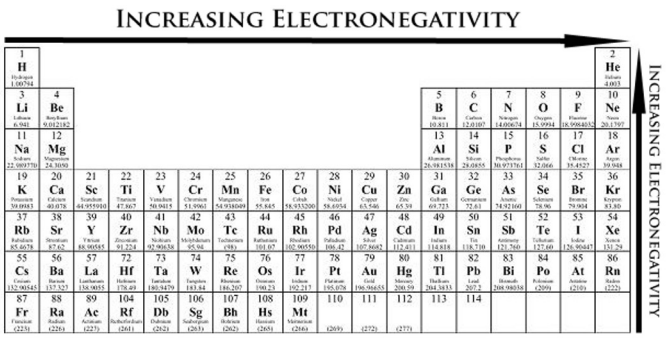
Formation of Ions

Electronegativity Trends



Metals (*groups 1A – 3A + transition elements*) want to lose electrons, so they generally have a low attraction to their own valence electrons

Electronegativity

Group Trend (*left to right*)
Increases Across Table

Atoms have a stronger attraction to e^- the closer they are to an octet of e^-

Period Trend (*up and down*)
Decreases Down Table

Lower atoms have more inner e^- to the val. e^-

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